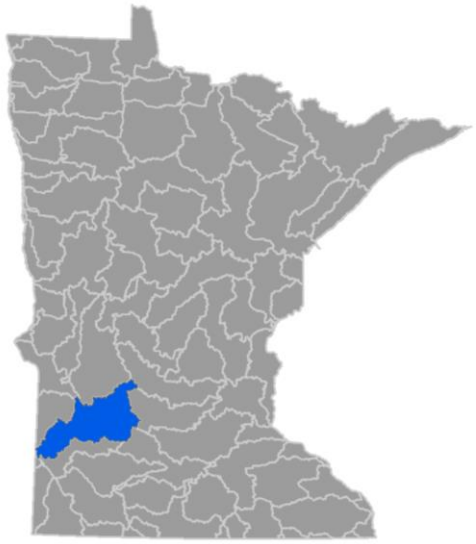
Hawk Creek Watershed

Stressor Identification Update
May 2026

Purpose

The Minnesota Pollution Control Agency (MPCA) conducts biological monitoring of fish and bug communities on select streams in each of the states 80 major watersheds on a 10-year cycle (Watershed Approach). 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 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.

Figure 1. Minnesota River - Yellow Medicine River Watershed.

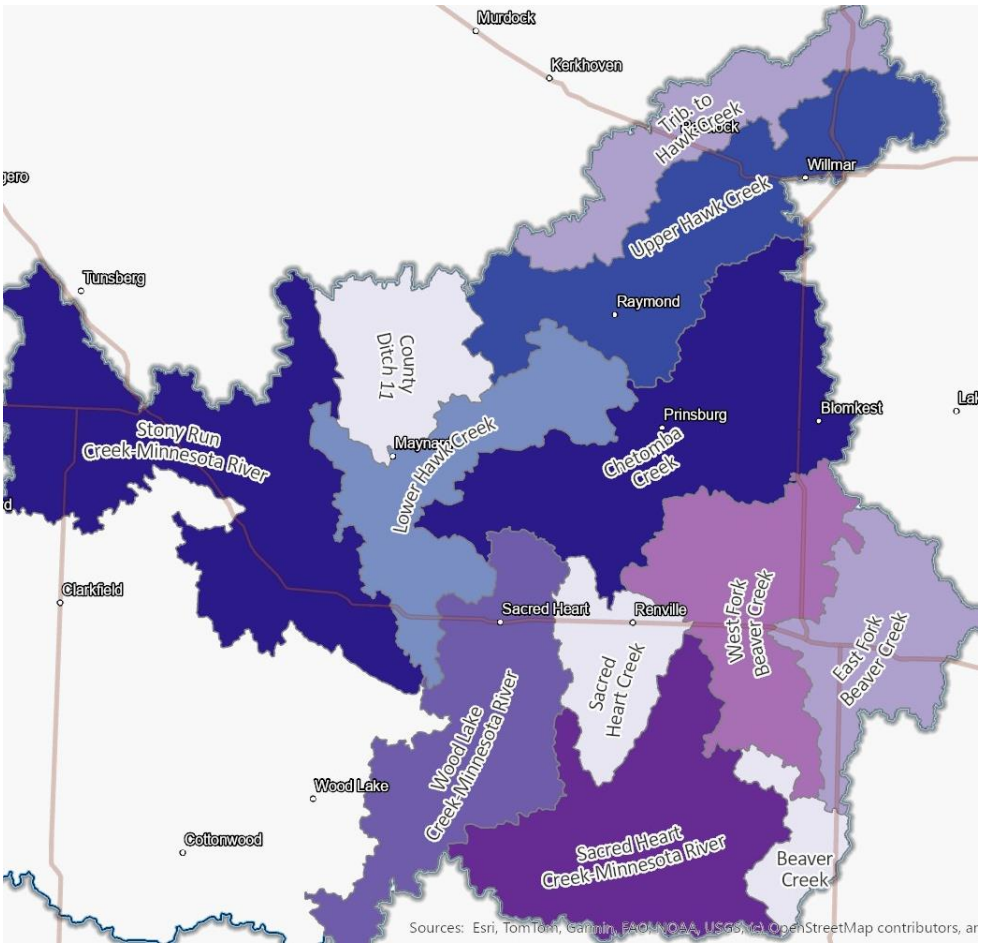


The stressor identification (SID) process investigates specifically why fish and bug communities are impaired. SID work was completed in 2013 for the Minnesota River – Yellow Medicine River (MN-YM) Watershed (HUC 07020004) following the initial monitoring and assessment in Cycle 1 (C1). The MN-YM Watershed (Figure 1), located in southwest Minnesota, drains over 1.3 million acres and is bisected by the mainstem of the Minnesota River. The MN-YM Watershed has traditionally been managed as two different watersheds with the Yellow Medicine River Watershed to the southwest of the Minnesota River and the Hawk Creek Watershed to the northeast. This report focuses on the Cycle 2 (C2) SID work in the Hawk Creek Watershed. The purpose of C2 SID work is to support follow-up watershed restoration and protection 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 Hawk Creek Watershed 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 in 2026.

What have we learned about stream health and stressors in the Hawk Creek Watershed in Cycle 2?

The most common stressors identified in the Hawk Creek Watershed in C2 (Figure 2) were lack of habitat, flow alteration, and nitrate. They were all orginally identified as stressors in the watershed during C1.

Figure 2. Hawk Creek subwatersheds.



Habitat was a stressor in the majority of stream reaches. Unstable flow regime as a result of channelization and tile drains can cause a lack of habitat, unstable stream banks, and filling of pools and riffle habitat. Altered hydrology was also a stressor in the majority of reaches.

Nitrate was identified as a stressor to East Fork Beaver Creek, West Fork Beaver Creek, Sacred Heart Creek, Middle Creek, Smith Creek. Phosphorous concentrations showed a statistically significant decrease on Hawk Creek (MPCA 2024), but eutrophication was identified as a stressor to East Fork Beaver Creek, County Ditch 11, and an unnamed creek, which are tributaries to Hawk Creek. Targeting nutrient reduction in these watersheds would help maintain a reduction in phosphorus values.

Upstream reaches of both Hawk Creek and Chetomba Creek are limited use waters (Class 7) and were not able to be assessed for aquatic life. Limited Use waters have less restrictive water chemistry standards and no biological standards. The highest phoshporus and nitrate values were collected on the Class 7 reach during a longitudinal survey of Hawk Creek.

While many stressors remained consistent from C1 to C2, Chetomba Creek (-577) the chlorpyrifos pesticide impairment was removed in 2024. This corresponds with an increase in macroinverbtebrate scores on the downstream reach of Chetomba Creek. There were also improvements in the stressors affecting Smith Creek, with an increase in the available habitat.

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

Part 1: Hawk Creek Watershed SID Summary Results

C1 monitoring (2010) and SID monitoring (2012-2013) and reporting in the Hawk Creek Watershed focused on the biologically impaired reaches in Smith Creek (-617), County Ditch 119 (-687), County Ditch 36 (-716), and an unnamed ditch (-566). Impairments on reaches with predominantly altered hydrology were deferred until Tiered Aquatic Life Use standards were created for modified reaches.

Cycle 2 Biological Impairment Summary

- New fish and/or macroinvertebrate impairments were identified on 29 new stream reaches during C2 monitoring (2021-2022) and assessment.
- The macroinvertebrate impairment on Spring Creek (07020004-776;-777) from C1 was reaffirmed. There were no new biological data on Unnamed Creek (Limbo Creek) (07020004-567), County Ditch 119 (07020004-687), or County Ditch 36 (07020004-716).

Cycle 2 Stressor Identification: Areas of focus

- This report addresses biological impairments and stressors in the Hawk Creek Watershed, the northeast portion of the Yellow Medicine River Watershed. A separate report addressed impairments and stressors for the Yellow Medicine Watershed (MPCA 2025). The SID process focused on several areas to gain additional information needed. The list shown below is of streams that were studied during the SID process (data collection, analysis, and report writing) in 2020-2024 and are further detailed in this report. These streams were selected based on impairment status and previous SID work. Some streams had C1 impairments that were deferred and needed additional information to understand stressor connections, while some were new impairments from C2 monitoring. The amount of information collected in each subwatershed was variable depending on the information needed.
- **Upper Hawk Creek Subwatershed**
    - Unnamed ditch (07020004-732)
    - Unnamed ditch (07020004-733)
    - Unnamed ditch (07020004-736)
- **Lower Hawk Creek Subwatershed**
    - Hawk Creek (07020004-568)
    - Hawk Creek (07020004-587)
    - County Ditch 37 (07020004-724)
    - Judicial Ditch 2 (07020004-730)
    - Unnamed ditch (07020004-731)
- **County Ditch 11 Subwatershed**
    - County Ditch 11 (07020004-689)
    - Unnamed ditch (07020004-725)

- **Stony Run Creek-MN Subwatershed**
    - County Ditch 36A (07020004-682)
- **Chetomba Creek Subwatershed**
    - Chetomba Creek (07020004-577)
    - Chetomba Creek (07020004-588)
    - County Ditch 8 (07020004-650)
    - County Ditch 18 (07020004-651)
    - Judicial Ditch 8 (07020004-728)
    - County Ditch 16 (07020004-734)
    - Unnamed Creek (07020004-571)
    - County Ditch 31 (07020004-574)
- **East Fork Beaver Creek Subwatershed**
    - East Fork Beaver Creek (07020004-785)
    - East Fork Beaver Creek (07020004-786)
- **West Fork Beaver Creek Subwatershed**
    - West Fork Beaver Creek (07020004-768)
    - West Fork Beaver Creek (07020004-769)
    - County Ditch 37 (07020004-531)
    - County Ditch 59 (07020004-677)
    - County Ditch 17A (07020004-678)
    - County Ditch 31 (07020004-727)
- **Sacred Heart Creek Subwatershed**
    - Sacred Heart Creek (07020004-771)
- **Sacred Heart Creek-Minnesota River Subwatershed**
    - Middle Creek (07020004-615)
    - Smith Creek (07020004-617)
    - Timms Creek (07020004-767)

Part 2: Cycle 2 Stressor Identification Stream Reaches

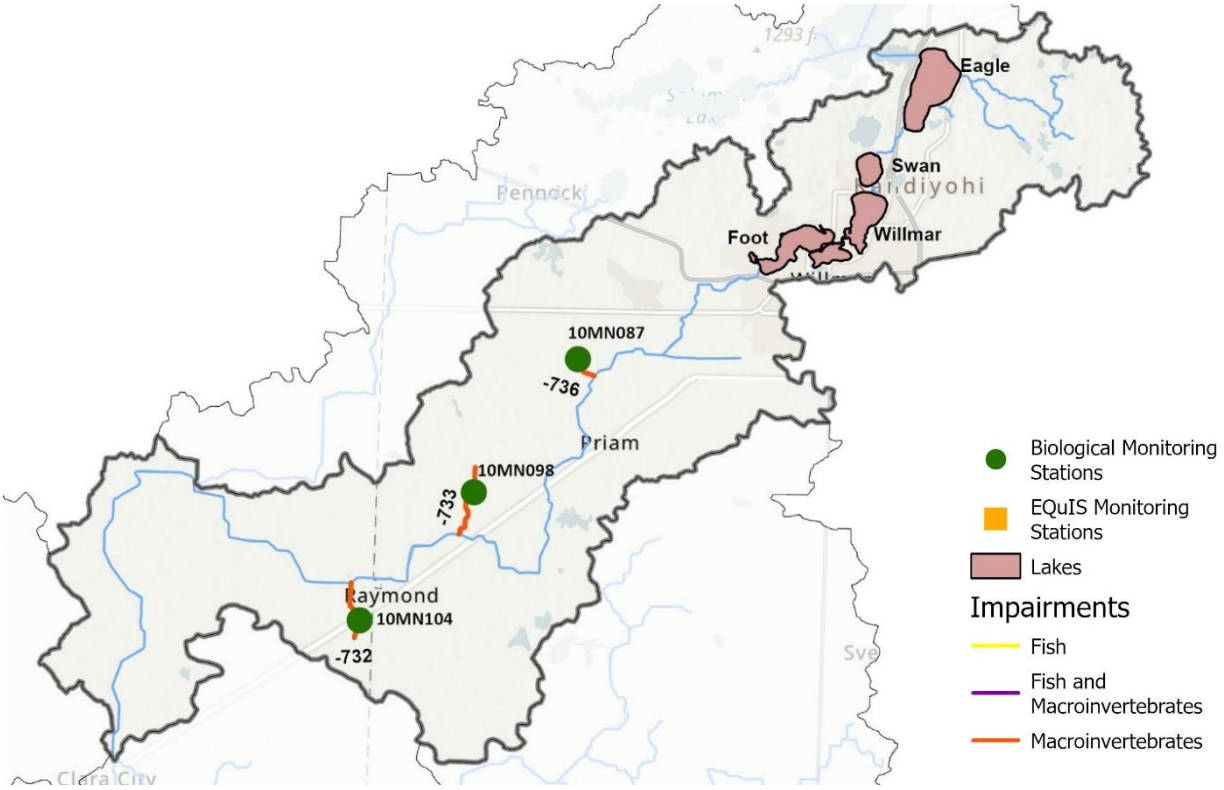
Upper Hawk Creek Subwatershed

Biological Community Summary

The Upper Hawk Creek Subwatershed (Figure 3) has three reaches that are direct tributaries to Hawk Creek, which are impaired for aquatic life due to the degraded macroinvertebrate communities. These reaches include Unnamed ditch (-732), Unnamed ditch (-733), and Unnamed ditch (-736). Stressors are identified in Figure 4.

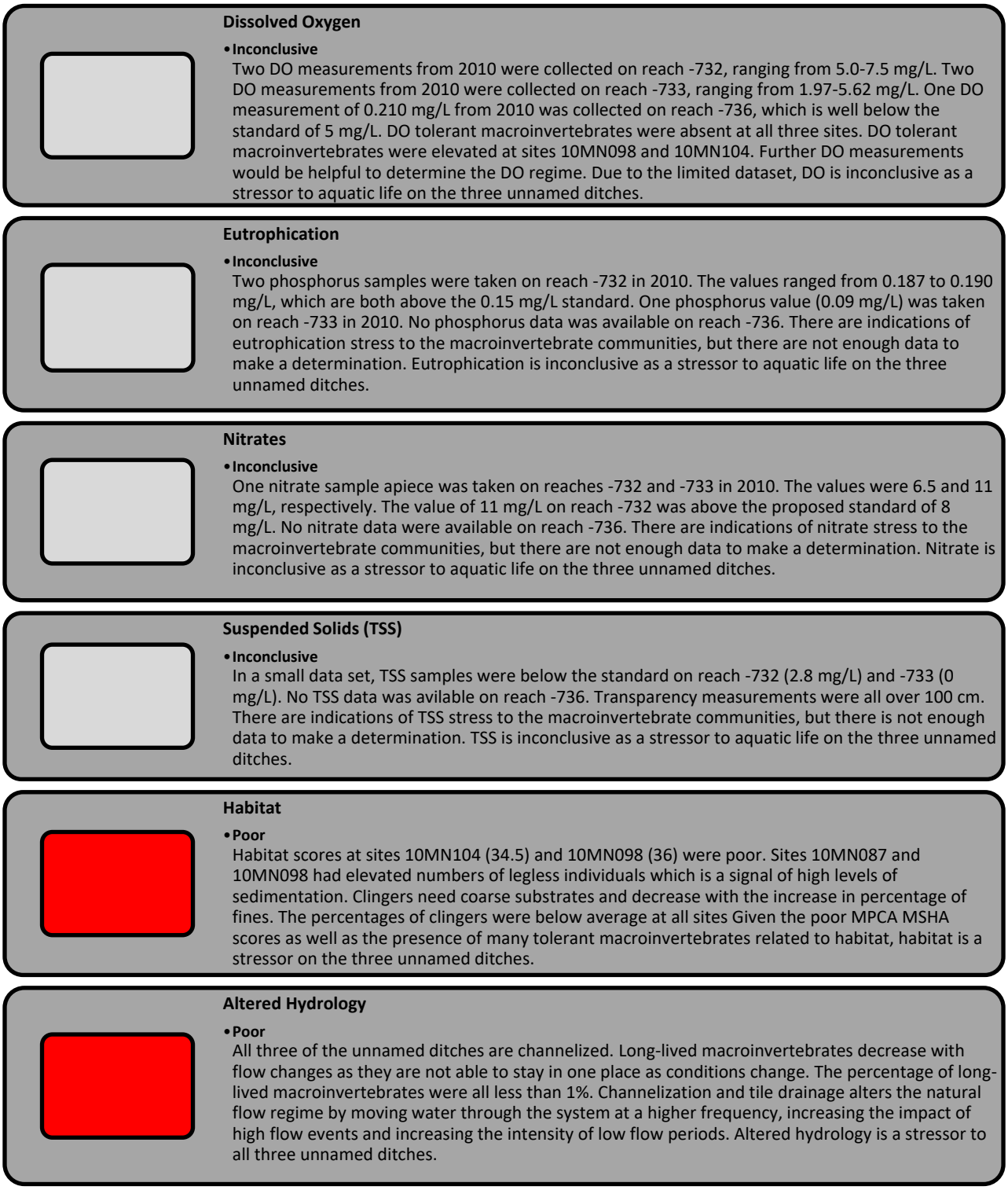
- Unnamed ditch (-732) is 1.47 mile long stream reach that is impaired for aquatic life use due to the poor scoring macroinvertebrate assemblage at its one biological monitoring site, 10MN104. The Macoinvertabrate Index of Biological Integrity (MIBI) score was 4 during the 2010 sampling visit. This score is below the Invertebrate Class 7 Prairie Streams modified use threshold of 22.
- Unnamed ditch (-733) is 1.68 mile long stream reach that is impaired for aquatic life use due to the degraded macroinvertebrate assemblage at its one biological monitoring site, 10MN098. The MIBI score was 13 during the 2010 sampling visit. This score is below the Invertebrate Class 7 Prairie Streams modified use threshold of 22.
- Unnamed ditch (-736) is 0.63 mile long stream reach that is impaired for aquatic life use due to the low scoring macroinvertebrate assemblage at its one biological monitoring site, 10MN087. The MIBI score was 3 during the 2010 sampling visit. This score is below the Invertebrate Class 7 Prairie Streams modified use threshold of 22.

Figure 3. Upper Hawk Creek Subwatershed with impairments.



What stressors are of concern?

Figure 4. Biological stressor determinations for tributaries to Hawk Creek (-732, -733, -736). 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

The three unnamed creeks all had dissolved oxygen (DO) values at or below the DO standard of 5 mg/L. DO tolerant macroinvertebrates were elevated at all three sites. Site 10MN104 on reach -732 is just downstream of a wetland, which could be impacting the low DO. All of the biological and chemical data is from 2010. More DO data would be helpful to determine if DO is a stressor to the biological community.

The two phosphorus values on reach -732 were both above the standard of 0.150 mg/L. Elevated phosphorus and algal growth (Figure 5 and Figure 6) indicate possible eutrophication stress on the unnamed ditches. DO flux or chlorophyll-*a* (chl-*a*) data would help to confirm.

Embeddedness of coarse substrates by fine sediments, a lack of depth variability, and a lack of channel development all limited the habitat scores at stations 10MN098 and 10MN104. Station 10MN098 had choking vegetation, likely a result of excess nutrients. Riparian buffers were identified as very narrow to moderate (Figure 7). Increasing riparian buffers could help reduce phosphorus concentrations.

The three unnamed ditches are tributaries to a section of Hawk Creek that is a Class 7 stream. Limiting nutrient transport to the stream will likely lead to improved conditions, especially regarding eutrophication.

Figure 5. Algal growth at site 10MN098 (9/16/09).

Figure 6. Algae and plants at site 10MN104 (7/29/10).

Figure 7. Channelization at site 10MN104 (8/18/10).

Lower Hawk Creek Subwatershed

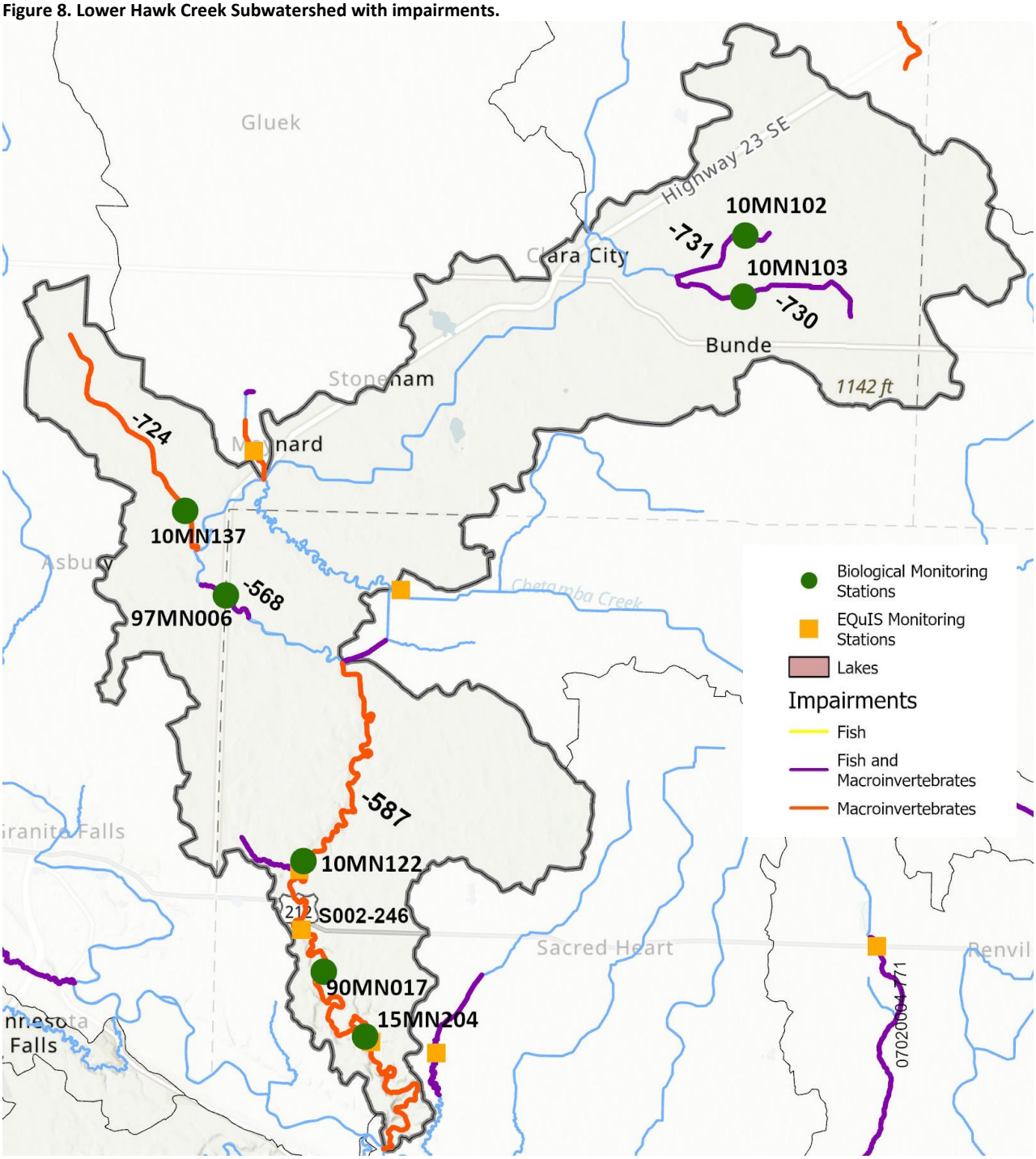
Biological Community Summary

The Lower Hawk Creek Subwatershed (Figure 8) also had five reaches impaired for aquatic life due to the degraded biological communities. These reaches include Hawk Creek (-568), Hawk Creek (-587), County Ditch 37 (-724), Judicial Ditch 2 (-730), and Unnamed Ditch (-731). Stressors to Hawk Creek are identified in Figure 9 and stressor to the tributaries are identified in Figure 14.

Hawk Creek (-568) is a 1.2-mile-long stream reach in the Lower Hawk Creek Subwatershed and is designated as impaired for aquatic life use due to the poor fish and macroinvertebrate community conditions. The fish community at site 97MN006 was sampled three times since 2010, with FIBI scores ranging from 34.75-46.60. These scores all fell below the Fish Class 1 Southern Rivers FIBI Threshold (49). The macroinvertebrate assemblage was sampled in 2010 at site 97MN006 and had a MIBI score of 17.6. The site was also sampled in 2021 and had a MIBI score of 23.8. These scores are both below the Invertebrate Class 5 Southern Streams MIBI threshold of 37.

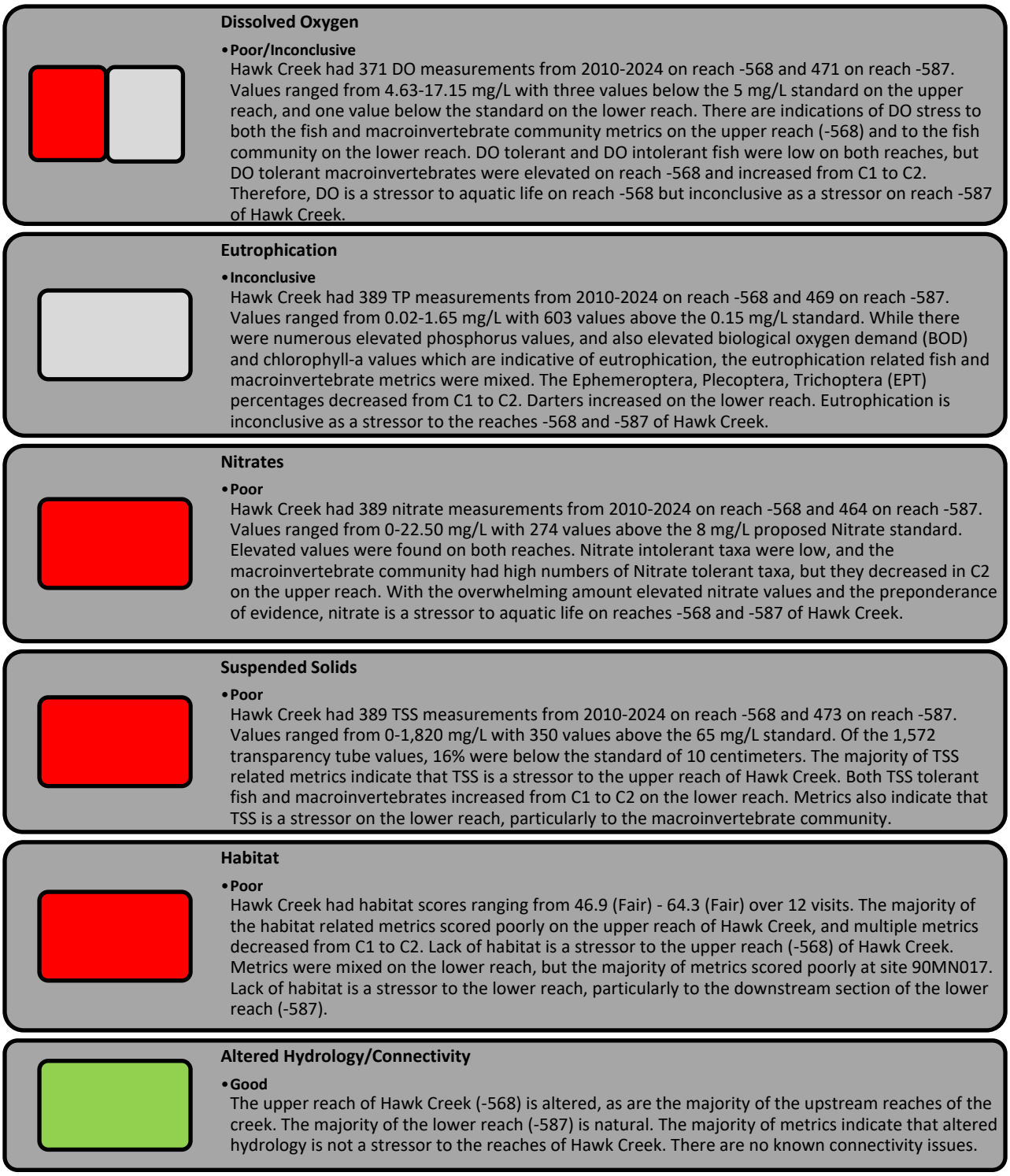
- Hawk Creek (-587) is a 15.63-mile-long stream reach downstream of -568, also located in the Lower Hawk Creek Subwatershed. This reach is designated as impaired for aquatic life due to the degraded macroinvertebrate assemblage. Hawk Creek was sampled for fish at three biological monitoring stations (10MN122, 15MN204, 90MN017) from 2010 through 2022. The MIBI scores along this reach ranged from 18.6-36.4 and were all below the respective class thresholds.
- County Ditch 37 (-724) is a 7.68-mile-long reach that is impaired for aquatic life use due to the degraded macroinvertebrate assemblage. The biological monitoring station, 10MN137, was sampled in 2010 and had a MIB score of 21.9. This score is below the invertebrate class 7 Prairie Streams threshold of 41.
- Judicial Ditch 2 (-730) is a 3.64-mile-long stream reach that is impaired for aquatic life use due to the poor fish and macroinvertebrate communities. The biological monitoring station, 10MN103, had a FIBI score of 0 in 2010, and 9.8 in 2021. Both scores are well below the Fish Class 7 Low Gradient threshold (15) for a modified use stream. Additionally, this site was also sampled for macroinvertebrates in 2010 and 2021. The MIBI score during the 2010 visit was 21.4 and was 18.0 during the 2021 visit. Both of the scores were below the modified use threshold (22.0) for an invertebrate class 7 Prairie Streams site.
- Unnamed ditch (-731) is 2.02-mile-long stream reach that is impaired for aquatic life use due to the low scoring fish and macroinvertebrate assemblages at biological monitoring station 10MN102. The FIBI score was zero during the 2010 sampling visit. This result is well below the Fish Class 7 Low Gradient modified use threshold of 15. The MIBI for this reach was one during the 2010 sampling visit, which is also well below the threshold (22) expected for a modified use Macroinvertebrate class 7 Prairie Streams site.

Figure 8. Lower Hawk Creek Subwatershed with impairments.



What stressors are of concern?

Figure 9. Biological stressor determinations for Hawk Creek (-568 and -587). 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

The headwaters of Hawk Creek is a limited use class 7 stream. Class 7 streams have less restrictive water quality standards and no biological standards.

Thick algae growth was found in Hawk Creek, upstream of the two impaired reaches (Figure 10). While eutrophication determined inconclusive as a stressor to Hawk Creek (-568, -587), elevated phosphorus (a high value of 1.65 mg/L) and elevated pH (a high value of 10.18) were prevalent on both reaches. Chl-*a* (44%) and biochemical oxygen demand (BOD; 38%) were also elevated on the lower reach. Reducing nutrient inputs to the creek would be beneficial.

Figure 10. Algal growth at 03MN007 (6/29/03).

Habitat conditions were considered fair in Hawk Creek, with scores lowest at sites 97MN006 and 15MN204. Factors limiting the habitat along this reach were erosion, lack of shade, moderate embeddedness, and lack of channel development. Burrowers increased and EPT percentages decreased from C1 to C2 at site 97MN006 on the upper reach.

Figure 11. Erosion at 15MN204 (8/19/15).

Severe bank erosion was recorded at site 15MN204 in 2015 (Figure 11). Riparap was added to the banks (Figure 12), but erosion will continue until the creek has access to its floodplain. The DNR did a geomorphology study at site 15MN204 and found the site to be entrenched and "…the channel is notably wide relative to its depth... The high W/D ratio makes the channel inefficient at transporting bedload, resulting in multiple areas of sand and gravel depositional bars" (DNR 2025).

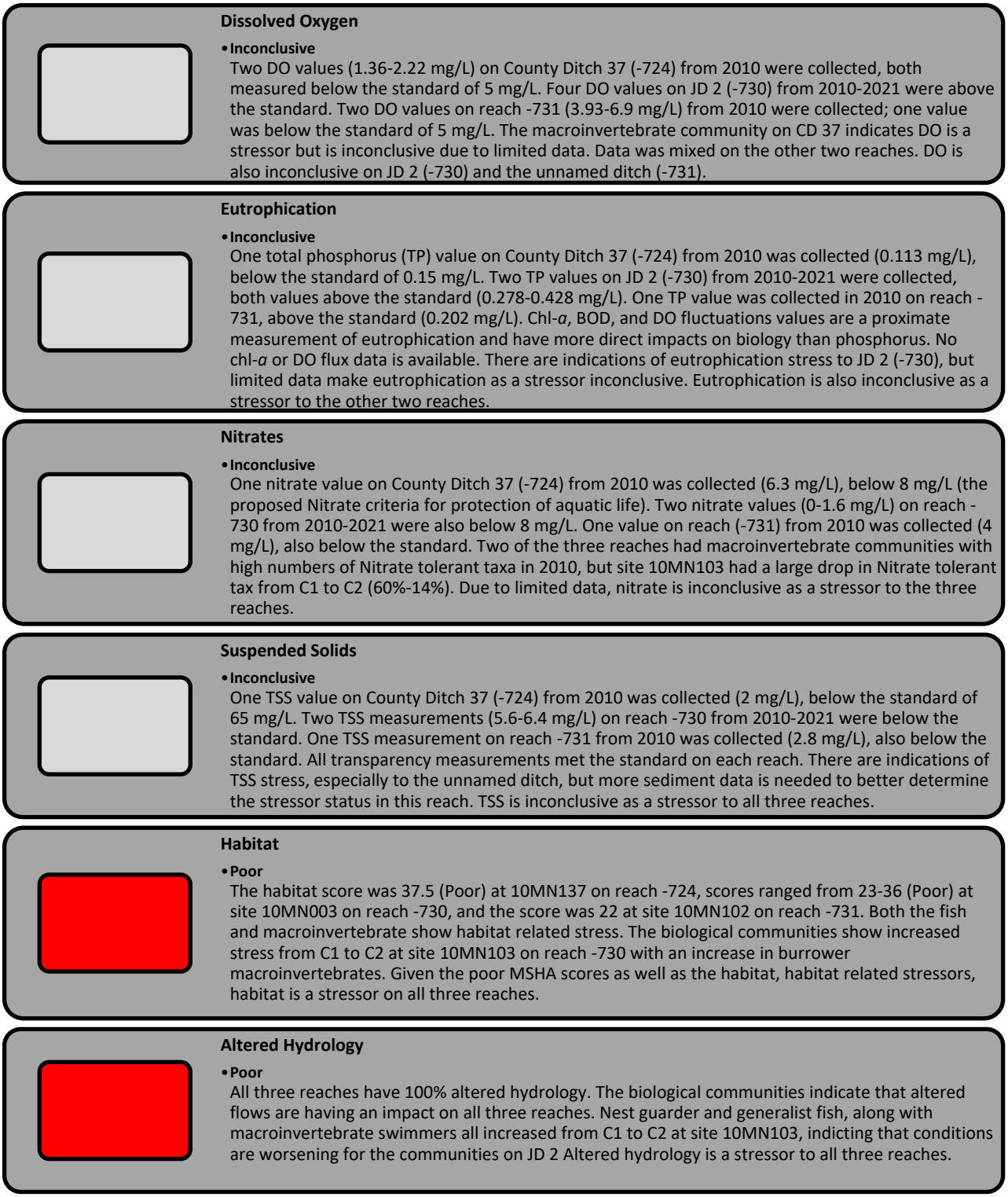
Figure 12. Bank riprap at 15MN204 (2020). Photo credit DNR.

Over 40% of TSS values are over the standard. On average, inorganic solids (sediment) made up the majority of the suspended solids (Figure 13). Elevated values were collected throughout the time range, and values were highest after rain. TSS tolerant fish increased from C1 to C2 and TSS tolerant macroinvertebrates were elevated during both visits.

Figure 13. Turbidity at 10MN147 (6/29/23).

Some elevated conductivity values were found on Hawk Creek, with a high value of 2,259 uS/cm. As salinity increases, macroinvertebrate taxa richness and Ephemeroptera richness decrease (Piscart et al. 2005). Both macroinvertebrate metrics were lower than average in C1 and decreased further in C2. Limited chloride data was below the standard, but further data would be helpful to determine if chloride is a stressor to the biological community.

Figure 14. Biological stressor determinations for tributaries to Hawk Creek (-724, -730, and -731). 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**

Two DO values (1.36-2.22 mg/L) on County Ditch 37 (-724) from 2010 were collected, both measured below the standard of 5 mg/L. Four DO values on JD 2 (-730) from 2010-2021 were above the standard. Two DO values on reach -731 (3.93-6.9 mg/L) from 2010 were collected; one value was below the standard of 5 mg/L. The macroinvertebrate community on CD 37 indicates DO is a stressor but is inconclusive due to limited data. Data was mixed on the other two reaches. DO is also inconclusive on JD 2 (-730) and the unnamed ditch (-731).

Eutrophication

- **Inconclusive**

One total phosphorus (TP) value on County Ditch 37 (-724) from 2010 was collected (0.113 mg/L), below the standard of 0.15 mg/L. Two TP values on JD 2 (-730) from 2010-2021 were collected, both values above the standard (0.278-0.428 mg/L). One TP value was collected in 2010 on reach -731, above the standard (0.202 mg/L). Chl-*a*, BOD, and DO fluctuations values are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. No chl-*a* or DO flux data is available. There are indications of eutrophication stress to JD 2 (-730), but limited data make eutrophication as a stressor inconclusive. Eutrophication is also inconclusive as a stressor to the other two reaches.

Nitrates

- **Inconclusive**

One nitrate value on County Ditch 37 (-724) from 2010 was collected (6.3 mg/L), below 8 mg/L (the proposed Nitrate criteria for protection of aquatic life). Two nitrate values (0-1.6 mg/L) on reach -730 from 2010-2021 were also below 8 mg/L. One value on reach (-731) from 2010 was collected (4 mg/L), also below the standard. Two of the three reaches had macroinvertebrate communities with high numbers of Nitrate tolerant taxa in 2010, but site 10MN103 had a large drop in Nitrate tolerant tax from C1 to C2 (60%-14%). Due to limited data, nitrate is inconclusive as a stressor to the three reaches.

Suspended Solids

- **Inconclusive**

One TSS value on County Ditch 37 (-724) from 2010 was collected (2 mg/L), below the standard of 65 mg/L. Two TSS measurements (5.6-6.4 mg/L) on reach -730 from 2010-2021 were below the standard. One TSS measurement on reach -731 from 2010 was collected (2.8 mg/L), also below the standard. All transparency measurements met the standard on each reach. There are indications of TSS stress, especially to the unnamed ditch, but more sediment data is needed to better determine the stressor status in this reach. TSS is inconclusive as a stressor to all three reaches.

Habitat

- **Poor**

The habitat score was 37.5 (Poor) at 10MN137 on reach -724, scores ranged from 23-36 (Poor) at site 10MN003 on reach -730, and the score was 22 at site 10MN102 on reach -731. Both the fish and macroinvertebrate show habitat related stress. The biological communities show increased stress from C1 to C2 at site 10MN103 on reach -730 with an increase in burrower macroinvertebrates. Given the poor MSHA scores as well as the habitat, habitat related stressors, habitat is a stressor on all three reaches.

Altered Hydrology

- **Poor**

All three reaches have 100% altered hydrology. The biological communities indicate that altered flows are having an impact on all three reaches. Nest guarder and generalist fish, along with macroinvertebrate swimmers all increased from C1 to C2 at site 10MN103, indicting that conditions are worsening for the communities on JD 2 Altered hydrology is a stressor to all three reaches.

Summary of stream health of tributaries in the Lower Hawk Creek Subwatershed

Both DO values on reach -724 were low in 2010 (1.36 and 2.22 mg/L). One value was taken in the morning when values are usually lowest, and one value was taken after 9 a.m. Further DO values would be helpful to determine if DO is stressing biological communities.

Excessive algal growth was observed at CD 37 and JD 2 (Figure 15 and Figure 16). Omnivorous fish, which increase with eutrophication increased from 3% in C1 to 47% in C2 at site 10MN103 on JD 2 (-730).

Two high temperatures over 30°C were collected on JD 2 (-730) in both 2010 and 2021, with a high value of 33.1°C. As temperatures increase, the saturation levels of DO decrease. Elevated temperatures can affect the composition of the fish community. Elevated temperatures can affect the composition of the fish community.

The habitat scores were rated poor at all three sites. The scores were lowered due to a lack of: channel development, depth variability, different substrate types, coarse substrates, and velocity types. JD 2 and the unnamed ditch were lacking any pools or riffles. The habitat scores decreased from C1 to C2 on JD 2. The unnamed ditch on reach -731 had choking vegetation through the reach (Figure 17).

Figure 15. Algae growth at 10MN137 (7/8/10).

Figure 16. Algae at 10MN103 (6/22/10)

Figure 17. Vegetation filled channel at 10MN102 (7/19/10).

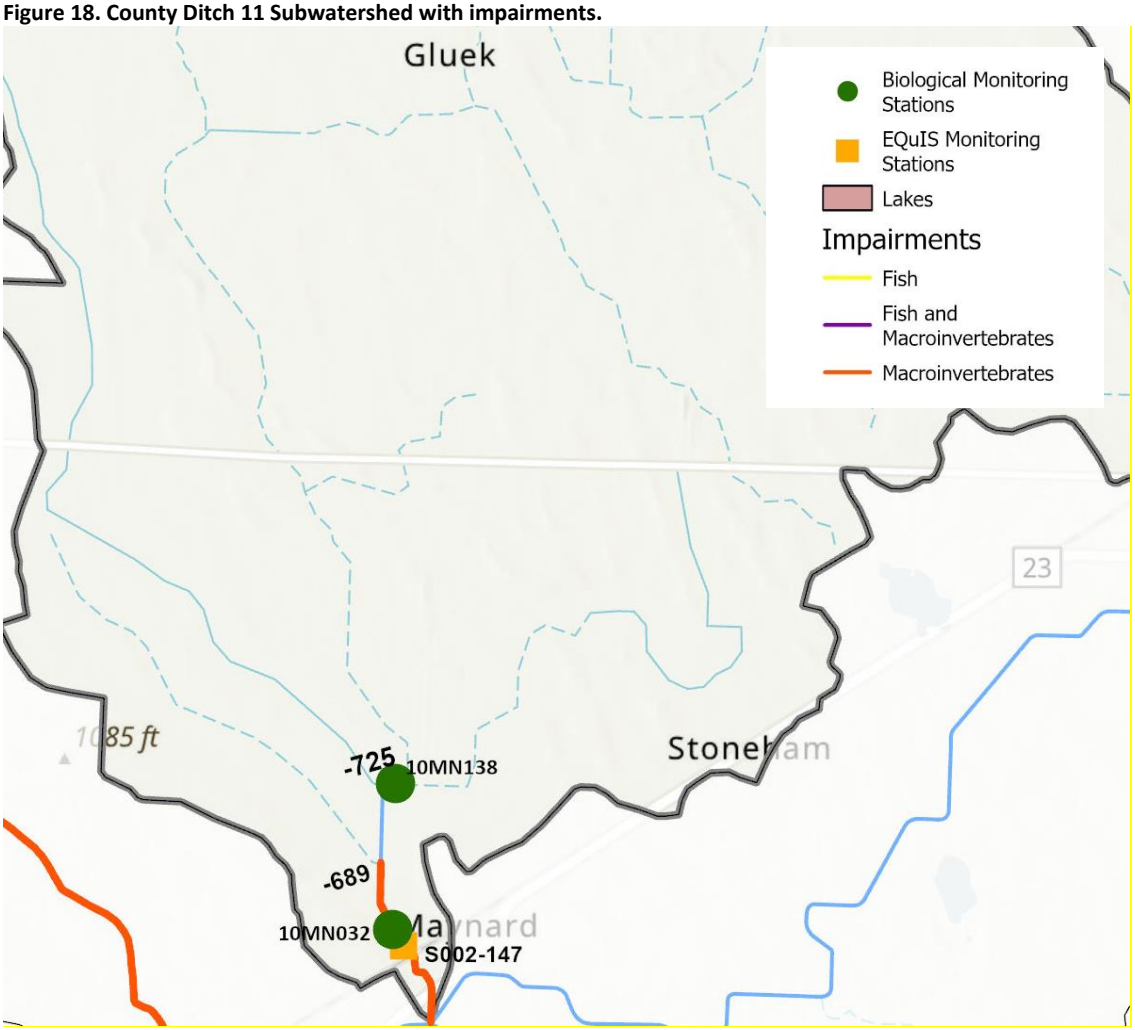
County Ditch 11 Subwatershed

Biological Community Summary

The County Ditch 11 Subwatershed (Figure 18) had two reaches impaired for aquatic life due to degraded biological communities. These reaches are County Ditch 11 (-689) and Unnamed ditch (-725). Stressors to County Ditch 11 are identified in Figure 19 and stressor to the tributaries are identified in Figure 20.

- County Ditch 11 (-689) is a 1.12-mile-long stream reach that is impaired due to the degraded macroinvertebrate assemblage at its biological monitoring station 10MN032. The MIBI scores at this site were 17.6 in 2010 and 19.8 in 2021. Both scores are below the Invertebrate Class 7 Prairie Streams modified use threshold of 22.
- Unnamed ditch (-725) is a 0.13-mile-long stream reach that is impaired due to the poor scoring fish and macroinvertebrate communities at its biological monitoring station 10MN138. The FIBI scores at this site were 0.3 in 2010 and 31.2 in 2022. Both scores are below the Fish Class 2 Southern Streams modified use threshold of 35. The MIBI was 20.5 (2010) during the only macroinvertebrate sampling event. This score is below the Invertebrate Class 7 Prairie Streams modified use threshold of 22.

Figure 18. County Ditch 11 Subwatershed with impairments.



What stressors are of concern?

Figure 19. Biological stressor determinations for County Ditch 11 (-689). Red boxes indicate poor conditions; therefore, a stressor to aquatic life. Green boxes indicate good conditions and not a stressor to aquatic life.

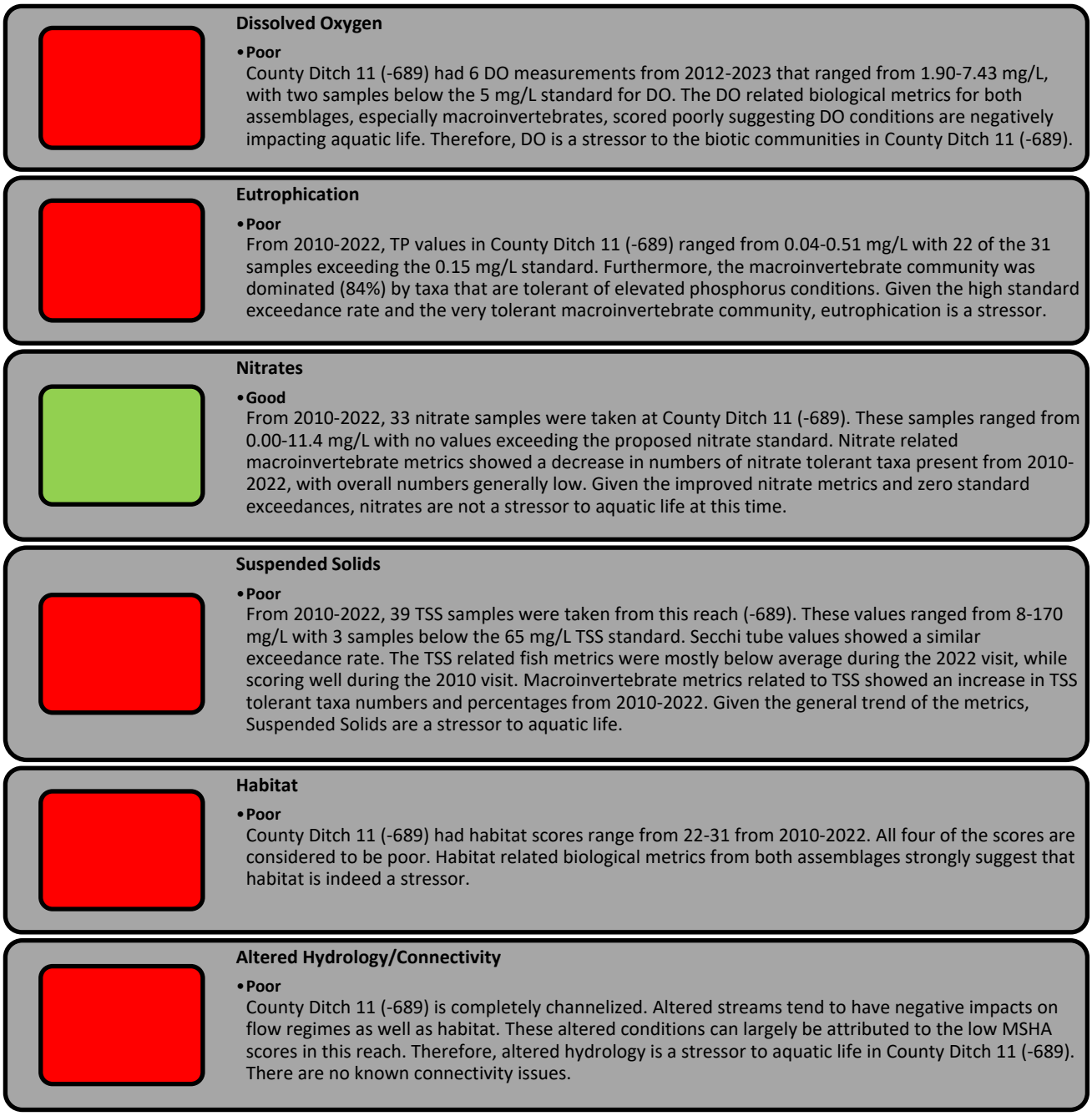
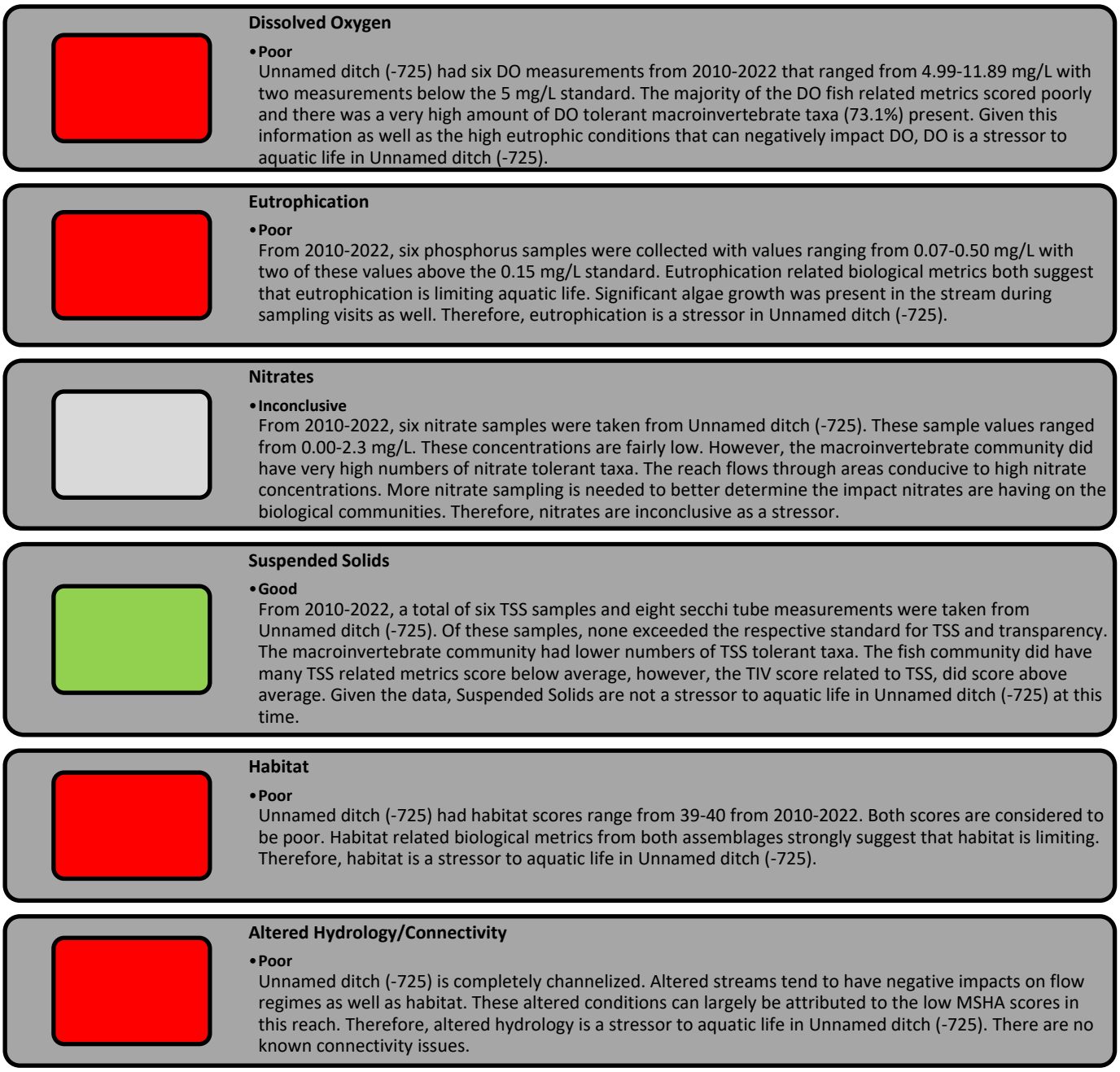


Figure 20. Biological stressor determinations for Unnamed ditch (-725). Red boxes indicate poor conditions; therefore, a stressor to aquatic life. Green boxes indicate good conditions and not a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.



Dissolved Oxygen

- **Poor**

Unnamed ditch (-725) had six DO measurements from 2010-2022 that ranged from 4.99-11.89 mg/L with two measurements below the 5 mg/L standard. The majority of the DO fish related metrics scored poorly and there was a very high amount of DO tolerant macroinvertebrate taxa (73.1%) present. Given this information as well as the high eutrophic conditions that can negatively impact DO, DO is a stressor to aquatic life in Unnamed ditch (-725).

Eutrophication

- **Poor**

From 2010-2022, six phosphorus samples were collected with values ranging from 0.07-0.50 mg/L with two of these values above the 0.15 mg/L standard. Eutrophication related biological metrics both suggest that eutrophication is limiting aquatic life. Significant algae growth was present in the stream during sampling visits as well. Therefore, eutrophication is a stressor in Unnamed ditch (-725).

Nitrates

- **Inconclusive**

From 2010-2022, six nitrate samples were taken from Unnamed ditch (-725). These sample values ranged from 0.00-2.3 mg/L. These concentrations are fairly low. However, the macroinvertebrate community did have very high numbers of nitrate tolerant taxa. The reach flows through areas conducive to high nitrate concentrations. More nitrate sampling is needed to better determine the impact nitrates are having on the biological communities. Therefore, nitrates are inconclusive as a stressor.

Suspended Solids

- **Good**

From 2010-2022, a total of six TSS samples and eight secchi tube measurements were taken from Unnamed ditch (-725). Of these samples, none exceeded the respective standard for TSS and transparency. The macroinvertebrate community had lower numbers of TSS tolerant taxa. The fish community did have many TSS related metrics score below average, however, the TIV score related to TSS, did score above average. Given the data, Suspended Solids are not a stressor to aquatic life in Unnamed ditch (-725) at this time.

Habitat

- **Poor**

Unnamed ditch (-725) had habitat scores range from 39-40 from 2010-2022. Both scores are considered to be poor. Habitat related biological metrics from both assemblages strongly suggest that habitat is limiting. Therefore, habitat is a stressor to aquatic life in Unnamed ditch (-725).

Altered Hydrology/Connectivity

- **Poor**

Unnamed ditch (-725) is completely channelized. Altered streams tend to have negative impacts on flow regimes as well as habitat. These altered conditions can largely be attributed to the low MSHA scores in this reach. Therefore, altered hydrology is a stressor to aquatic life in Unnamed ditch (-725). There are no known connectivity issues.

Summary of stream health County Ditch 11 Subwatershed

Additional analyses of the biological, water chemistry, and stream conditions in County Ditch 11 (-689) and Unnamed ditch (-725) have pointed to the importance of natural stream conditions. Channelized streams change the stream hydrology causing inconsistent flow conditions that can change both fish and macroinvertebrate community dynamics. This stressor can directly impact other stressors as well.

Figure 21. Algae on the tributary at 10MN138 (8/1/22).

Excess phosphorus concentrations can lead to eutrophic conditions (Figure 21 and Figure 22). Both reaches in this subwatershed showed elevated phosphorus concentrations. Eutrophication can also limit the amount of DO available, with both reaches showing low levels of DO and poor scoring biological metrics related to DO. Improving the riparian buffer and limiting phosphorus loading to the stream will likely lead to much improved conditions regarding eutrophication and DO.

Figure 22. Algae at site 10MN032 on CD 11 (8/9/21).

Habitat conditions in both County Ditch 11 and Unnamed ditch were poor with MPCA's Stream Habitat Assessment (MSHA) and habitat related biological metrics reflecting the degraded conditions. Limiting the habitat in these reaches are the surrounding land use, lack of stream shading, abundance of sand and silt substrates, lack of coarse substrates, poor sinuosity, and poor channel development. Improving habitat conditions in this watershed should be a goal to improve aquatic life.

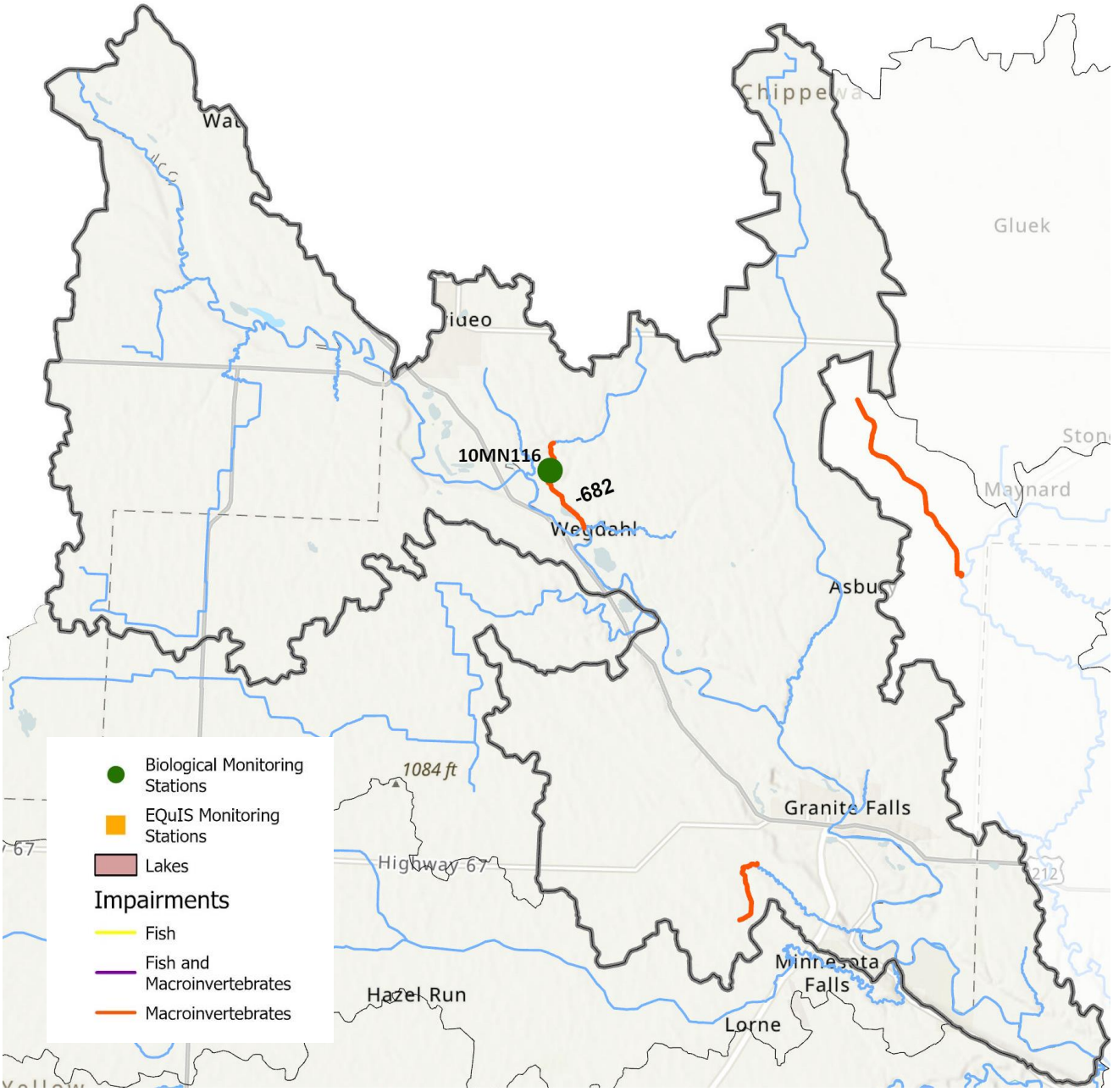
Stony Run Creek-MN River Subwatershed

Biological Community Summary

The Stony Run Creek-MN River Subwatershed (Figure 23) has one reach, a direct tributary to the Minnesota River, that is impaired for aquatic life due to the degraded biological communities. The impaired reach is County Ditch 36A (-682). Stressors are identified in Figure 24.

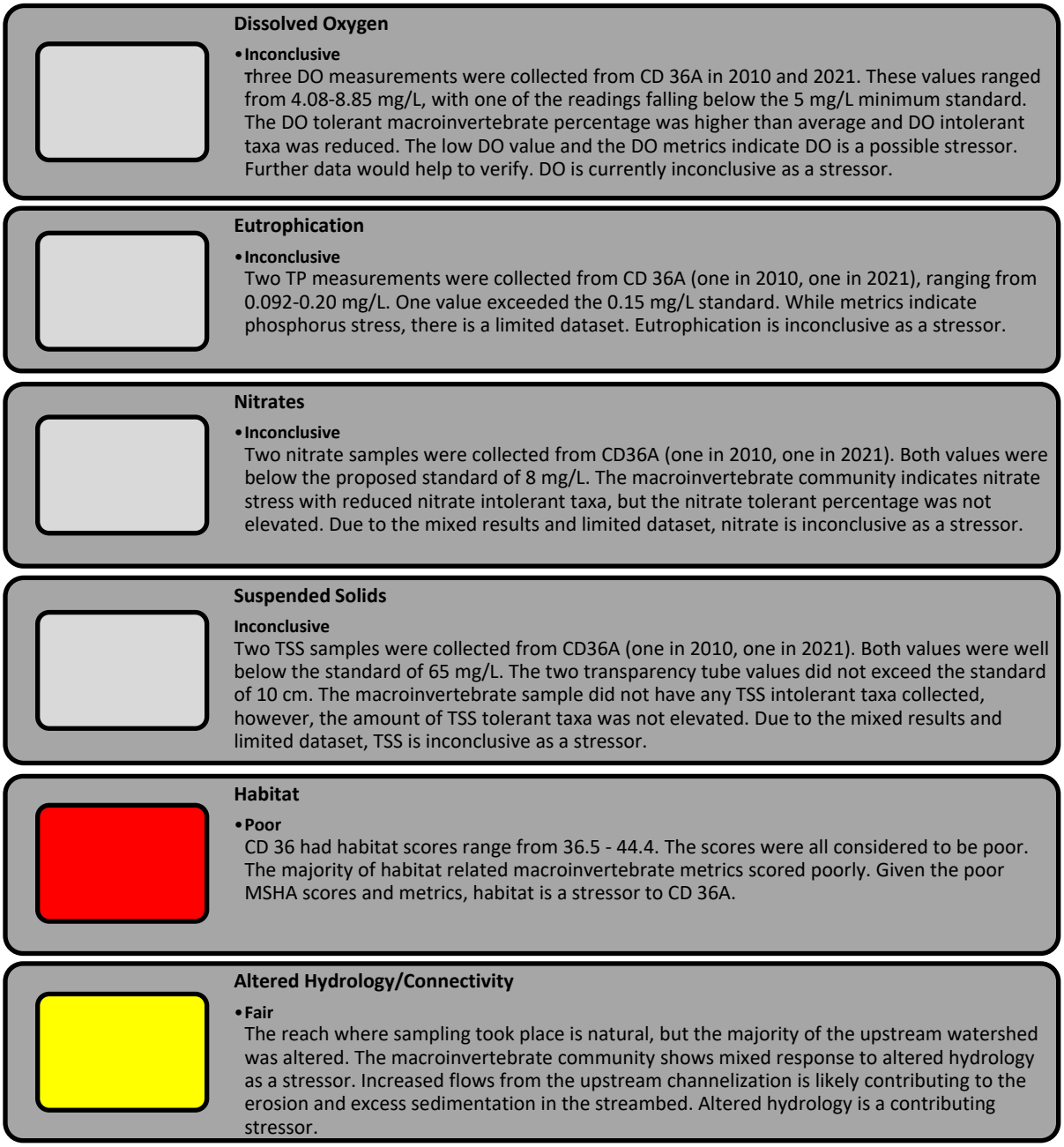
- County Ditch 36A (-682) is a 2.2-mile-long stream reach that is impaired for aquatic life use due to the low scoring macroinvertebrate assemblage at its biological monitoring station 10MN116. The MIBI score at this site was 31.9, which is below the Macroinvertebrate Class 7 Prairie Stream general use threshold of 41.

Figure 23. Stony Run Creek-MN River Subwatershed.



What stressors are of concern?

Figure 24. Biological stressor determinations for County Ditch 36A (-682). Red boxes indicate poor conditions; therefore, a stressor to aquatic life. Yellow boxes indicate fair conditions and indicate a secondary stressor. Grey boxes indicate that the parameter is inconclusive as a stressor.



Summary of stream health

The fish community at site 10MN116 on CD 36A was supporting of aquatic life in both C1 and C2. Macroinvertebrates were not collected in C1 but indicated impairment based on sampling in C2. The biological monitoring site is located within a fenced cattle pasture (Figure 25).

The habitat scores were limited by erosion (rated moderate to heavy), embeddedness of coarse substrates with fine sediments (Figure 26), a lack of channel development, low channel stability, and sparse cover amounts. Burrowers and legless macroinvertebrate percentages were both elevated. Both species are an indication of excess fine sediments.

The erosion and excess sedimentation in the stream bed are impacted by riparian and upstream land uses. Cattle trampling in the adjacent pasture, and upstream channelization are both contributing to the lack of habitat in the reach. The channel is natural through the reach and has sinuosity and a wooded riparian area. Limiting the cattle access would help improve conditions at this tributary to the Minnesota River.

Figure 25. Cattle trampling at site 10MN116 (8/18/21).

Figure 26. Silt substrate in streambed at 10MN116 (5/4/21).

Chetomba Creek Subwatershed

Biological Community Summary

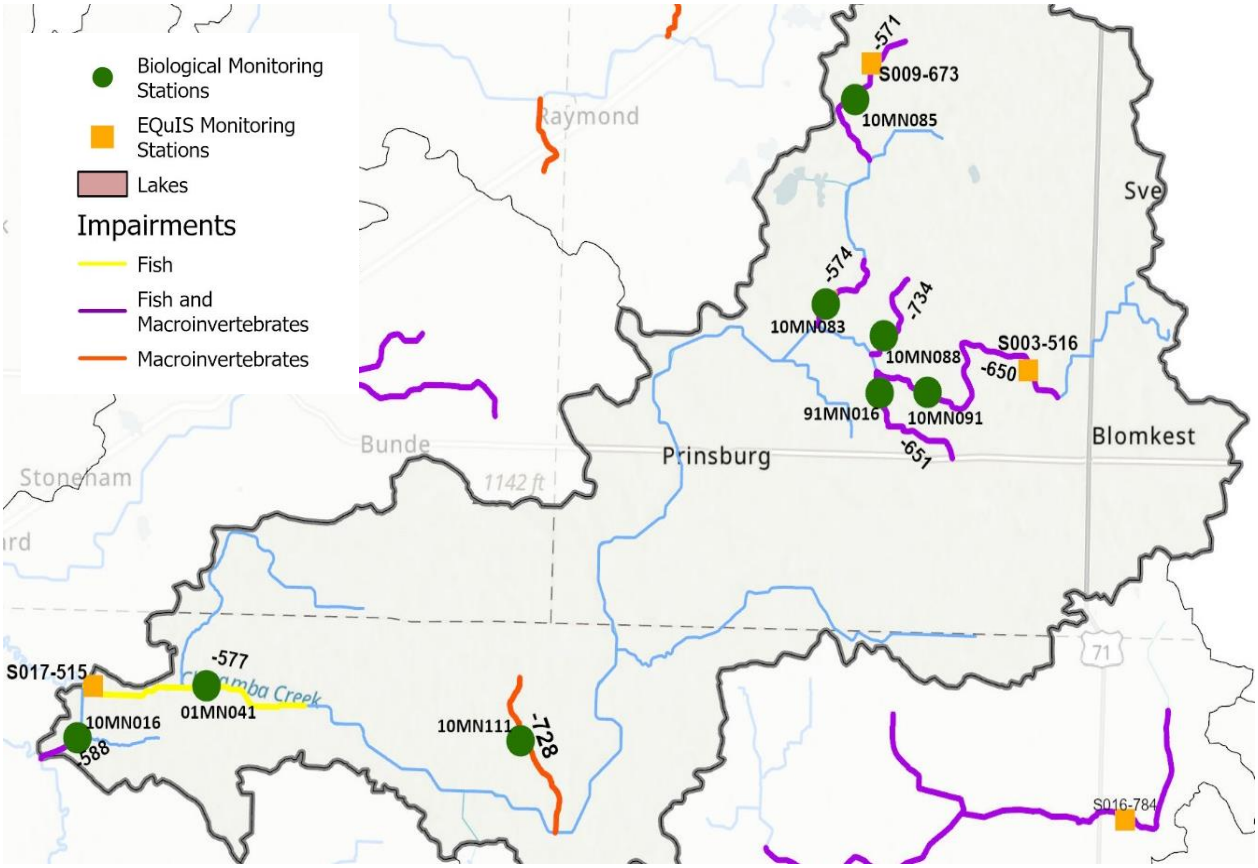
The Chetomba Creek Subwatershed (Figure 27) had eight reaches impaired for aquatic life due to the degraded biological communities. These reaches include Chetomba Creek (-577), Chetomba Creek (-588), County Ditch 8 (-650), County Ditch 18 (-651), Judicial Ditch 8 (-728), County Ditch 16 (-734), Unnamed Creek (-571), and County Ditch 31 (-574). Stressors to Chetomba Creek are identified in Figure 28 and stressor to the tributaries are identified in Figure 32.

- Chetomba Creek (-577) is a 4.43-mile reach in the Chetomba Creek Subwatershed that is impaired for aquatic life use due to the low fish assemblage score. The FIBI score was 27.4 at the biological monitoring station 01MN041 during the only visit in 2001. This score is below the modified use threshold of a Fish Class 2 Southern Streams site. There are no recent biological or chemical data on this reach.
- Chetomba Creek (-588) is a 0.84-mile-long stream reach also located in the Chetomba Creek Subwatershed. This reach is designated as impaired for aquatic life due to the poor fish and macroinvertebrate community conditions. Chetomba Creek (-588) was sampled for fish twice at biological monitoring station 10MN016. The FIBI score was 24 in 2010 and the FIBI score was 23 in 2021. Both scores are well below the Fish Class 2 Southern streams modified use threshold of 35. Additionally, this reach was sampled three times for macroinvertebrates. In 2010, MIBI scores at site 10MN016 were 19.2, and 13.0. In 2021, the MIBI score was 27.9. The most recent sample is above the Invertebrate Class 7 Prairie Streams modified use threshold of 22; however, the earlier samples were below.
- County Ditch 8 (-650) is a 5.53-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 10MN091. The fish community was sampled at this site in 2010 and had a FIBI score of 19.9, which is below the Fish Class 3 Southern Headwaters modified use threshold of 33. The MIBI score at this site was 8.3 during the macroinvertebrate sampling event in 2010. This score is well below the Invertebrate Class 7 Prairie Streams modified use threshold of 22.
- County Ditch 18 (-651) is a 2.51-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 91MN016. The fish community was sampled at this site twice in 2010 and had FIBI scores of 18.9 and 20.8. Both scores are below the Fish Class 3 Southern Headwaters modified use threshold of 33. The MIBI score at this site was 19.5 during the macroinvertebrate sampling event in 2010. This score is well below the Invertebrate Class 7 Prairie Streams modified use threshold of 22.
- Judicial Ditch 8 (-728) is a 3.1-mile-long stream reach that is impaired for aquatic life use due to the degraded macroinvertebrate community at its biological monitoring station 10MN111. The macroinvertebrate community was sampled at this site in 2010 and had a MIBI score of 0.0. This score is far below the Invertebrate Class 7 Prairie Streams GP modified use threshold of 22.
- County Ditch 16 (-734) is a 1.85-mile-long stream reach that is impaired for aquatic life use due to the poor scoring fish and macroinvertebrate assemblages at its biological monitoring station, 10MN088. The FIBI score at this site was 0 during the 2010 sampling event. This is below the

Fish Class 7 Low Gradient modified use threshold (15). The MIBI score on this reach was zero during the 2010 sampling event. This is below the Invertebrate Class 7 Prairie Streams GP modified use threshold (22).

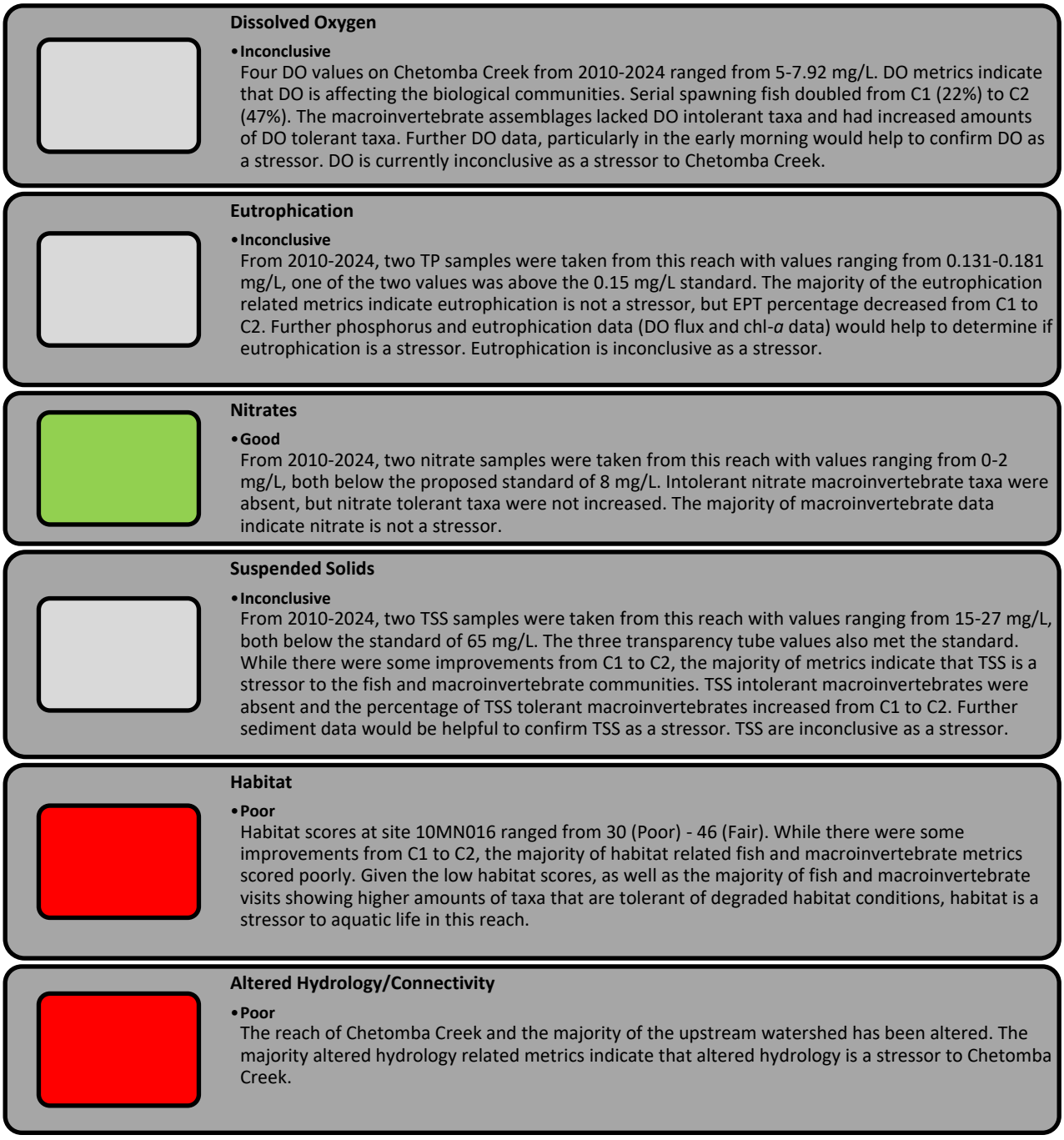
- Unnamed Creek (-571) is a 3.09-mile-long stream reach that is impaired for aquatic life use due to the low scoring fish and macroinvertebrate communities at biological monitoring station 10MN085. The FIBI score was 17 during the 2010 visit. This result is below the Fish Class 3 Southern Headwaters modified use threshold of 33. The MIBI score for this site was 26, which is slightly above the Invertebrate Class 7 Prairie Streams GP modified use threshold of 22. However, the raw invert community suggests that the MIBI score for 2010 sample is generous, with 90% tolerant taxa, 2 EPT taxa, and largely dominated by midge larvae resulting in impairment.
- County Ditch 31 (-574) is a 1.74-mile-long stream reach that is impaired for aquatic life use due to the degraded fish and macroinvertebrate communities. The fish community was sampled three times at station 97MN006. The FIBI scores were 46.6 (2010), 44.4 (2021), and 34.8 (2021). All of these scores are below the Fish Class 1 Southern Rivers threshold of 49. The MIBI scores at this site were 17.6 in 2010 and 23.8 in 2021. Both scores are below the Invertebrate Class 5 Southern Streams modified use threshold of 24.

Figure 27. Chetomba Creek Subwatershed with impairments.



What stressors are of concern?

Figure 28. Biological stressor determinations for Chetomba Creek (-577 and -588). Red boxes indicate poor conditions; 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

An upstream reach of Chetomba Creek is a limited use stream that extends 17.5 miles. A diversion channel was created upstream of reach -588 and Chetomba Creek was rerouted into Spring Creek. A dam is located just upstream of site 10MN016 (Figure 29), preventing fish migtation from Hawk Creek. There is another impoundment near the mouth of the reach (Figure 30). Migratory fish were below average both in C1 and C2. Barriers that limit fish migration can change upstream fish community dynamics upstream.

Phosphorus values were limited on the impaired reaches, but upstream reaches on Chetomba Creek have more data, with 67% of values over the standard. Longitudinal phosphorus sampling in 2023 at four locations showed values decreasing from upstream to downstream. One chl-*a* sample (2.46 ug/L) was taken just upstream of site 10MN016, and was well below the standard of 40. Thick alage was observed in August of 2021 (Figure 31). Phosphorus reduction in the watershed would be helpful to reduce algae.

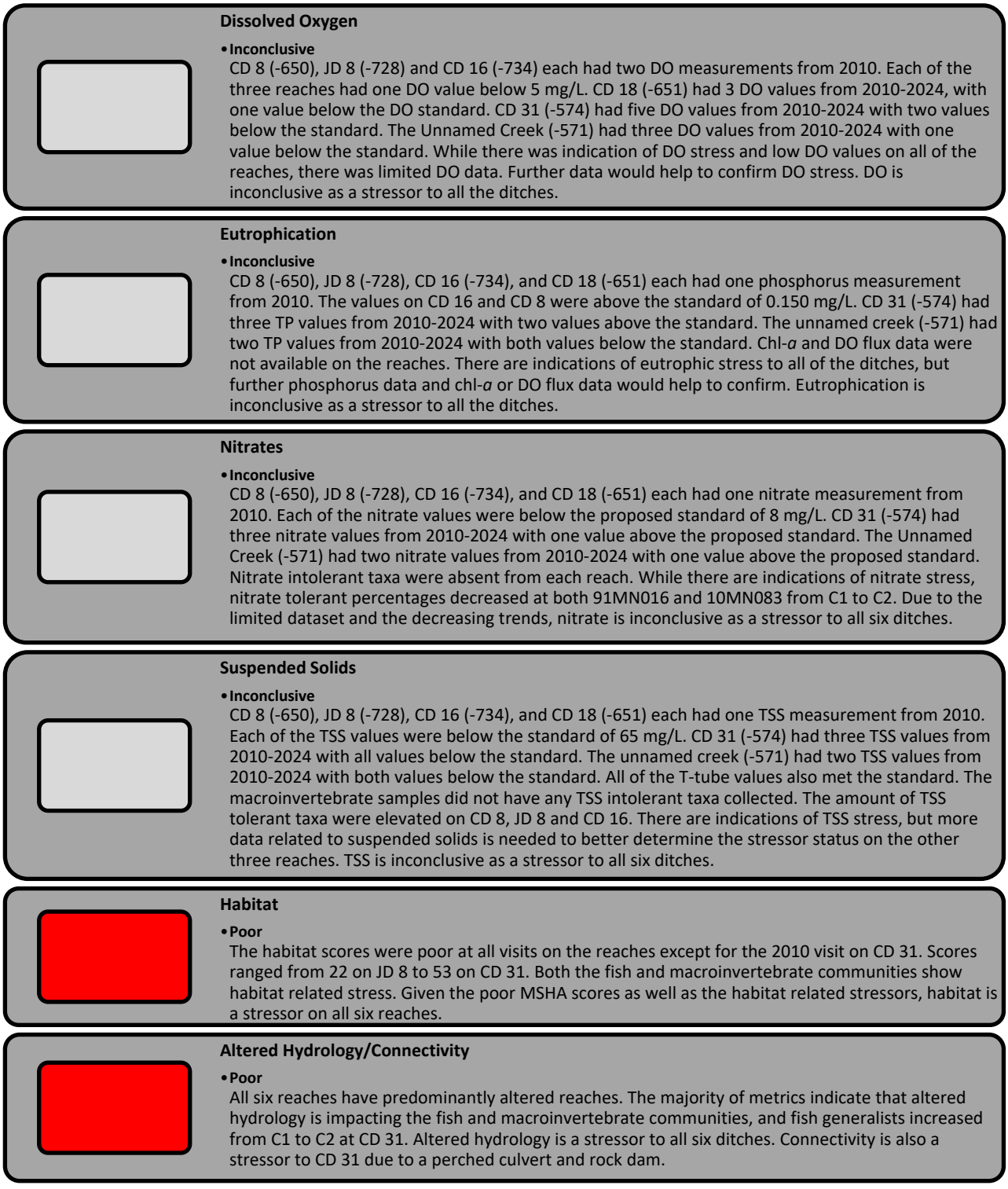
Lack of habitat is an issue in the creek. MSHA scores ranged from poor to fair. The habitat scores were limited by a lack of cover amount, channel development, a lack of sinuosity, and moderate embeddedness of coarse substrates with fine sediments.

Figure 29. Dam at 10MN016 (7/27/10).

Figure 30. Impoundment near the mouth of the creek.

Figure 31. Algae at 10MN016 (8/11/21).

Figure 32. Biological stressor determinations for tributaries (-650, -651, -728, -734, -571 and -574). Red boxes indicate poor conditions; therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.



Summary of stream health

Low DO values were collected on all the ditches that are tribuataries to Chetomba Creek in 2010 including CD 8 (2.18 mg/L), JD 8 (0.17 mg/L), and CD 18 (Figure 33) (0.690 mg/L). CD 18 and CD 31 had increases in low DO tolerant macroinvertebrate taxa from C1 to C2. CD 31 had both low and elevated DO values, an indication of possible eutrophication issues.

Elevated phosphorus values on CD 16 (0.454 mg/L), CD 8 (0.201 mg/L), and CD 31 (0.263-0.291 mg/L) were also indications of eutrophication (Figure 34). Chl-*a* or DO flux data woud be helpful to determine the impact of eutrophication.

Lack of habitat is an issue in the creek. MSHA scores ranged from poor to fair. The habitat scores were limited by a lack of cover amount. All of the reaches had a lack of channel development, a lack of depth variability, a lack of sinuosity, and a lack of riffles. JD 18, CD 16, JD 8 and the Unnamed Creek had no coarse substrates. The score decreased on CD 31 from 53 in C1 to an average of 34.4 in C2. This was primarily due to the loss of a pool in the sample reach.

Connectivity is a stressor in CD 31, which has a perched culvert and rock dam, and is preventing the upstream migration of fish species upstream especially during low flow conditions (35).

Figure 33. Cattails in channel at 91MN016 (8/1/22).

Figure 34. Algae at 10MN088 (7/19/10).

Figure 35. Perched culvert at 10MN083 (8/2/21).

East Fork Beaver Creek Subwatershed

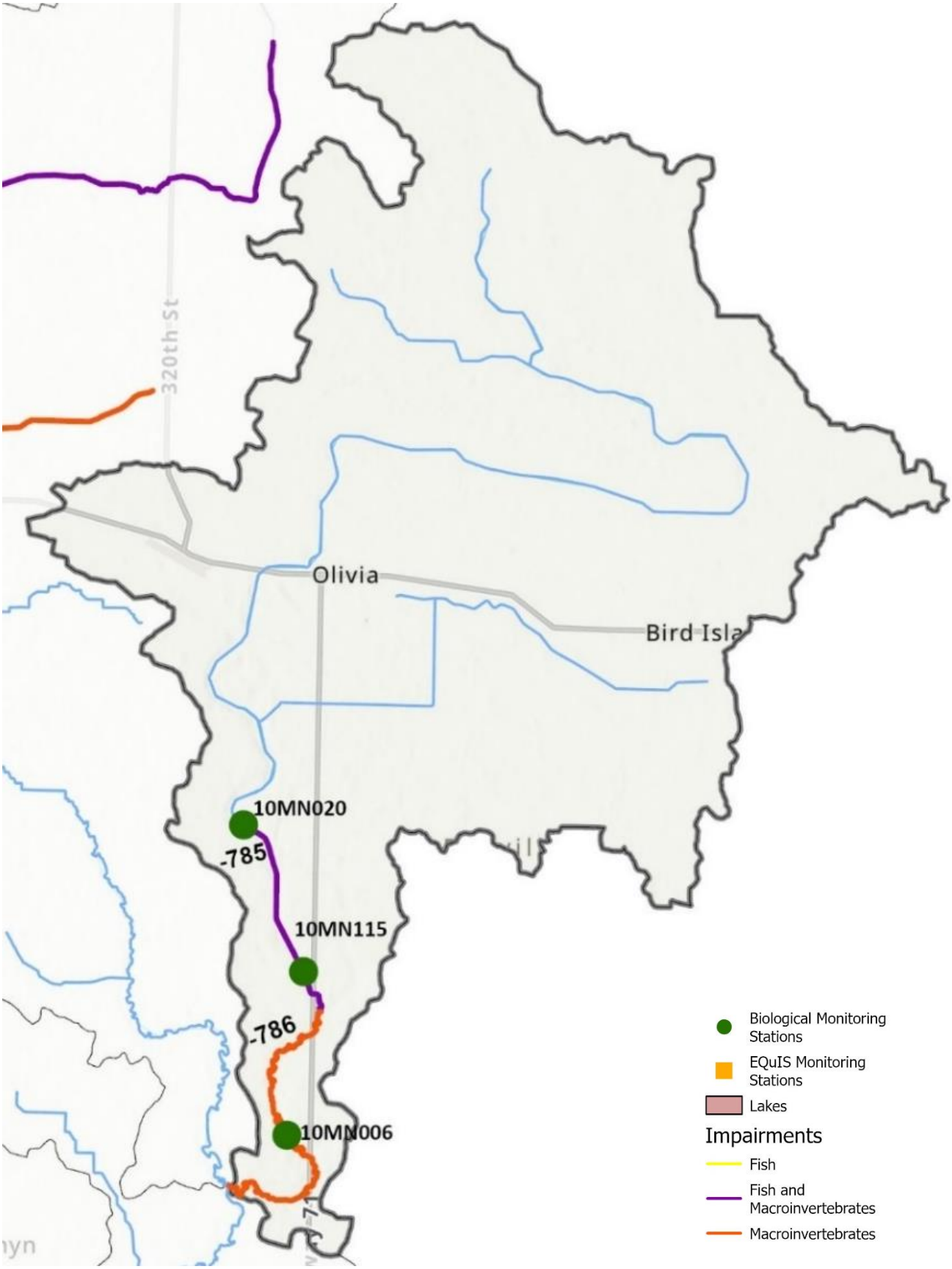
Biological Community Summary

The East Fork Beaver Creek Subwatershed (Figure 36) had two stream reaches impaired for aquatic life use. These reaches include East Fork Beaver Creek (-785) and East Fork Beaver Creek (-786). Stressors are identified in Figure 37.

East Fork Beaver Creek (-785) is a 2.87-mile-long stream reach that is impaired for aquatic life use due to the degraded fish and macroinvertebrate communities at its biological monitoring stations 10MN020 and 10MN115. Site 10MN020 was sampled for fish in 2010 and had a FIBI score of 21, while site 10MN115 had FIBI scores of 28 in 2010 and decreased to 19 in 2021. All scores are below the Fish Class 2 Southern Streams modified use threshold of 35. The MIBI scores on this reach were 8 and 13 during sampling events in 2010 at site 10MN020. In 2021, site 10MN115 had a MIBI score of 5. All of the scores are well below the Invertebrate Class 7 Prairie Streams modified use threshold of 22.

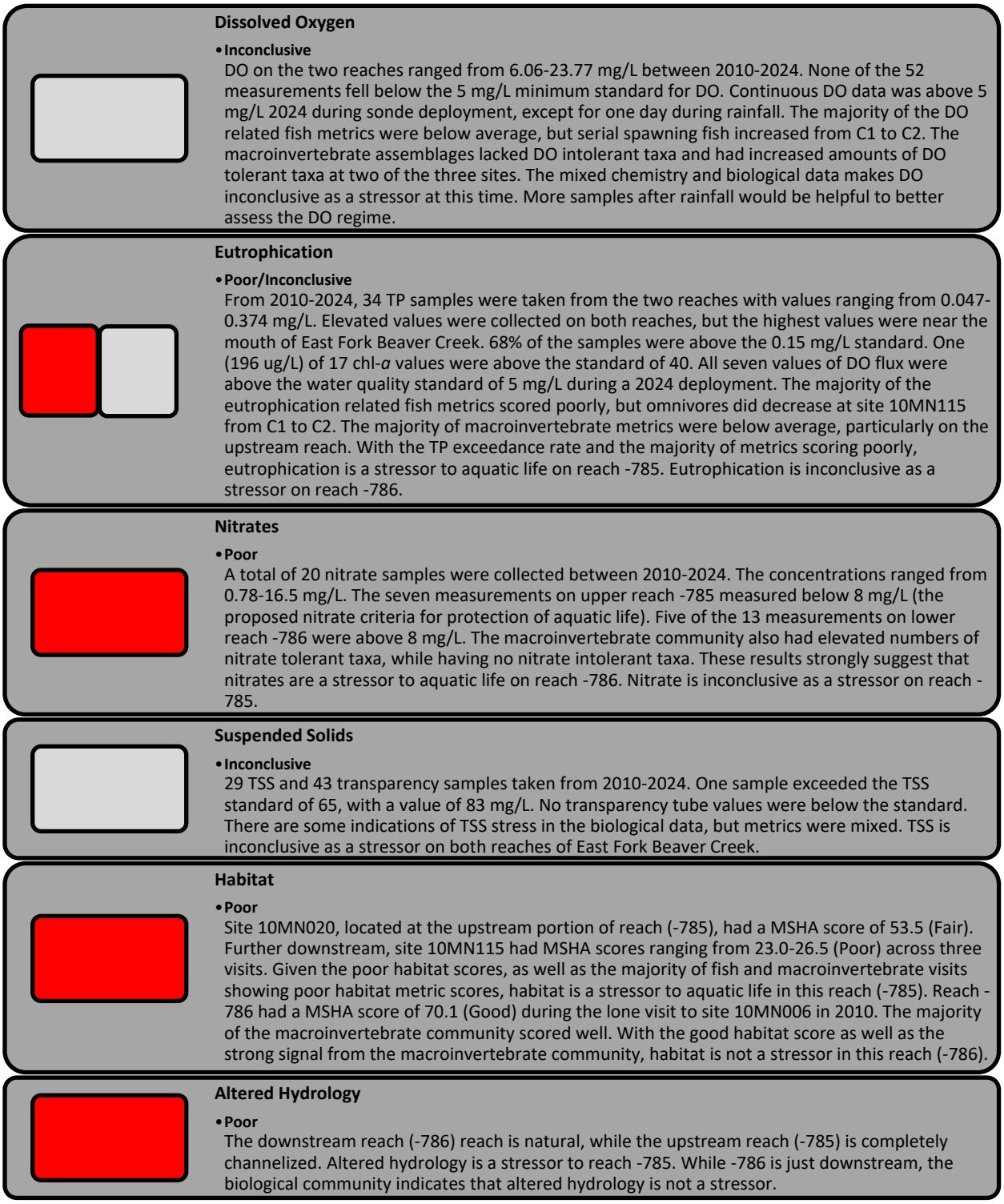
East Fork Beaver Creek (-786) is a 5.53-mile-long stream reach downstream of reach -785 that is impaired for aquatic life use due to the poor scoring macroinvertebrate assemblage at biological monitoring station 10MN006. The MIBI score at this site was 19 during the lone sampling event in 2010. This score is below the Invertebrate Class 5 Southern Streams threshold of 37.0.

Figure 36. East Fork Beaver Creek Subwatershed with impairments.



What stressors are of concern?

Figure 37. Biological stressor determinations for East Fork Beaver Creek (-785 and -786). Red boxes indicate poor conditions; therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.



Summary of stream health

Phosphorus values were high, with 67% of values over the standard. Longitudinal phosphorus sampling in 2022 at three locations (S004-687, S000-484, and S000-404) along the East Fork Beaver Creek showed values increasing from upstream to downstream. All three longitudinal phosphorus values were over the standard (increasing from 0.170 mg/L in the headwaters to 0.270 mg/L near the mouth) . Phosphorus values were slightly higher in East Fork Beaver Creek than in West Fork Beaver Creek. Daily DO flux data from August 2024 showed all 7 days above the standard, with a maximum value of 11 mg/L. Eutrophication is likely driving low DO values, algal growth (Figure 38) and elevated daily DO flux.

Figure 38. Algal growth at site 10MN115 (8/23/23).

Figure 39. Eroding banks at site 10MN115 (5/5/21).

Lack of habitat is an issue in the upper part of the creek (reach -785). MSHA scores ranged from poor to fair. The habitat scores were limited by a lack of channel development, a lack of sinuosity, the absence of riffles, and moderate embeddedness. Site 10MN115 was also lacking depth variability and pools. Erosion increased from C1 to C2 at 10MN115 (Figure 39). Legless macroinvertebrates, which are correlated with increased sedimentation, were elevated at site 10MN115.

Altered hydrology is a stressor to the upper reach of East Fork Beaver Creek. Long-lived macroinvertebrates were low at both sites on reach -785. They decrease with flow changes as they are not able to stay in one place as conditions change. The percentage of riffle dwelling fish decreased from C1 (49%) to C2 (7%) and on the upper reach of East Fork Beaver Creek.

West Fork Beaver Creek Subwatershed

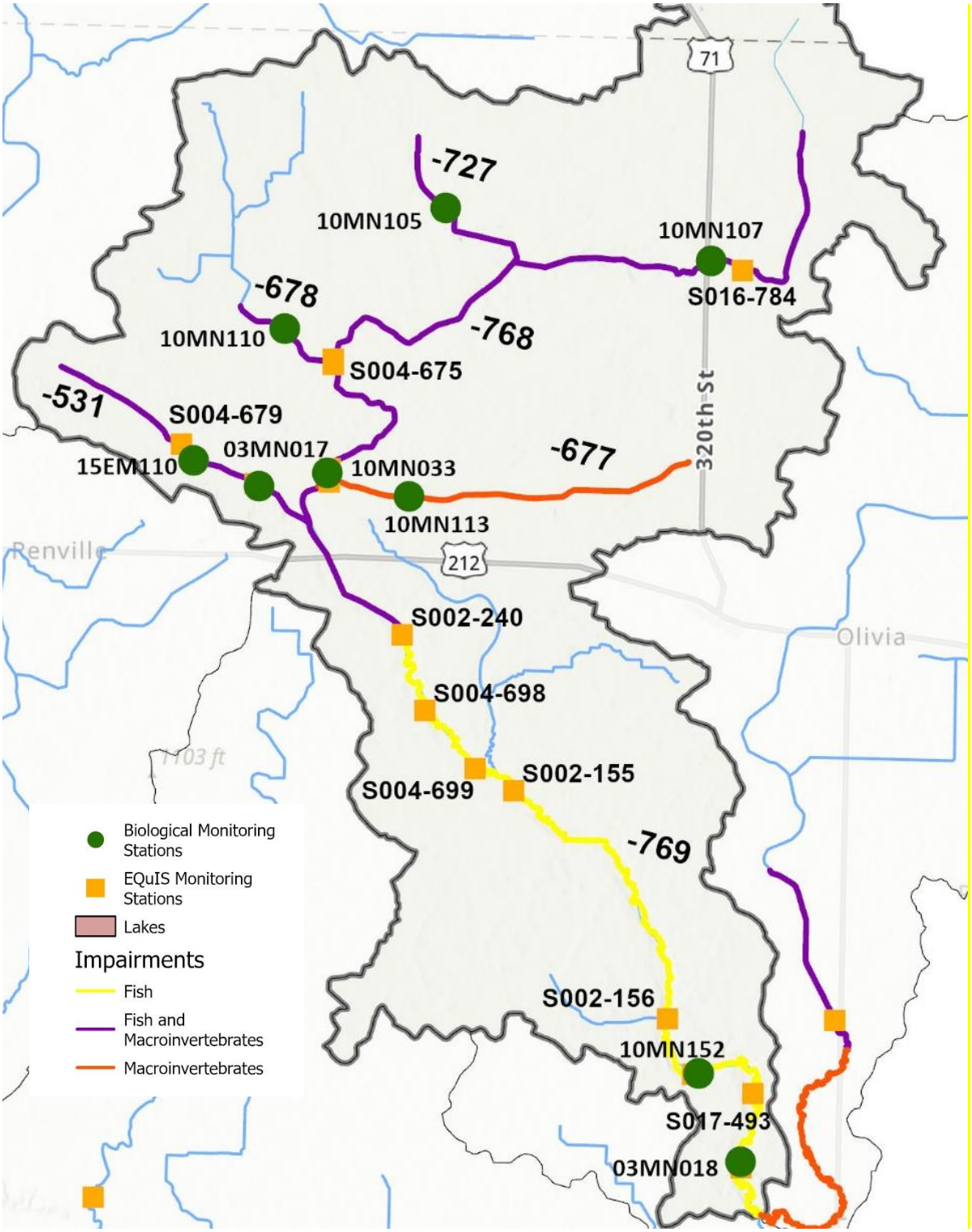
Biological Community Summary

The West Fork Beaver Creek Subwatershed (Figure 40) had six stream reaches impaired for aquatic life use. These reaches include West Fork Beaver Creek (-768), West Fork Beaver Creek (-769), County Ditch 37 (-531), County Ditch 59 (-677), County Ditch 17A (-678), and County Ditch 31 (-727). Stressors to West Fork Beaver Creek are identified in Figure 41 and stressors to the tributaries are identified in Figure 45.

- West Fork Beaver Creek (-768) is a 14.86-mile-long stream reach impaired for aquatic life use due to the degraded fish and macroinvertebrate communities. Fish were sampled at two stations along this reach, 10MN033 and 10MN107. Site 10MN033 had FIBI scores of 44 (2010), 13 (2021), and 22 (2022). Site 10MN107 had a FIBI score of 10 during the fish sampling event in 2010. All fish scores at 10MN033, except the 2010 sample, fell below the Fish Class 2 Southern Streams modified use threshold of 35. The fish score at 10MN107 was below the Class 3 Southern Headwaters modified threshold of 33. Additionally, this reach had MIBI scores of 4 (2010), 25 (2010), and 14 (2021), which are all below the Invertebrate Class 7 Prairie Streams modified use threshold of 22.
- West Fork Beaver Creek (-769) is a 14.56-mile-long stream reach located directly downstream of West Fork Beaver Creek (-768). The reach is impaired for aquatic life use due to the poor fish assemblage. Fish sampling took place at biological monitoring station 10MN152 in 2021. The FIBI score at this site was 36.6, which is below the Fish Class 2 Southern Streams general use threshold of 50.
- County Ditch 37 (-531) is a 4.1-mile-long stream reach impaired for aquatic life use due to the low scoring fish and macroinvertebrate assemblages at its biological monitoring station 15EM110. The FIBI scores at this site were 18.2 in 2015 and 0.0 in 2021. The FIBI score in 2015 was above the Fish Class 7 Low Gradient modified use threshold of 15, however, the most recent sample was far below this mark. The MIBI scores at this site were 3.5 in 2015 and 13.3 in 2020. Both scores were well below the Invertebrate Class 7 Prairie Streams GP modified use threshold of 22.
- County Ditch 59 (-677) is 5.17-mile-long stream reach impaired for aquatic life use due to the poor scoring macroinvertebrate community at biological monitoring station 10MN113. The MIBI scores at this site were 5.7 in 2010 and 7.3 in 2021. Both scores are below the Invertebrate Class 7 Prairie Streams modified use threshold of 22.
- County Ditch 17A (-678) is 1.61-mile-long stream reach impaired for aquatic life use due to the degraded fish and macroinvertebrate assemblages at its biological monitoring station 10MN110. The lone fish visit in 2010, had a FIBI score of 14.1. This score is below the Fish Class 7 Low Gradient modified use threshold of 15. The MIBI score on this reach was 8.7 in 2010, which is below the Invertebrate Class 7 Prairie Streams modified use threshold of 22.
- County Ditch 31 (-727) is a 2.55-mile-long stream reach impaired for aquatic life use due to the poor scoring fish and macroinvertebrate communities at its biological monitoring station 10MN105. The FIBI score at this site was 16.7 during the only visit in 2010. This score is below the Fish Class 3 Southern Headwaters modified use threshold of 33. The MIBI score at site

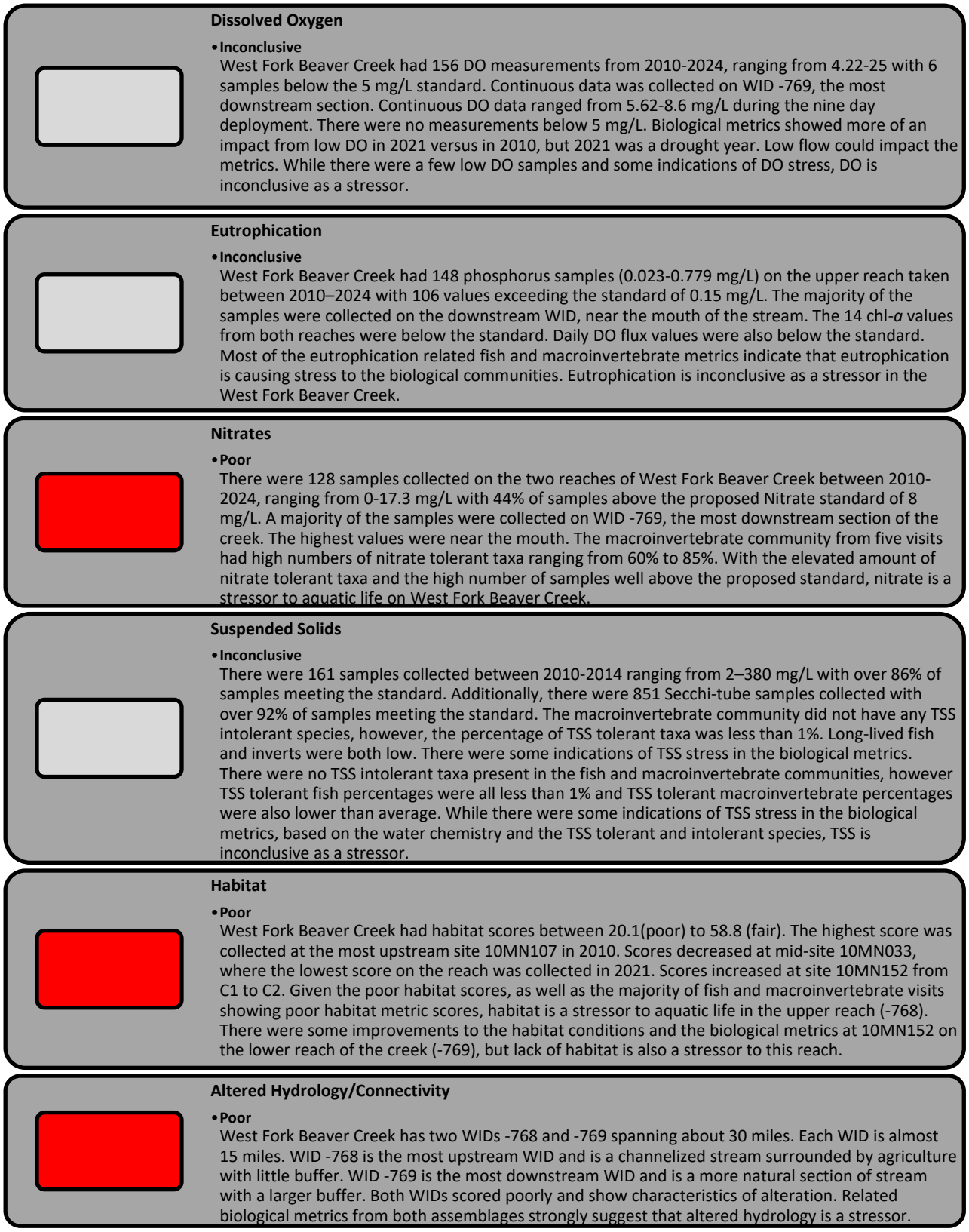
10MN105 was 0.0 during the only sampling event in 2010. This score is well below the Invertebrate Class 7 Prairie Streams modified use threshold of 22.

Figure 40. West Fork Beaver Creek Subwatershed.



What stressors are of concern?

Figure 41. Biological stressor determinations for West Fork Beaver Creek (-768 and -769). 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**

West Fork Beaver Creek had 156 DO measurements from 2010-2024, ranging from 4.22-25 with 6 samples below the 5 mg/L standard. Continuous data was collected on WID -769, the most downstream section. Continuous DO data ranged from 5.62-8.6 mg/L during the nine day deployment. There were no measurements below 5 mg/L. Biological metrics showed more of an impact from low DO in 2021 versus in 2010, but 2021 was a drought year. Low flow could impact the metrics. While there were a few low DO samples and some indications of DO stress, DO is inconclusive as a stressor.

Eutrophication

- **Inconclusive**

West Fork Beaver Creek had 148 phosphorus samples (0.023-0.779 mg/L) on the upper reach taken between 2010–2024 with 106 values exceeding the standard of 0.15 mg/L. The majority of the samples were collected on the downstream WID, near the mouth of the stream. The 14 chl-*a* values from both reaches were below the standard. Daily DO flux values were also below the standard. Most of the eutrophication related fish and macroinvertebrate metrics indicate that eutrophication is causing stress to the biological communities. Eutrophication is inconclusive as a stressor in the West Fork Beaver Creek.

Nitrates

- **Poor**

There were 128 samples collected on the two reaches of West Fork Beaver Creek between 2010-2024, ranging from 0-17.3 mg/L with 44% of samples above the proposed Nitrate standard of 8 mg/L. A majority of the samples were collected on WID -769, the most downstream section of the creek. The highest values were near the mouth. The macroinvertebrate community from five visits had high numbers of nitrate tolerant taxa ranging from 60% to 85%. With the elevated amount of nitrate tolerant taxa and the high number of samples well above the proposed standard, nitrate is a stressor to aquatic life on West Fork Beaver Creek.

Suspended Solids

- **Inconclusive**

There were 161 samples collected between 2010-2014 ranging from 2–380 mg/L with over 86% of samples meeting the standard. Additionally, there were 851 Secchi-tube samples collected with over 92% of samples meeting the standard. The macroinvertebrate community did not have any TSS intolerant species, however, the percentage of TSS tolerant taxa was less than 1%. Long-lived fish and inverts were both low. There were some indications of TSS stress in the biological metrics. There were no TSS intolerant taxa present in the fish and macroinvertebrate communities, however TSS tolerant fish percentages were all less than 1% and TSS tolerant macroinvertebrate percentages were also lower than average. While there were some indications of TSS stress in the biological metrics, based on the water chemistry and the TSS tolerant and intolerant species, TSS is inconclusive as a stressor.

Habitat

- **Poor**

West Fork Beaver Creek had habitat scores between 20.1(poor) to 58.8 (fair). The highest score was collected at the most upstream site 10MN107 in 2010. Scores decreased at mid-site 10MN033, where the lowest score on the reach was collected in 2021. Scores increased at site 10MN152 from C1 to C2. Given the poor habitat scores, as well as the majority of fish and macroinvertebrate visits showing poor habitat metric scores, habitat is a stressor to aquatic life in the upper reach (-768). There were some improvements to the habitat conditions and the biological metrics at 10MN152 on the lower reach of the creek (-769), but lack of habitat is also a stressor to this reach.

Altered Hydrology/Connectivity

- **Poor**

West Fork Beaver Creek has two WIDs -768 and -769 spanning about 30 miles. Each WID is almost 15 miles. WID -768 is the most upstream WID and is a channelized stream surrounded by agriculture with little buffer. WID -769 is the most downstream WID and is a more natural section of stream with a larger buffer. Both WIDs scored poorly and show characteristics of alteration. Related biological metrics from both assemblages strongly suggest that altered hydrology is a stressor.

Summary of stream health

Low DO values were collected throughout the West Fork Beaver Creek reaches, but low DO values made up only 3.8% of the dataset. No continuous data was below 5 mg/L, but low DO values were collected both upstream and downstream from where the continuous data was collected. It would be helpful to collect more continuous DO data, especially where discrete low DO values were collected.

The habitat conditions at the most downstream station of West Branch Beaver Creek, increased over 15 points from 2010 to 2022 at site 10MN152. Coarse substrates became present in 2022 after earlier visits were dominated by fine sediments. It's likely that the coarse substrates were embedded by the fine sediments during earlier visits. Darters increased from C1 to C2 and macroinvertebrates that burrow in fine sediments decreased. There was also an increase in cover amounts and an increase in deeper section of the creek, creating pool habitat.

Site 10MN107 was sampled once in 2010 and the high percentages of legless and burrower macroinvertebrates correspond with the amount of fine substrates observed during sampling. Central stonerollers were the most prevalent fish collected at site 10MN033 in 2022, corresponding with an increase in coarse substrates. High flows are moving through the system as evidenced by the debris (Figure 42) and the creek doesn't have access to its floodplain, which is causing erosion and eroding banks (Figure 43).

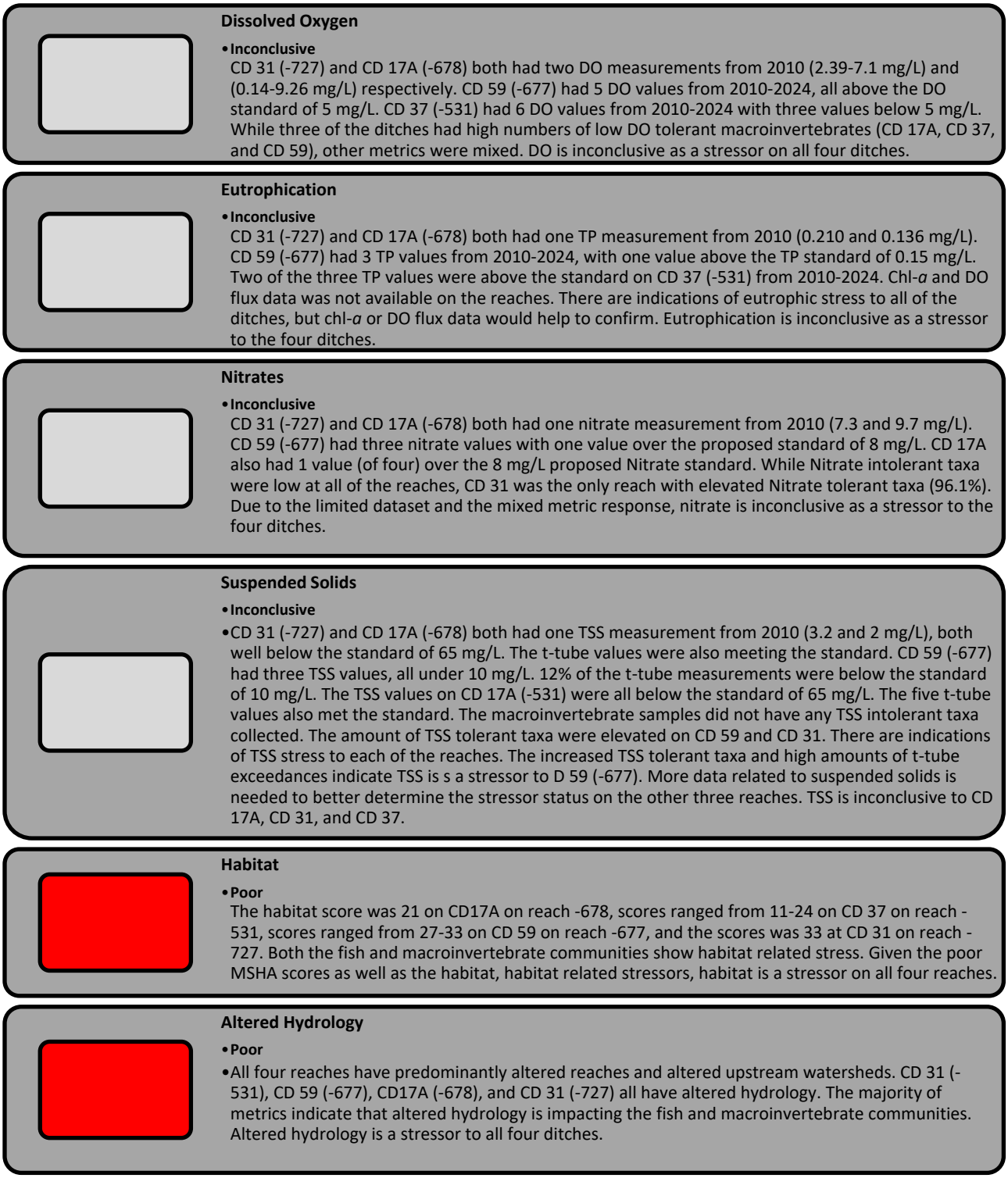
Figure 42. Site 10MN107 (7/6/22).

Figure 43. Site 10MN033 (7/6/22).

Figure 44. Algae at site 10MN033 (6/27/22).

Total phosphorus values exceeded the standard at a high rate, and elevated DO values up to 25 mg/L were collected. Thick alage was also observed (Figure 44). The EPT percentage decreased from 25.2% in C1 to 7.5% in C2 at site 10MN033. DO flux and chl-*a* values were not elevated, but it would be helpful to get further DO flux at an upstream location where the elvated DO values were collected, to eliminate eutrophication as a stressor. Limiting phosphorus loading to the stream would be beneficial.

Figure 45. Biological stressor determinations for West Fork Beaver Creek tributaries (-531, -677, -678, and -727). Red boxes indicate poor conditions; therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.



Summary of stream health

Two low DO values below 1 mg/L (0.220 in 2015 and 0.880 mg/L in 2010) were collected on CD 37, and the ditch was listed on the Impaired Waters List for DO in 2020. The low DO values were collected both upstream and downstream of the Southern Minnesota Beet Sugar Coop discharge. No fish were collected at downstream station 03MN017 in 2010 (Figure 46).

Figure 46. Scum at 03MN017 (6/7/10).

Elevated nutrients are a concern in CD 37 (-531) with a nitrate value of 11 mg/L, CD 17A (-678) with a value of 9.7 mg/L, and CD 59 (-677) with a value of 9.8 mg/L (Figure 47). CD 17A also had an elevated phosphorus values with a high of 0.429 mg/L. Elevated DO values, which can be indicative of DO flux and eutrophication were collected on CD 37 (-531) with a maximum value of 17.8 mg/L and CD 59 (-677) with a max balue of 14.45 mg/L.

Figure 47. Algae at site 10MN113 (7/19/21).

The habitat scores were rated poor and were limited on all four ditches. The scores on CD 37 were all lower than 25 and rated poor. The habitat scores were lowered on CD 17A, CD 37 and CD 59 by a lack of; channel stability, channel development, sinuosity, and depth variability. The only sediment types observed were silt and muck on CD 37. The biological communities show increased stress over time at site 15EM110 on reach -730 with an increase in burrowers and legless macroinvertebrates, which are an indication of fine sedimentation. Legless macroinvertebrates also increased from C1 to C2 at site 10MN113 on CD 59.

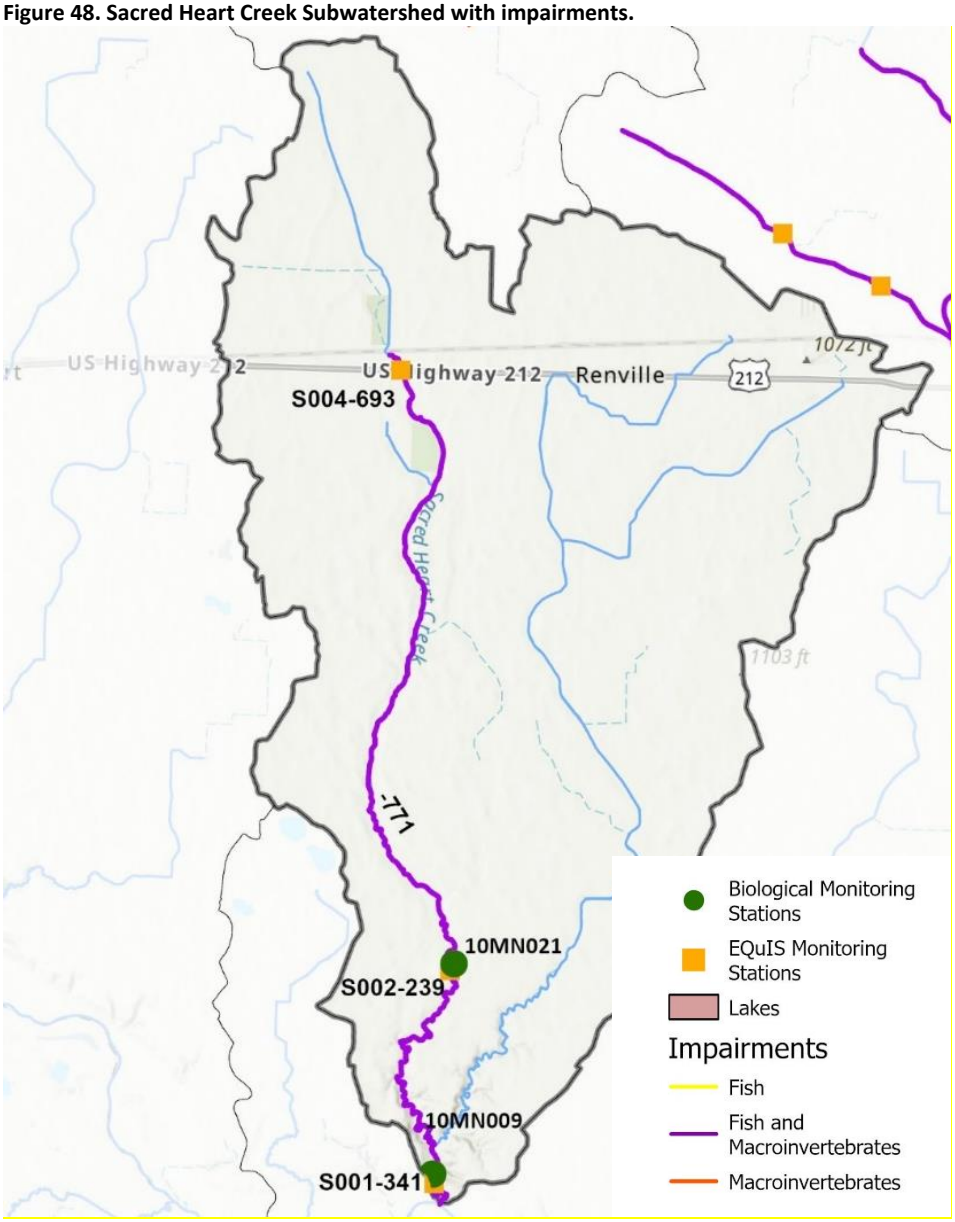
Of 101 T-tube values collected on CD 59, 11.9% of values were below the standard of 10 cm with a low T-tube value of 3 cm. The T-tube values were collected 2023-2025 near the mouth of CD 59 before it flows into West Fork Beaver Creek. TSS tolerant macroinvertebrate taxa increased from C1 (15.5%) to C2 (55.5%) at site 10MN113.

Sacred Heart Creek Subwatershed

Biological Community Summary

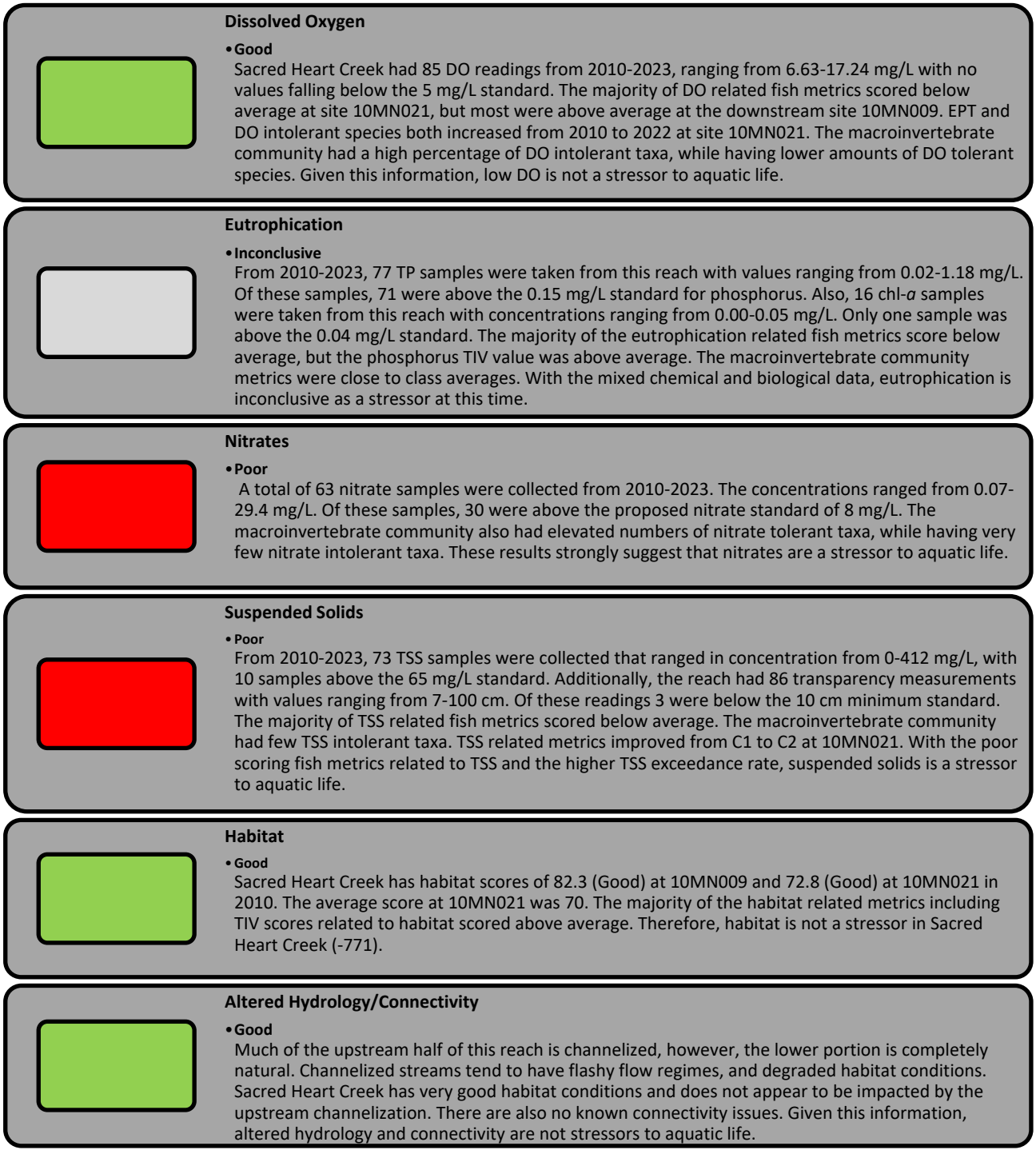
Sacred Heart Creek (-771) in the Sacred Heart Creek Subwatershed (Figure 48) is a 11.8-mile stream reach impaired for aquatic life use due to the low scoring fish and macroinvertebrate assemblages at its biological monitoring station, 10MN021. The FIBI score was 40.5 in 2010 and increased to 51.3 in 2022. Both scores are below the Fish Class 3 Southern Headwaters general use threshold of 55. MIBI scores for this reach were 15.1 (2010) and an increase to 41.9 (2022). The most recent score was above the Invertebrate Class 5 Southern Streams RR general use threshold of 37. Every aspect of the invertebrate community improved. Site 10MN009, further downstream on the reach had a FIBI score of 55.3 in 2010. The score was above the threshold while the invert score was at the threshold with a score of 37.4. Stressors are identified inFigure 49.

Figure 48. Sacred Heart Creek Subwatershed with impairments.



What stressors are of concern?

Figure 49. Biological stressor determinations for Sacred Heart Creek (-771). Red boxes indicate poor conditions; 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

Biological and water chemistry information throughout Sacred Heart Creek identified nitrate and TSS as stressors with potential stress coming from eutrophication (Figure 50).

Nitrates are a stressor in Sacred Heart Creek. A value of 29.4 mg/L was collected, which is more than three times the proposed standard. The highest values were collected near the mouth of the creek.

ISuspended sediments are a stressor. Values are highest near the mouth of the creek (Figure 51). Inorganic (sediment) makes up the majority of the suspended sediments in the creek. The downstream reach of the creek has substantial buffers, but areas in the upper watershed are lacking. Ensuring buffers throughout the stream would help prevent further erosion.

There are a number of elevated phosphorus values, elevated DO values, and one chl-*a* value over the standard. Further data would help to understand and mitigate eutrophication effects.

Figure 50. Filamentous algae at 10MN021 (8/2/22).

Figure 51. Turbid conditions at 10MN009 (7/14/10).

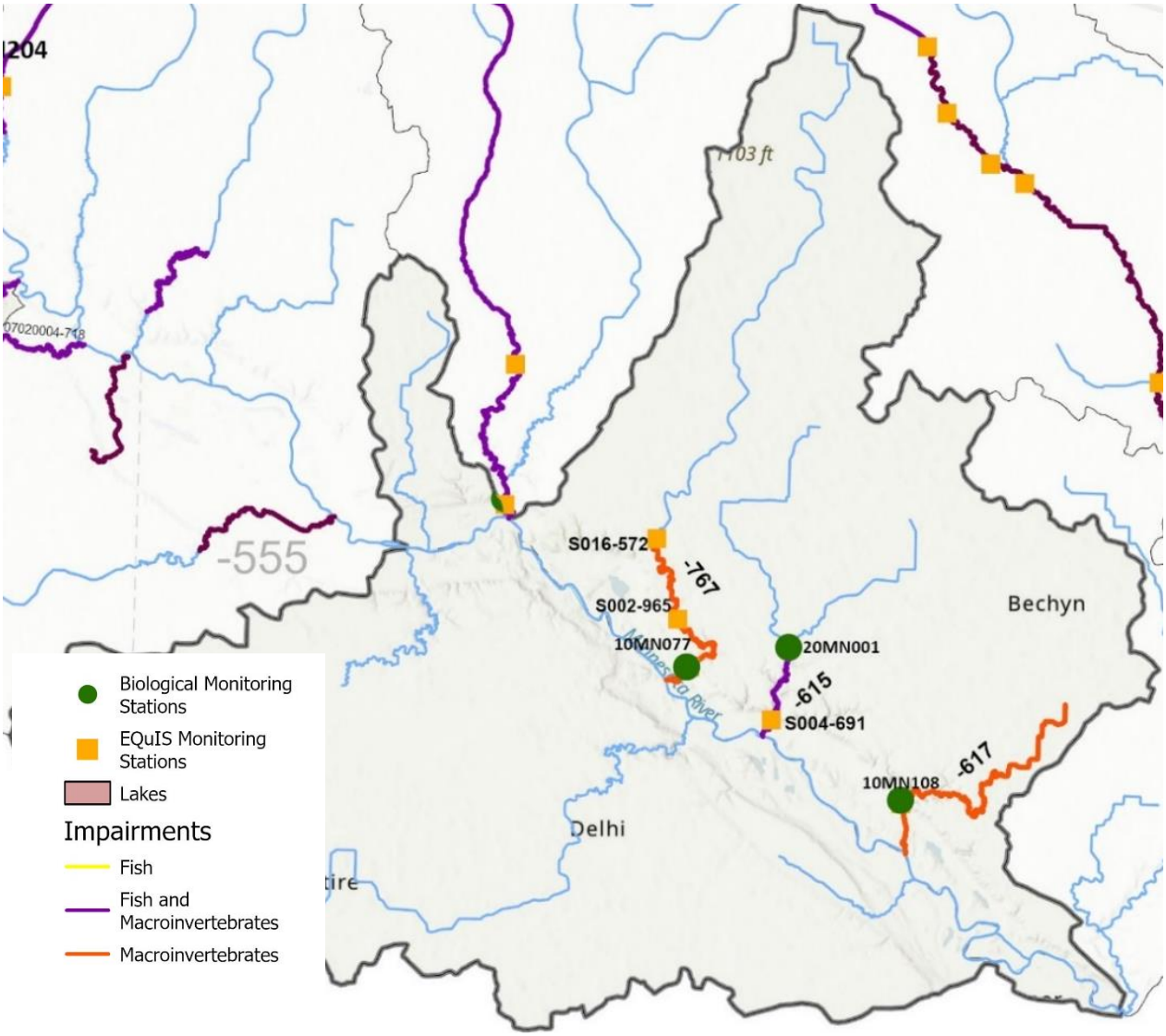
Sacred Heart Creek-Minnesota River Subwatershed

Biological Community Summary

The Sacred Heart Creek-MN River Subwatershed (Figure 52) has three reaches impaired for aquatic life due to degraded biological communities; Middle Creek (-615), Smith Creek (-617), and Timms Creek (-767). Stressors in Middle Creek are identified in Figure 53, stressors in Smith Creek are identified in Figure 54, and stressors in Timms Creek are identified in Figure 55.

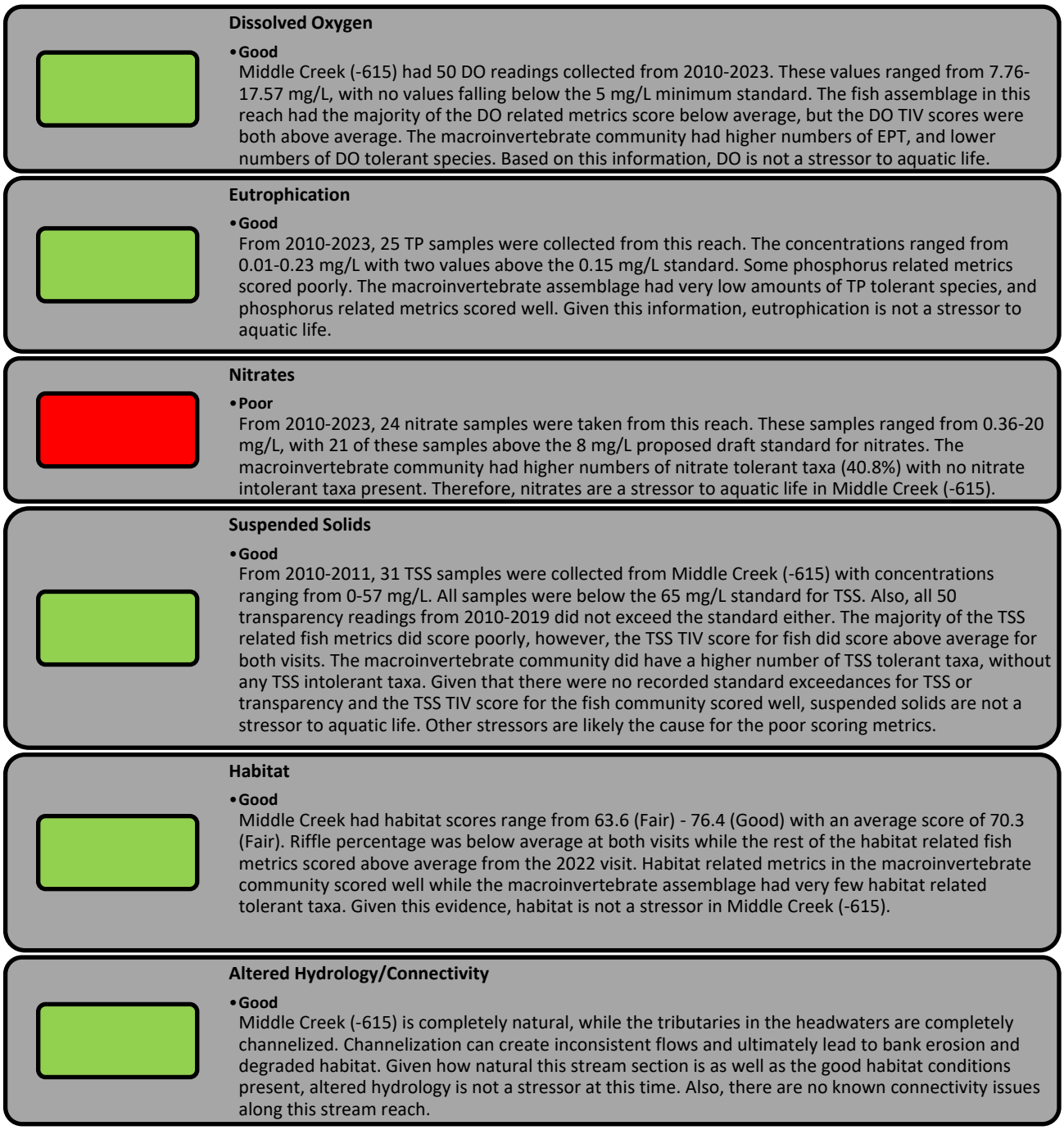
- Middle Creek (-615) is a 1.92-mile-long stream reach impaired for aquatic life use due to the poor scoring fish and macroinvertebrate communities at its biological monitoring station 20MN001. The FIBI score at this site is 46.6 in 2021 and 45.9 in 2022. Both scores are below Fish Class 3 Southern Headwaters general use threshold of 55. The MIBI score was 30.7 during the 2022 macroinvertebrate sampling event. This score is below the Invertebrate Class 5 Southern Streams threshold of 37.
- Smith Creek (-617) is a 6.42-mile-long stream reach impaired for aquatic life use due to the degraded macroinvertebrate assemblage at its biological monitoring site 10MN108. The MIBI score at this site was 27.3 in 2010 and 21.7 in 2021. Both scores are well below the Class 5 Southern Streams threshold of 37. SID work was completed on Smith Creek (-617) during C1 where nitrate and habitat were determined to be stressors.
- Timms Creek (-767) is a 4.52-mile-long stream reach impaired for aquatic life use due to the low scoring macroinvertebrate community at biological monitoring station 10MN077. The MIBI score was 29 during 2010 sampling, below the Class 5 Southern Streams threshold of 37.

Figure 52. Sacred Heart Creek-Minnesota River Subwatershed with impairments.



What stressors are of concern?

Figure 53. Biological stressor determinations for Middle Creek (-615). Red boxes indicate poor conditions; therefore, a stressor to aquatic life. Green boxes indicate good conditions and not a stressor to aquatic life.



Dissolved Oxygen

- **Good**

Middle Creek (-615) had 50 DO readings collected from 2010-2023. These values ranged from 7.76-17.57 mg/L, with no values falling below the 5 mg/L minimum standard. The fish assemblage in this reach had the majority of the DO related metrics score below average, but the DO TIV scores were both above average. The macroinvertebrate community had higher numbers of EPT, and lower numbers of DO tolerant species. Based on this information, DO is not a stressor to aquatic life.

Eutrophication

- **Good**

From 2010-2023, 25 TP samples were collected from this reach. The concentrations ranged from 0.01-0.23 mg/L with two values above the 0.15 mg/L standard. Some phosphorus related metrics scored poorly. The macroinvertebrate assemblage had very low amounts of TP tolerant species, and phosphorus related metrics scored well. Given this information, eutrophication is not a stressor to aquatic life.

Nitrates

- **Poor**

From 2010-2023, 24 nitrate samples were taken from this reach. These samples ranged from 0.36-20 mg/L, with 21 of these samples above the 8 mg/L proposed draft standard for nitrates. The macroinvertebrate community had higher numbers of nitrate tolerant taxa (40.8%) with no nitrate intolerant taxa present. Therefore, nitrates are a stressor to aquatic life in Middle Creek (-615).

Suspended Solids

- **Good**

From 2010-2011, 31 TSS samples were collected from Middle Creek (-615) with concentrations ranging from 0-57 mg/L. All samples were below the 65 mg/L standard for TSS. Also, all 50 transparency readings from 2010-2019 did not exceed the standard either. The majority of the TSS related fish metrics did score poorly, however, the TSS TIV score for fish did score above average for both visits. The macroinvertebrate community did have a higher number of TSS tolerant taxa, without any TSS intolerant taxa. Given that there were no recorded standard exceedances for TSS or transparency and the TSS TIV score for the fish community scored well, suspended solids are not a stressor to aquatic life. Other stressors are likely the cause for the poor scoring metrics.

Habitat

- **Good**

Middle Creek had habitat scores range from 63.6 (Fair) - 76.4 (Good) with an average score of 70.3 (Fair). Riffle percentage was below average at both visits while the rest of the habitat related fish metrics scored above average from the 2022 visit. Habitat related metrics in the macroinvertebrate community scored well while the macroinvertebrate assemblage had very few habitat related tolerant taxa. Given this evidence, habitat is not a stressor in Middle Creek (-615).

Altered Hydrology/Connectivity

- **Good**

Middle Creek (-615) is completely natural, while the tributaries in the headwaters are completely channelized. Channelization can create inconsistent flows and ultimately lead to bank erosion and degraded habitat. Given how natural this stream section is as well as the good habitat conditions present, altered hydrology is not a stressor at this time. Also, there are no known connectivity issues along this stream reach.

Figure 54. Biological stressor determinations for Smith Creek (-617). Red boxes indicate poor conditions; therefore, a stressor to aquatic life. Yellow boxes indicate fair conditions and indicate a secondary stressor. Green boxes indicate good conditions and not a stressor to aquatic life.

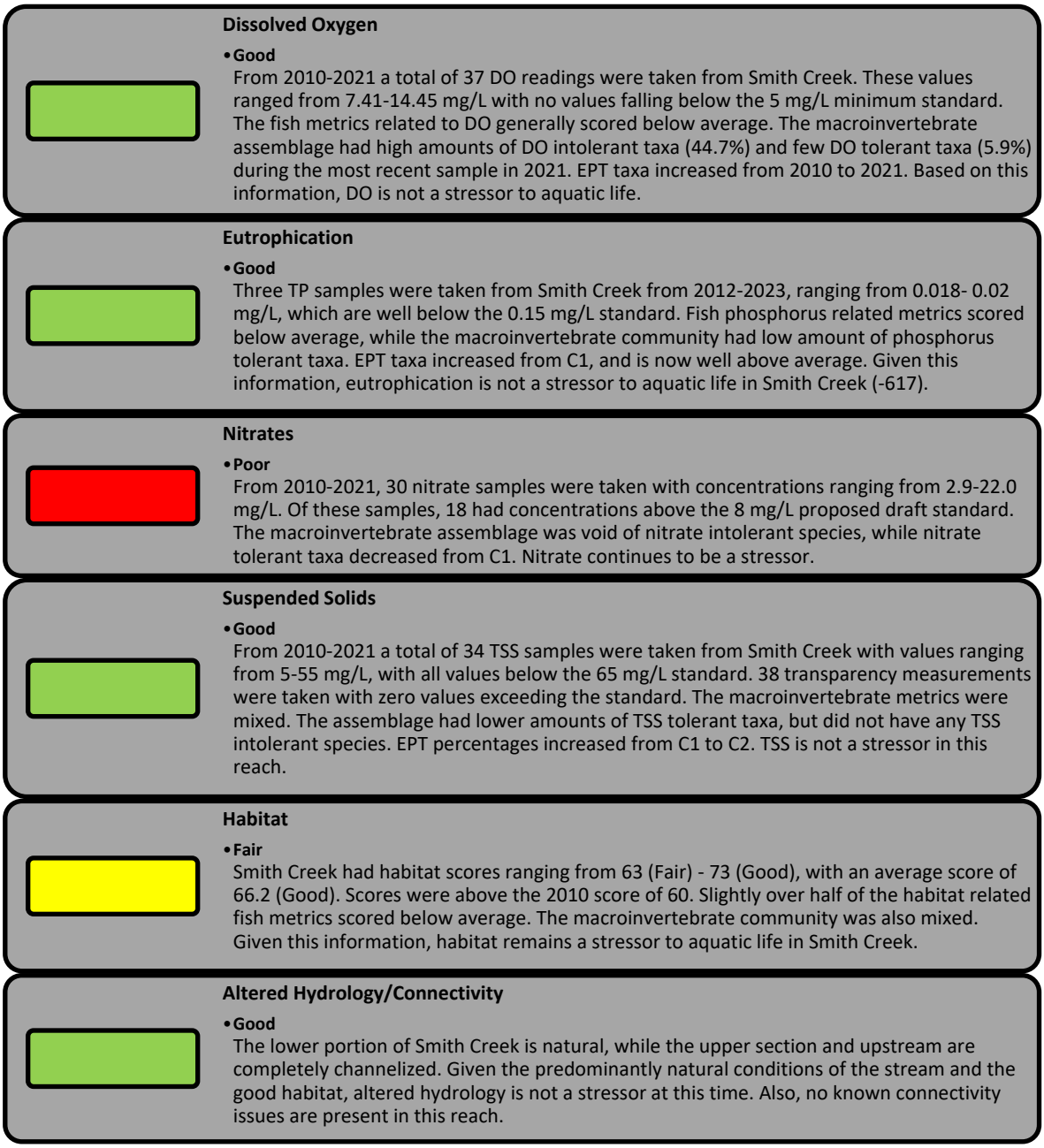
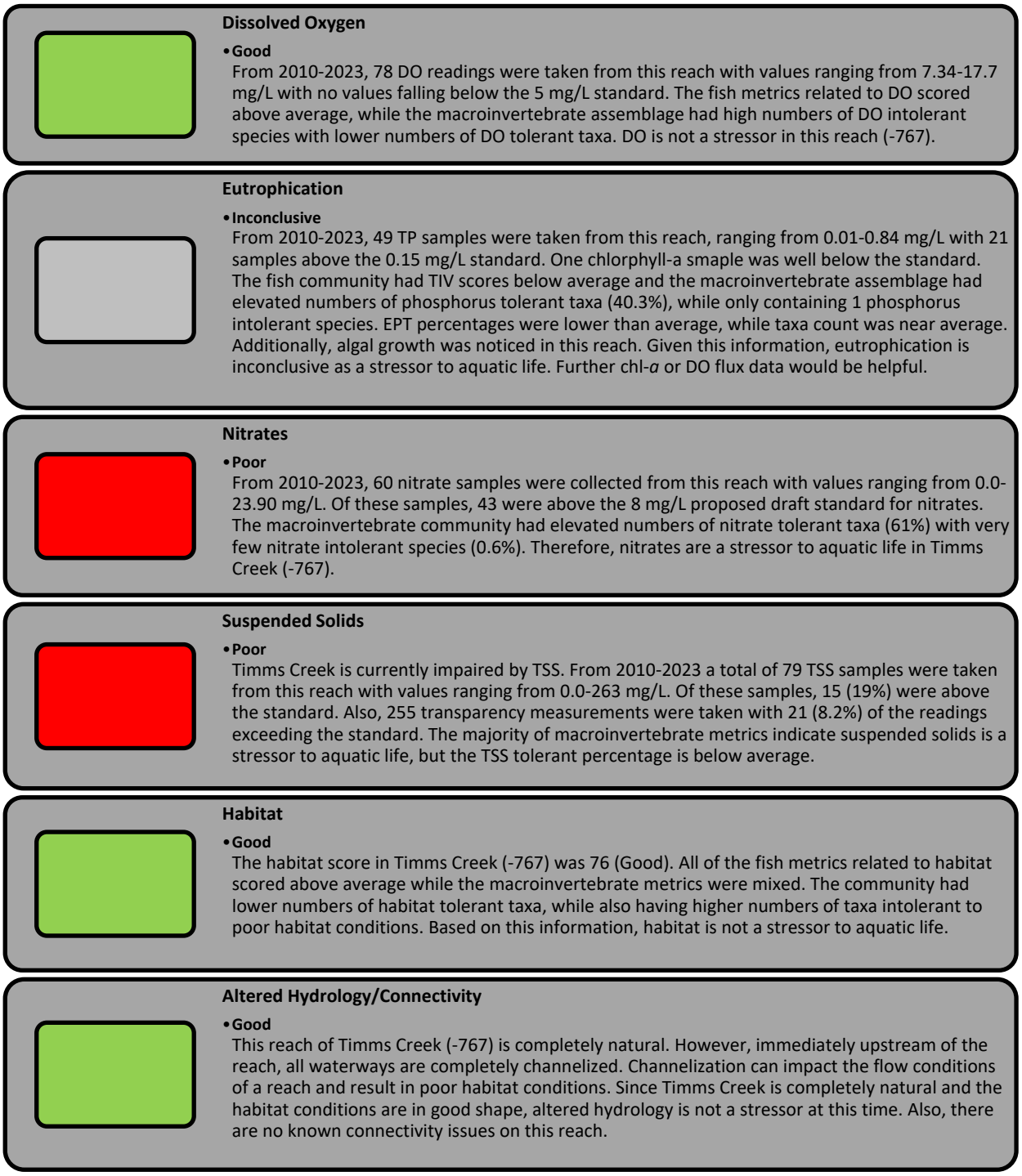


Figure 55. Biological stressor determinations for Timms Creek (-767). Red boxes indicate poor conditions; therefore, a stressor to aquatic life. Green boxes indicate good conditions and not a stressor to aquatic life.



Summary of stream health

The three creeks are direct tributaries to the Minnesota River. The bedrock geology and high gradient of Timms Creek makes for unique features like large riffles and small cascades (Figure 56).

Nitrate and habitat were stressors on Smith Creek in C1. Nitrate remains a stressor. The habitat scores increased from C1 to C2, but embeddedness of coarse substrates with fine sediments remains an issue (Figure 57).

Nitrate is a stressor on all three creeks. Nitrate data collected from 2010-2024 showed the highest value (22 mg/L in 2024) was collected on Timms Creek, and the average value (14.5 mg/L) was highest on Middle Creek. Nitrate mitigation would benefit both the three creeks and the Minnesota River downstream.

Eutrophication is a possible stressor on Timms Creek (Figure 58). There are a number of elevated phosphorus values, a few elevated DO values. Longitudinal sampling showed phosphorus highest in the upstream reach of the creek (-766). Further data would be helpful to determine the extent of the stress.

Figure 56. Timms Creek at 10MN077 (7/21/10).

Figure 57. Fine sediments on Smith Creek (8/17/21).

Figure 58. Algae on Timms Creek (6/28/23).

Part 3: Conclusion

Table 1. Stressor determinations in the Hawk Creek Watershed.

		Stressors	Dissolved Oxygen	Eutrophication	Nitrate	Suspended Solids	Habitat	Altered Hydrology	Connectivity
Stream Name	**AUID**	**Aquatic Life Impairment**							
Upper Hawk Creek Subwatershed									
Unnamed ditch	07020004-732	Macroinvertebrates	o	o	o	o	●	●	---
Unnamed ditch	07020004-733	Macroinvertebrates	o	o	o	o	●	●	---
Unnamed ditch	07020004-736	Macroinvertebrates	o	o	o	o	●	●	---
Lower Hawk Creek Subwatershed									
Hawk Creek	07020004-568	Fish, Macroinvertebrates	●	o	●	●	●	---	---
Hawk Creek	07020004-587	Fish, Macroinvertebrates	---	o	●	●	●	---	---
County Ditch 37	07020004-724	Macroinvertebrates	o	o	o	o	●	●	---
Judicial Ditch 2	07020004-730	Fish, Macroinvertebrates	o	o	o	o	●	●	---
Unnamed ditch	07020004-731	Fish, Macroinvertebrates	o	o	o	o	●	●	---
County Ditch 11 Subwatershed									
County Ditch 11	07020004-689	Macroinvertebrates	●	●	---	●	●	●	---
Unnamed ditch	07020004-725	Macroinvertebrates	●	●	o	---	●	●	---
Stony Run Creek-MN River Subwatershed									
County Ditch 36A	07020004-682	Macroinvertebrates	o	o	o	o	●	●	---
Chetomba Creek Subwatershed									
Chetomba Creek	07020004-588	Fish, Macroinvertebrates	o	o	---	o	●	●	●
County Ditch 8	07020004-650	Fish, Macroinvertebrates	o	o	o	o	●	●	---
County Ditch 18	07020004-651	Fish, Macroinvertebrates	o	o	o	o	●	●	---
Judicial Ditch 8	07020004-728	Macroinvertebrates	o	o	o	o	●	●	---
County Ditch 16	07020004-734	Fish, Macroinvertebrates	o	o	o	o	●	●	---
Unnamed Creek	07020004-571	Fish, Macroinvertebrates	o	o	o	o	●	●	---

		Stressors	Dissolved Oxygen	Eutrophication	Nitrate	Suspended Solids	Habitat	Altered Hydrology	Connectivity
Stream Name	**AUID**	**Aquatic Life Impairment**							
County Ditch 31	07020004-574	Fish, Macroinvertebrates	o	o	o	o	●	●	●
East Fork Beaver Creek Subwatershed									
East Fork Beaver Creek	07020004-785	Fish, Macroinvertebrates	o	●	●	o	●	●	---
East Fork Beaver Creek	07020004-786	Macroinvertebrates	o	o	o	o	---	---	---
West Fork Beaver Creek Subwatershed									
West Fork Beaver Creek	07020004-768	Fish, Macroinvertebrates	o	o	●	o	●	●	---
West Fork Beaver Creek	07020004-769	Fish	o	o	●	o	●	●	---
County Ditch 37	07020004-531	Fish, Macroinvertebrates	o	o	o	o	●	●	---
County Ditch 59	07020004-677	Macroinvertebrates	o	o	o	●	●	●	---
County Ditch 17A	07020004-678	Fish, Macroinvertebrates	o	o	o	o	●	●	---
County Ditch 31	07020004-727	Fish, Macroinvertebrates	o	o	o	o	●	●	---
Sacred Heart Creek Subwatershed									
Sacred Heart Creek	07020004-771	Fish, Macroinvertebrates	---	o	●	●	---	---	---
Sacred Heart Creek-MN River Subwatershed									
Middle Creek	07020004-615	Fish, Macroinvertebrates	---	---	●	---	---	---	---
Smith Creek	07020004-617	Macroinvertebrates	---	---	●	---	●	---	---
Timms Creek	07020004-767	Macroinvertebrates	---	o	●	●	---	---	---

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

For more information

WRAPS Updates, including necessary TMDLs, follow the completion of the SID process. For more information, go to https://www.pca.state.mn.us/watershed-information/minnesota-river-yellow-medicine-river-hawk-creek or search for “Minnesota River- Yellow Medicine River/Hawk Creek Watershed” on the MPCA website.

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

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MINNESOTA POLLUTION CONTROL AGENCY

CLEAN WATER LAND & LEGACY AMENDMENT

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