SID Update

Dobbins Creek Watershed

November 2022

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

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

- Numerous conservation practices have been installed in the watershed, with many more planned.
- Dobbins Creek Watershed is upstream of the city of Austin, which has a long history of flooding issues.

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

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

Cycle 1 SID Summary:

- There were no biological impairments identified in the Dobbins Creek Watershed in Cycle 1, therefore, no Cycle 1 SID was conducted.
- New sites (14CD002, 14CD003, and 14CD004) were added in the headwaters area of Dobbins Creek after Cycle 1; these new sites/data led to the Cycle 2 fish and macroinvertebrate impairment. The lower portion of Dobbins Creek continues to meet biological standards.

This SID document summarizes biological condition and provides monitoring highlights and stressor conclusions for Dobbins Creek Watershed. This document is designed to complement existing Cedar River Watershed reports (e.g., the Cedar River Watershed Restoration and Protection Strategy (WRAPS)

and Cedar-Wapsipinicon Comprehensive Watershed Management Plan [CWMP]), which should also be used to inform watershed work; these documents contain information such as priority issues, priority areas, and pollutant loading data which are critical in prioritizing implementation work.

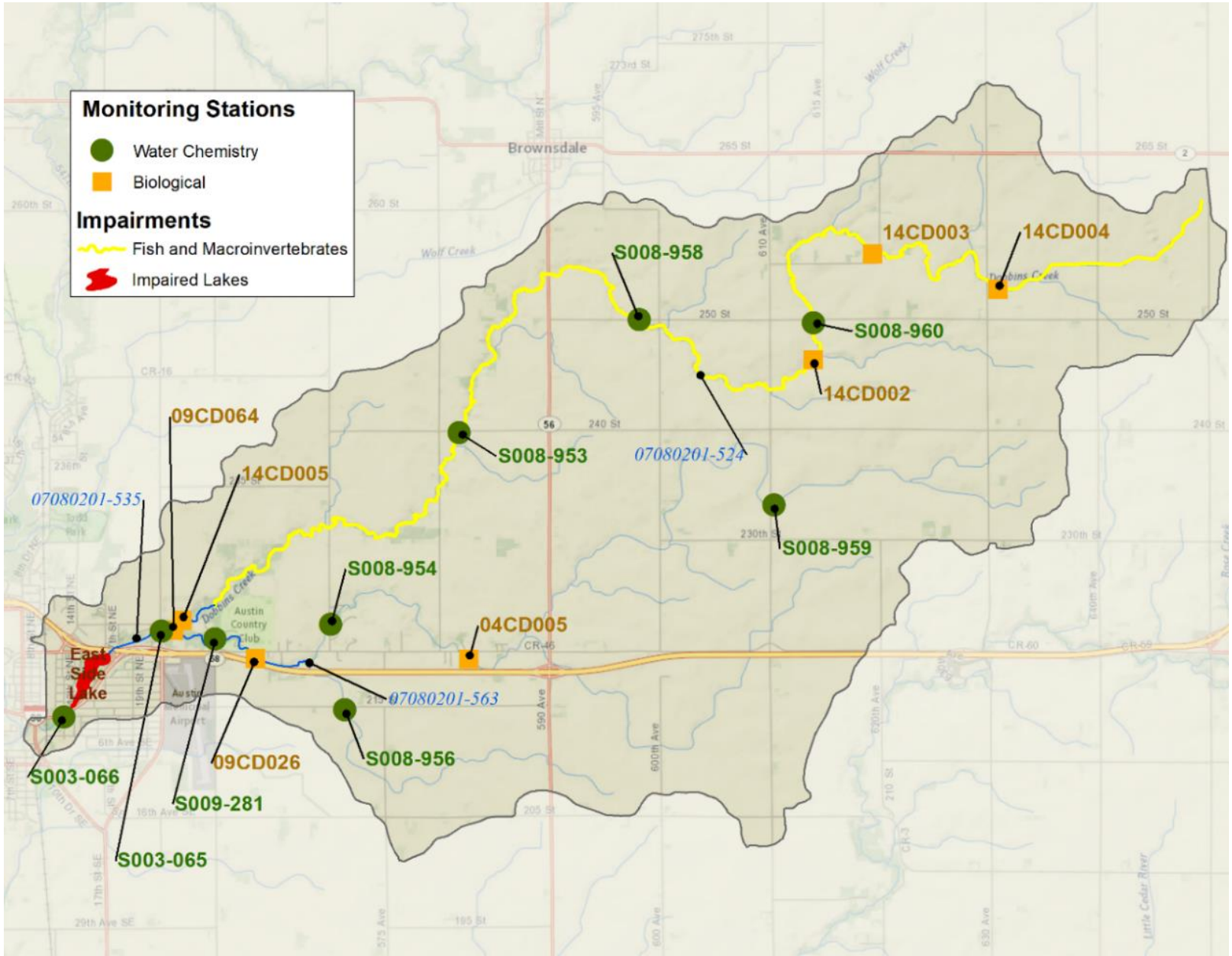
Biological Communities

Fish and macroinvertebrate communities in the Dobbins Creek Watershed are of varying quality; some are impaired and failing to meet standards while others are healthy and meeting standards (Table 1, Figure 1). This is typical of many small warmwater streams in the region. Most fish index of biological integrity (FIBI) and macroinvertebrate index of biotic integrity (MIBI) scores were higher in Cycle 2. In general, macroinvertebrates belonging to the family Chironomidae (flies/non-biting midges) dominated the Cycle 1 and 2014 samples; Physidae (snails), Hydropsychidae (net-spinning caddisflies), and Elmidae (riffle beetles) were also abundant at times. Similar to Cycle 1, Chironomidae dominated the Cycle 2 samples. The fish community during all samples was primarily comprised of Cyprinidae (shiners, dace, minnows, stonerollers, chubs), Percidae (darters), and Catostomidae (white suckers). Most of Dobbins Creek (AUID -524) is impaired for fish and macroinvertebrates, while the remaining stream reaches (AUIDs -535 and -563) are meeting biological standards. It should be noted that all stations (14CD002, 14CD003, and 14CD004) at which data indicated fish and macroinvertebrate impairment are located in the headwaters area of Dobbins Creek; these stations were established after Cycle 1 to monitor effectiveness of conservation practices in that part of the watershed.

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

Waterbody	AUID	Biological Stations	Biological Impairment	Class	FIBI	FIBI Threshold	FIBI Year	MIBI	MIBI Threshold	MIBI Year
Dobbins Creek	524	14CD002	Fish, Macroinvertebrates	2Bg	43.4	55	2014	24.3	43	2014
					45.5		2019	61.6		2019
		14CD003			42.2	55	2014	12.9	37	2014
					55.1		2019	25.6		2019
		14CD004			71.3	55	2014	-	-	-
Dobbins Creek	535	09CD064	None	2Bg	49.0	50	2009	55.1	43	2009
					47.7		2014	56.7		2009
					44.2		2019	65.1		2019
		14CD005			62.2	55	2014	43.7	37	2014
Unnamed Creek	563	09CD026	None	2Bg	51.4	55	2009	51.3	43	2009
								45.1		2009

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



Monitoring Highlights

Stream Temperature

- Several instantaneous (point) measurements were collected throughout the watershed over the last decade (2011 through 2020), and all were below 30 °C (daily average warmwater standard). Also, stream temperatures during sonde deployments in 2019 were suitable for warmwater biota as no values exceeded 30 °C.

Nitrate

- Nitrate samples were collected across the watershed at nine stations as part of Cycle 2 SID in 2019, with a goal to sample various flow conditions and establish a range of nitrate concentrations (Figure 2). Concentrations ranged from 1.7 to 13 mg/L (average of 7.2 mg/L), and 7 (10%) of the 67 samples were above 10 mg/L. In general, concentrations were moderate – elevated across the watershed, with highest concentrations observed in the upper part of the watershed; stations S008-953, S008-959, S008-958, and S008-960 had at least 1 sample above 10 mg/L. Nitrate tolerant macroinvertebrates were also abundant across the watershed. Nitrate tolerant macroinvertebrates in the upper end of Dobbins Creek at stations 14CD002 and 14CD003 ranged from 89% to 93% in 2014 and 76% to 78% in 2019; this section of Dobbins Creek is impaired for fish and macroinvertebrates. Stations S008-953 and S008-954 allow us to compare the two main branches of the watershed; these stations have similar drainage areas (approximately 8,900 acres and 8,600 acres respectively) which provides a more valuable comparison when looking at nitrate concentration and potential load (Figure 3). Station S008-953 was consistently higher than station S008-954 and had a higher average concentration (7.7 mg/L compared to 6.8 mg/L). The watershed area for station S008-953 has a higher percentage of cultivated crops (91%) than station S008-954 (84%), which is a potential explanation for the higher nitrate concentrations (in addition to differences in nutrient management/conservation practices, soils, tile drainage, etc.). In general, concentrations upstream (S003-065) and downstream (S003-066) of East Side Lake were similar but concentrations leaving the lake were consistently lower (Figure 4). The average concentration upstream of the lake (S003-065) was 6.6 mg/L while the average concentration downstream of the lake (S003-066) was 5.5 mg/L; denitrification and/or plant uptake are likely reasons for the reductions.

  Nitrate concentrations across the watershed over the last decade (2011 through 2020) ranged from 0.8 to 21.4 mg/L (average of 8.3 mg/L, 319 samples); 98 samples (31%) were above 10 mg/L.

TSS

- Total suspended solids (TSS) samples were collected across the watershed at nine stations as part of Cycle 2 SID in 2019, with a goal to sample various flow conditions and establish a range of TSS concentrations (Figure 2). Concentrations ranged from 2 to 480 mg/L, and 10 (15%) of the 67 samples exceeded the warmwater TSS standard (65 mg/L). All stations except S003-066 (just downstream of East Side Lake) had at least 1 exceedance, with most during elevated flow conditions. In general, TSS concentrations were low (below the standard) during low flow conditions, but Dobbins Creek and Unnamed Creek (AUID -624) are impaired for turbidity/TSS. TSS tolerant macroinvertebrates in the upper end of Dobbins Creek at stations 14CD002 and 14CD003 comprised 47% and 73% of the community respectively in 2014, and 42% and 38% in 2019. The main reason for the significant reduction in TSS tolerant macroinvertebrates in 2019 at station 14CD003 was the decrease of Physidae (188 sampled in 2014 and only 6 in 2019). The

probability of meeting the TSS standard based on the composition of the fish community in 2014 and 2019 ranged from 51% to 57% in the upper part of Dobbins Creek (stations 14CD002, 14CD003, and 14CD004). TSS concentrations at station S008-958 (just downstream of biological stations 14CD002, 14CD003, and 14CD004) exceeded the standard frequently from 2016 through 2019 (26 out of 54 samples, 48%).

TSS concentrations across the watershed over the last decade (2011 through 2020) ranged from 1.3 to 1,720 mg/L (average of 74.8 mg/L, 300 samples); 83 samples (28%) were greater than 65 mg/L.

Habitat

- The MPCA Stream Habitat Assessment (MSHA) scores throughout the watershed range from 26.7 ("poor") to 72.9 ("good"). Station 09CD064, near the mouth of Dobbins Creek, was the only station with Cycle 1 and Cycle 2 MSHA scores; scores were similar but decreased slightly from 2009 to 2019 (2009 – 73, 2014 – 69, 2019 – 61, 2019 – 57). Lower land use, substrate, and channel morphology sub-category scores were the primary reason for MSHA score reductions. Bank erosion, fine substrate, and embeddedness were common in the upper end of Dobbins Creek (AUID with fish and macroinvertebrate impairment, Figure 5). Most of the MSHA scores in the upper end of Dobbins Creek were "poor." Elevated burrowers and legless individuals and reduced clingers are present across the watershed; often times this is associated with lack of coarse substrate and/or woody debris, excess fine substrate, embeddedness, etc. Habitat examples from biological monitoring in 2019 can be seen in Figure 6. Overall, there is a range of habitat across the watershed, with better habitat conditions in the lower portion of the watershed compared to the upper portion.

Fish Passage

- Fieldwork in the upper end of Dobbins Creek in August 2021 identified road crossings with dry streambeds and/or minimal flows; it also appeared as though some small fish were trapped in isolated pockets of ponded water near stations 14CD003 and 14CD004 (Figure 7). These conditions are likely periodic based on climate, but fish passage does appear to be negatively impacting the fish community during low flow years. Flow data near the mouth of Dobbins Creek indicates that low flow conditions similar to those observed in 2021 have also occurred in previous years (Figure 8). Migratory fish from 2014 and 2019 samples ranged from 0% to 17% of the community in the upper portion of Dobbins Creek.

Flow Alteration

- Most of mainstem Dobbins Creek and the Unnamed tributary to the south are natural channels; however, much of the headwater areas in the watershed are altered and drained via subsurface tile (Figure 9). Also, low to no flow conditions have been documented in the headwaters of Dobbins Creek (Figure 7); the MPCA biologists noted that the stream bed was primarily fine substrate with inadequate flow for riffle organisms at station 14CD002 during macroinvertebrate sampling in 2014 and 2019. In addition, Minnesota Department of Natural Resources (DNR) staff provided precipitation and streamflow analysis for the Dobbins Creek (at Austin, CR61) streamgage; overall, upward trends for both precipitation and streamflow were observed. Precipitation increased during all seasons (during the post-change period, 1990 through 2020), and the largest runoff volumes occurred from April through June with the lowest in August.

TP/ Eutrophication

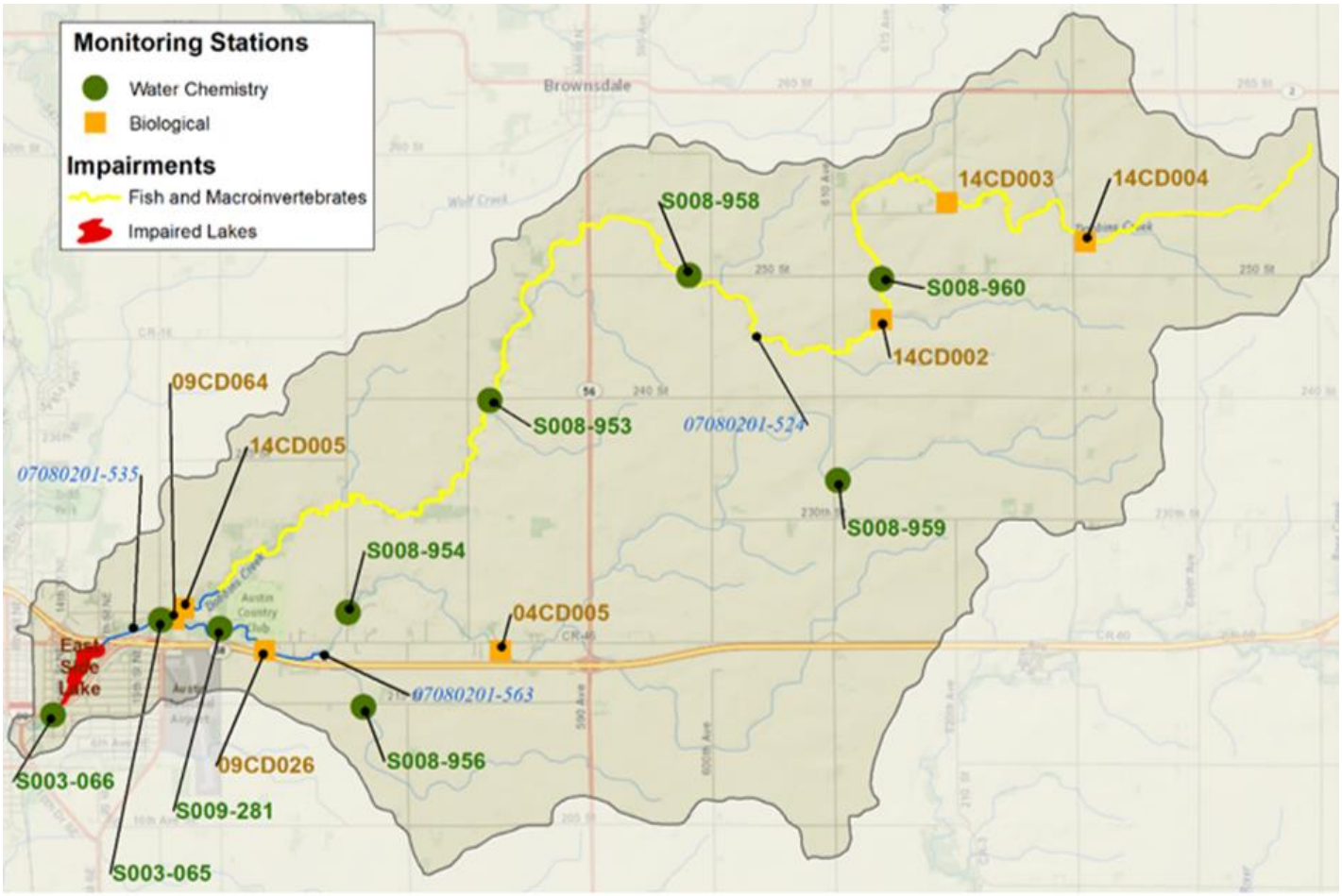
- Total phosphorus (TP) samples were collected across the watershed at nine stations as part of Cycle 2 SID in 2019, with a goal to sample various flow conditions and establish a range of TP concentrations (Figure 2). Concentrations ranged from 0.012 to 0.656 mg/L (average of 0.106 mg/L), and 11 (16%) of the 67 samples exceeded the river eutrophication standard for the South Region (0.15 mg/L). Each station had at least 1 exceedance, with most during elevated flow conditions. In general, TP concentrations were low (below the standard) during low flow conditions. Two chlorophyll-*a* (chl-*a*) and biochemical oxygen demand (BOD) samples were collected in 2019 (one in July and one in August) at stations S003-065 (lower portion of watershed) and S008-960 (upper portion of watershed); all samples were meeting standards. Also, there were no daily dissolved oxygen (DO) flux exceedances during the 2019 sonde deployments but occasional low DO has been documented. Although elevated TP has been documented, the limited response variable (chl-*a*, BOD, and DO flux) data is meeting standards therefore it's unclear if excess TP is resulting in eutrophication issues.

  TP concentrations across the watershed over the last decade (2011 through 2020) ranged from 0.012 to 1.51 mg/L (average of 0.18 mg/L, 303 samples); 112 samples (37%) were greater than 0.15 mg/L.

DO

- Several instantaneous (point) measurements were collected throughout the watershed over the last decade (2011 through 2020), and only one (<1%) was below 5 mg/L; the exceedance (2 mg/L) occurred at station S008-956 in August 2019. Low DO was also documented in the upper end of Dobbins Creek during fieldwork in August 2021 (Figure 7). There was no low DO identified during two sonde deployments in late June through mid-July of 2019; one sonde was deployed in the upper end of Dobbins Creek (S008-960) and one was deployed in the lower portion (S003-065). Overall, DO conditions appear suitable for warmwater biota most of the time, but low DO has been documented. The fish and macroinvertebrates show minimal signs of DO stress, with generally few low DO tolerant individuals. The probability of meeting the DO standard based on the composition of the fish community ranged from 80% to 95% across the watershed (this range includes samples from 2009, 2014, and 2019).

Figure 2: 2019 TSS (brown box plots), TP (purple box plots), and nitrate (green box plots) concentrations (mg/L) in Dobbins Creek Watershed. The red lines represent the TSS standard (65 mg/L), river eutrophication standard for the South Region (0.15 mg/L), and nitrate drinking water standard (10 mg/L).



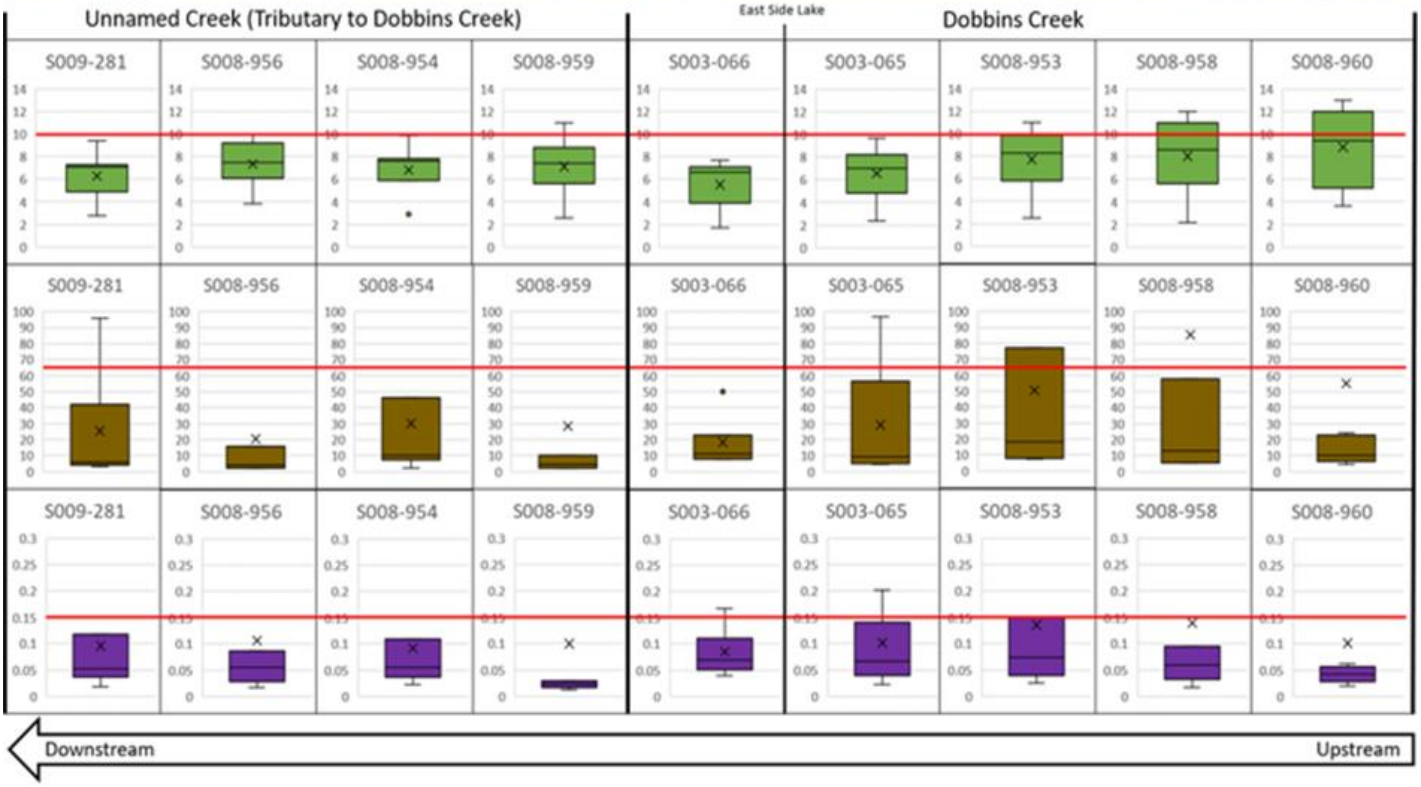


Figure 3: 2019 nitrate, TSS, and TP concentrations in the northern part of the watershed (Dobbins Creek, S008-953) and southern part of the watershed (Unnamed Creek, S008-954). In general, concentrations were similar but consistently higher in the northern portion of the watershed (S008-953); these two stations have similar size drainage areas, which is why they were used for comparison.

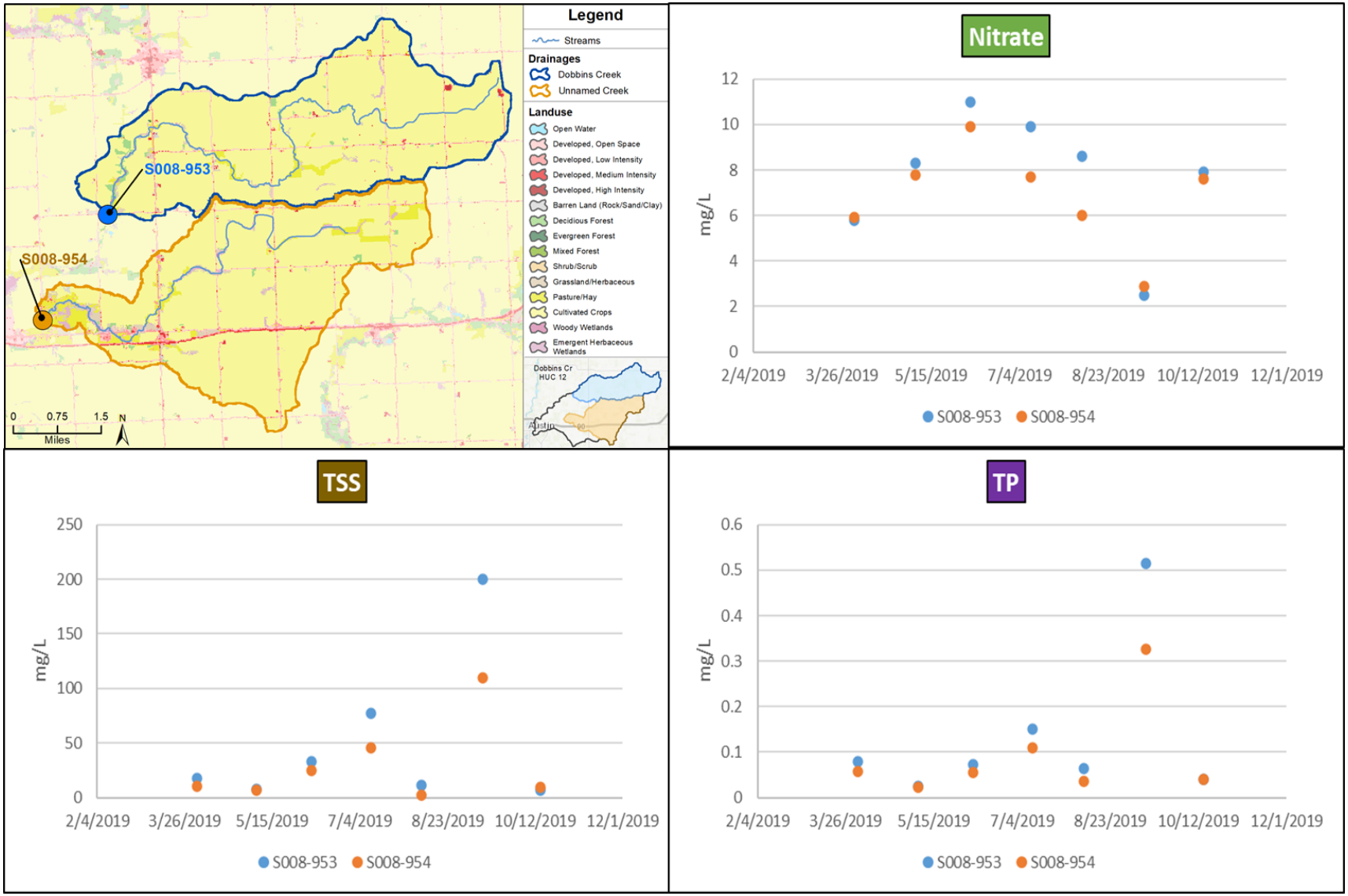


Figure 4: 2019 nitrate, TSS, and TP concentrations upstream (S003-065) and downstream (S003-066) of East Side Lake; nitrate concentrations leaving the lake were consistently lower (likely due to denitrification and/or plant uptake) whereas TSS and TP concentrations were more variable in terms of which site (upstream or downstream) had higher concentrations. East Side Lake imagery courtesy of Google Earth.

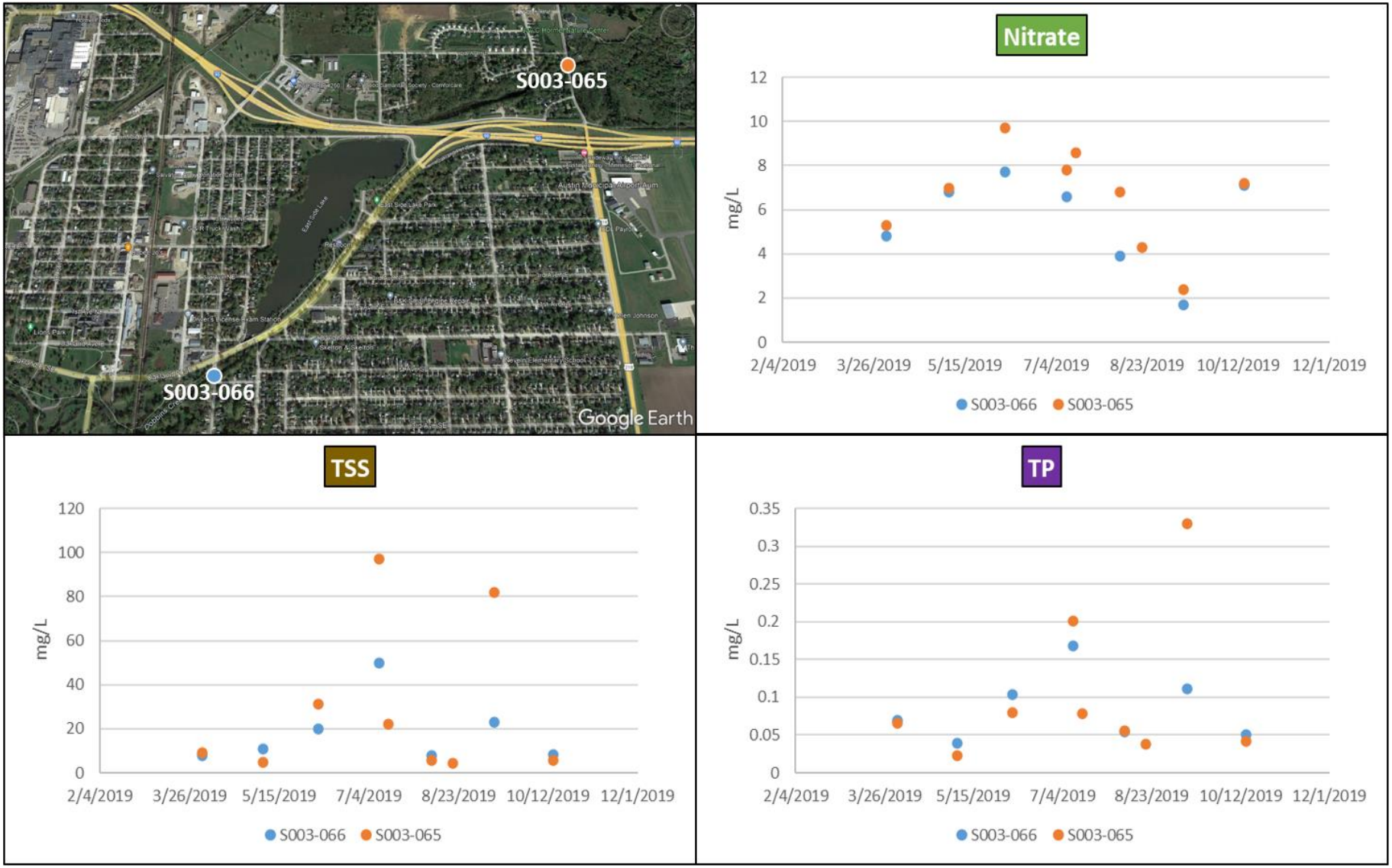


Figure 5: Examples of bank erosion, fine substrate, and embeddedness in the upper end of Dobbins Creek at station 14CD003; the top left photo was taken in 2014 and the other two were taken in 2019.

Figure 6: Habitat examples from biological monitoring stations in the Dobbins Creek Watershed in 2019.

Figure 7: Longitudinal flow conditions in the upper end of Dobbins Creek in August 2021; many road crossings had dry streambeds and/or minimal flows. Low DO was documented where flow was present and it also appeared as though some small fish were trapped in isolated pockets of ponded water near stations 14CD003 and 14CD004.

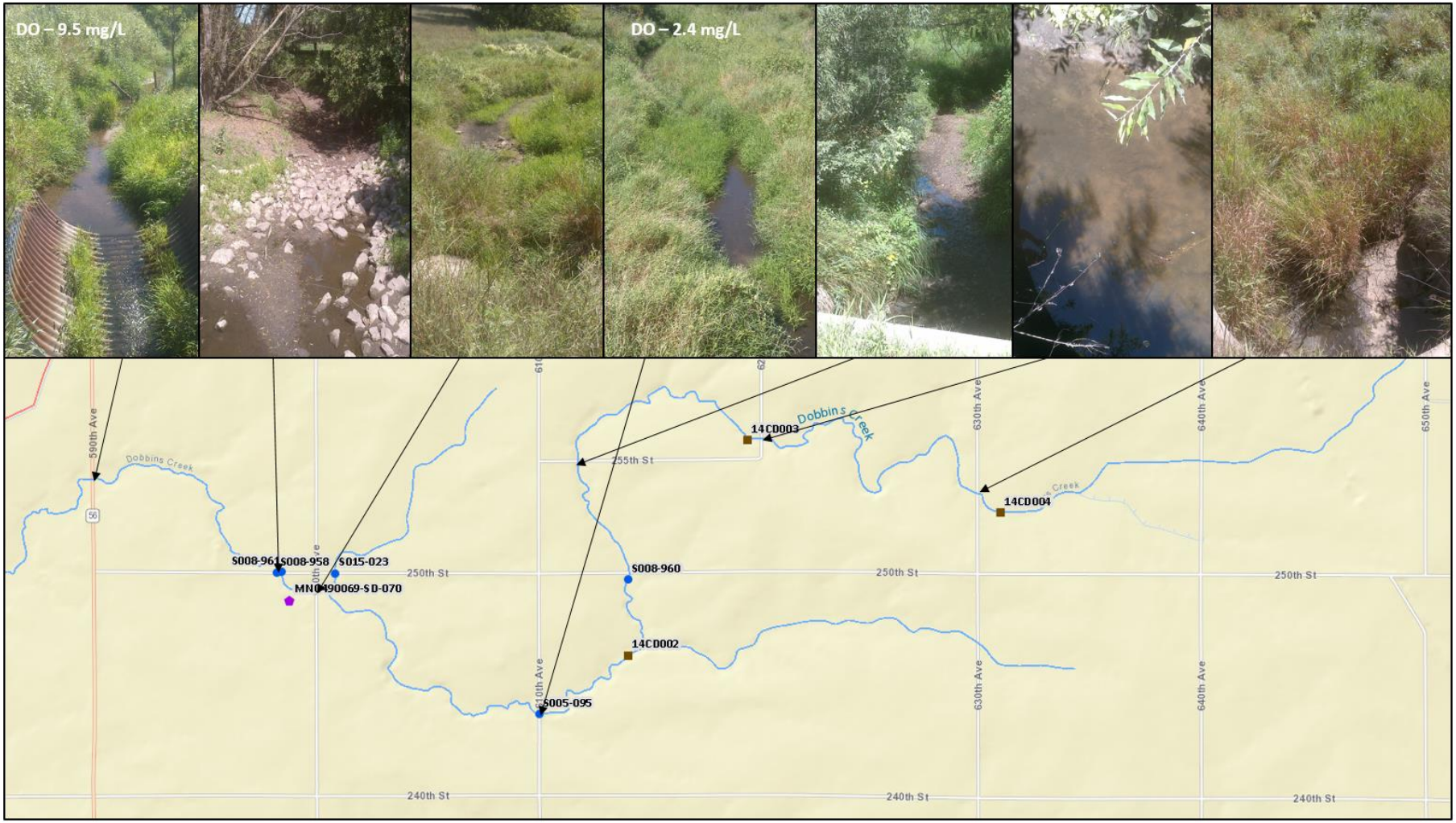


Figure 8: Flow data from 1998 – 2022 in the lower portion of Dobbins Creek (near biological station 09CD064); the low flow conditions documented in August 2021 seem to occur periodically when looking at the historical data and don't appear to be a "one-time" event. Note the y-axis doesn't include the entire flow range, instead it's scaled to provide finer resolution on low flow time periods

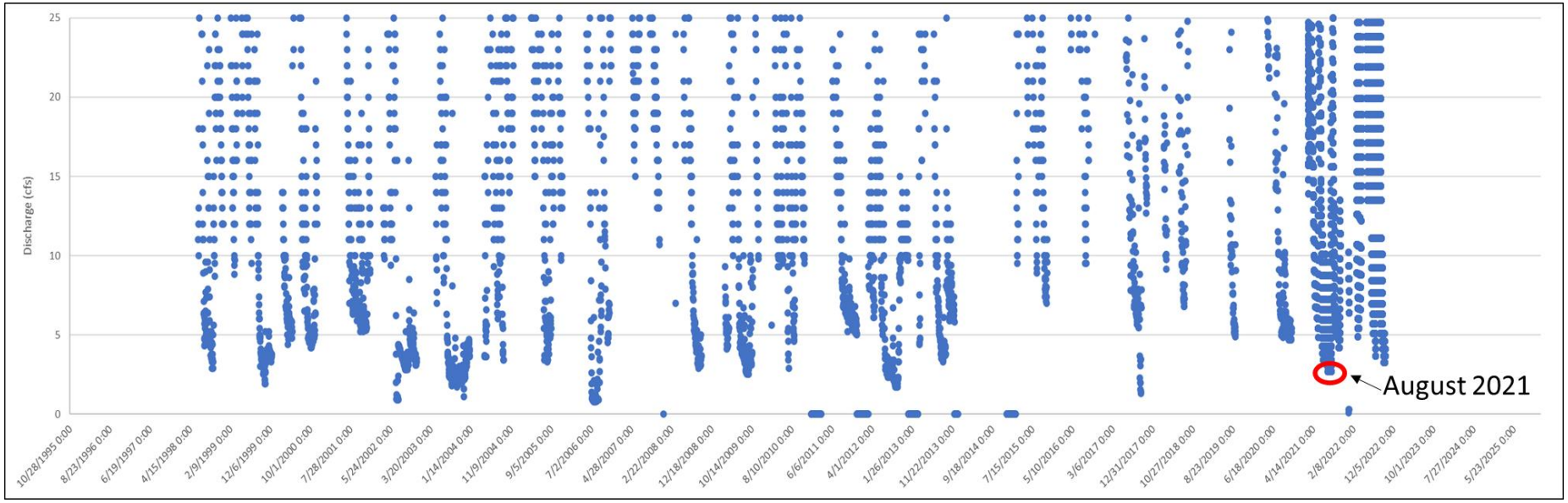
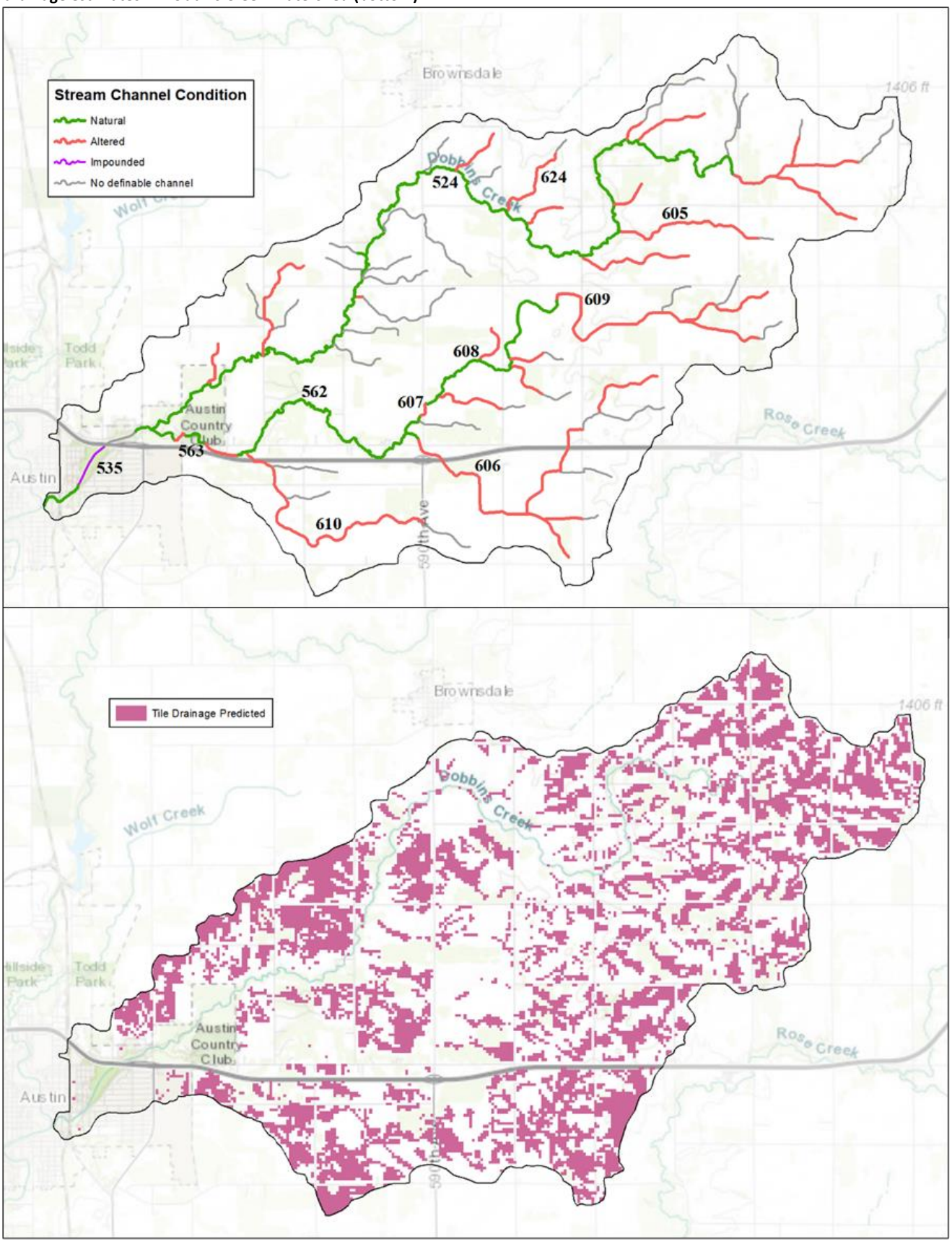


Figure 9: Natural, altered, impounded, and no definable channel watercourses in Dobbins Creek Watershed (top), and tile drainage estimates in Dobbins Creek Watershed (bottom).



Summary

- Nitrate, TSS, habitat, fish passage, and flow alteration are stressing the biology in the upper end of Dobbins Creek Watershed, while stream temperature is not currently a stressor and eutrophication and DO are inconclusive (Table 2).
- Nitrate concentrations were moderate – elevated across the watershed, with highest concentrations observed in the upper part of the watershed. Cultivated crops dominate the watershed and are the primary source of nitrogen to surface waters; tile drainage is abundant and a primary transport path to surface waters.
- TSS concentrations were low (below the standard) during low flow conditions, but Dobbins Creek and Unnamed Creek (AUID -624) are impaired for turbidity/TSS. The biology in the upper end of Dobbins Creek show signs of TSS stress, and TSS concentrations at station S008-958 (just downstream of biological stations 14CD002, 14CD003, and 14CD004) exceeded the standard frequently from 2016 through 2019 (26 out of 54 samples, 48%). Sediment is also a concern via habitat loss and degradation from an abundance of fine substrate and embeddedness. Since cultivated crops are the dominant land use in the watershed, likely sediment sources include runoff from agricultural fields and stream bank erosion.
- Habitat varies across the watershed with better conditions in the lower portion; bank erosion, fine substrate, and embeddedness were common in the upper end of Dobbins Creek and most MSHA scores were “poor”.
- No flow/minimal flow time periods can occur in the upper end of Dobbins Creek, negatively impacting fish passage in this part of the watershed (Figure 7). These conditions also impact other variables such as habitat quality/availability and DO concentrations.
- Flow alteration is negatively impacting biology in Dobbins Creek Watershed; headwater areas are altered and drained via subsurface tile (Figure 9). Altered watercourses are often associated with poor habitat, an abundance of fine substrate, excess nutrients and productivity, altered DO regimes (low DO and high DO flux), and minimal flow time periods. Also, DNR staff have documented increases in precipitation and streamflow, highlighting the need for water storage on the landscape (especially during the early part of the growing season). Increases in precipitation and streamflow have the potential to alter multiple variables such as nutrient/sediment loading, bank erosion, and habitat. Flow alteration is complex and can impact biology in various ways throughout the year (e.g., both high/increased flows and low/no flow time periods impact biology in Dobbins Creek Watershed).
- Elevated TP concentrations and low DO have been documented, but it’s uncertain if they are stressing the fish and/or macroinvertebrate communities. Currently there is no clear link indicating that elevated TP concentrations are creating eutrophic conditions resulting in low DO environments; very low flows during certain years/times of year may result in periodic low DO in the headwater areas of Dobbins Creek and its tributaries.
- Stream temperatures are adequate to support warmwater biota.

- In general, TSS, TP, and nitrate concentrations were similar but consistently higher in the northern part of the watershed (S008-953) compared to the southern portion (S008-954); these two stations have similar size drainage areas which is why they were used for comparison (Figure 3).
- Data suggests that water leaving East Side Lake has generally low (below standards) TSS, TP, and nitrate concentrations (Figure 4). In general, concentrations upstream (S003-065) and downstream (S003-066) of East Side Lake were similar; nitrate concentrations leaving the lake were consistently lower (likely due to denitrification and/or plant uptake) whereas TSS and TP concentrations were more variable in terms of which site (upstream or downstream) had higher concentrations. A high flow event sampled in September 2019 illustrates the ability of East Side Lake to act as a sink for sediment and phosphorus; TSS and TP concentrations were dramatically lower downstream of the lake (likely due to sediment settling out in the lake).
- It should be noted that significant resources have been devoted to the Dobbins Creek Watershed, and numerous conservation practices have been installed and are planned.
- Overall, reducing nutrient and sediment loading, improving in-stream habitat, and addressing flow alteration related issues (e.g., poor habitat, fine substrate, nitrogen rich tile water, water storage, etc.) are critical to improve fish and macroinvertebrate health in the headwaters area of Dobbins Creek.

Table 2: Summary of stressors in the Dobbins Creek Watershed (• = stressor, ○ = inconclusive stressor, blank = not a stressor, NE = not evaluated).

Waterbody	AUID	Biological Stations	Biological Impairment	Class	Stressors							
					Temperature	Nitrate	Eutrophication	DO	TSS	Habitat	Fish Passage	Flow Alteration
Dobbins Creek	524	14CD002, 14CD003, 14CD004	Fish, Macroinvertebrates	2Bg		●	○	○	●	●	●	●
Dobbins Creek	535	09CD064, 14CD005	None	2Bg	NE	NE	NE	NE	NE	NE	NE	NE
Unnamed Creek	563	09CD026	None	2Bg	NE	NE	NE	NE	NE	NE	NE	NE

For more information

For more information, go to https://www.pca.state.mn.us/watershed-information/cedar-river.

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