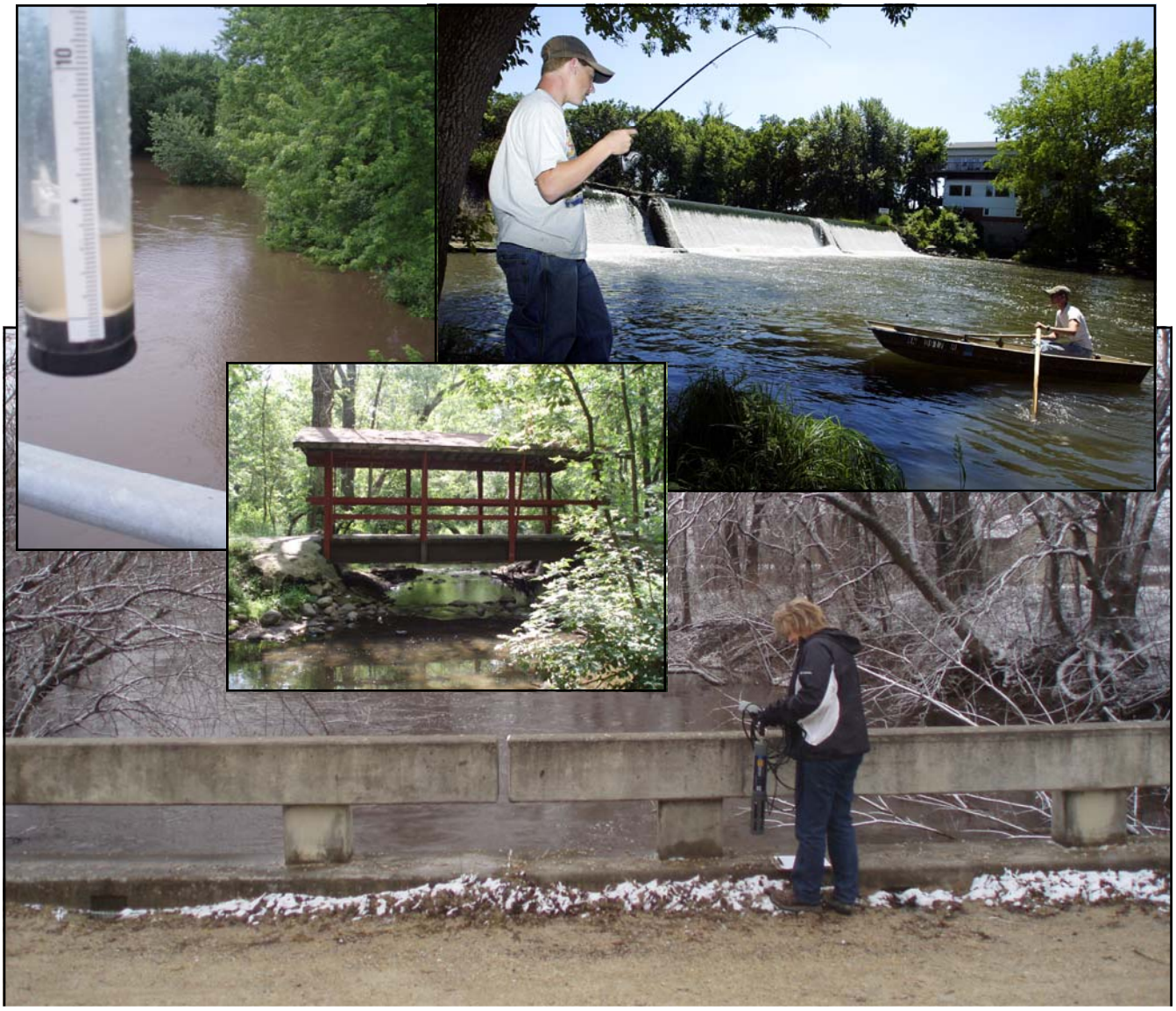
Cedar River Watershed

2011

Surface Water Monitoring Report



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1. Executive Summary

The Cedar River Watershed District monitoring program provides data to:

- Assess water quality trends
- Assist in the TMDL process
- Set watershed goals
- Collect baseline stream data
- Track the progress towards goals

In 2011 the Cedar River Watershed District funded the sampling on 10 sites in the watershed. The following sites were covered and sampled by the Mower SWCD:

- Blooming Prairie Tributary at Mower Co. 1
- Cedar River at 335th St
- Cedar River at Mower Co. 2
- Cedar River at Mower Co. 28
- Dobbins Creek at Mower Co. 61
- JD #5 at Mower Co. 25
- JD #5 at 255th St
- JD #5 at 262nd St
- Lansing Tributary at Mower Co. 2
- Rose Creek at Mower Co. 29

2011 Highlights:

- Rain events early in the monitoring season and an extremely dry in the mid to late monitoring season
- Total precipitation was 28.84 inches below the normal average precipitation for this area of 32.8 inches
- Total suspended solids concentrations ranged from <2 mg/L to 457 mg/L compared to the state guideline of 60 mg/L

2. Monitoring Program

The purpose of the Cedar River Watershed Districts monitoring program is to monitor the Cedar River and its tributaries. This is done through both staff and volunteer efforts. Staff monitors streams for stage, transparency, dissolved oxygen, conductivity, pH, turbidity, temperature, flow, suitability and color. Staff also sends samples to Minnesota Valley Testing Labs (MVTL) that are monitored for total suspended solids, nitrates, total phosphorus, ortho phosphorus and total kjeldahl nitrogen.

Data and findings are sent to Minnesota Pollution Control Agency (MPCA) and placed in the EQuIS program. This data as well as past monitoring efforts are available on the web at www.pca.state.mn.us/data/eda/search.cfm.

Stream water quality data is compared to the range of mean values observed in the Western Corn Belt Plains Ecoregion as a means to assess relative water quality data and provide a framework to set water quality goals.

3. Monitoring Parameters

Conductivity:

Conductivity sampling is used to measure the ability of electrical current to pass through water. Conductivity is affected by the presence of inorganic dissolved solids like chlorides, sulfates, and nitrates. The primary effect on conductivity is the material of which the water flows. Streams flowing through clay soils tend to have higher conductivity than those that flow through granite bed rock. That is because clay soils tend to have materials that ionize more readily than that of granite bedrock. The estimated levels for a good mixed fishery are between .150 and .500 mS/cm. Levels outside of this range may cause problems for some fish and macroinvertibrates.

Dissolved Oxygen:

Dissolved Oxygen (DO) is a basic requirement for a healthy aquatic environment. DO is basically the amount of oxygen that is available in the water column. Oxygen enters the water through the atmosphere and plants as a result of photosynthesis. Oxygen can be depleted from an aquatic system by plants, animals, and microorganisms. Low levels of dissolved oxygen can be caused by the decomposition of plant material and lack of water flow. Rapids and ripples increase the amount of surface to air contact and increase the levels of DO. Most fish and aquatic insects require some level of DO to survive in aquatic ecosystems. The general range for fish is from 7-11 mg/L with levels below 2 mg/L causing fish to suffocate. Dissolve oxygen levels below 5 mg/L can have an effect on aquatic life.

Nitrogen:

Nitrogen is a basic plant nutrient. Nitrogen can exist in many forms in aquatic systems as; ammonia, dissolved gas, nitrite, nitrate, and organic nitrogen. Forms of nitrogen that are readily available for plant use like nitrates, nitrites, and ammonia have the greatest impact on water quality. Particulate and organic nitrogen have less of a short term effect on water quality. Sources of excess nitrogen may include wastewater treatment plants, fertilizers, improper handling of human waste, and poor septic systems. Inorganic nitrogen is typically found in storm runoff. The MPCA has a drinking water standard of 10mg/L for nitrate-nitrite. Iowa currently has a TMDL for the Cedar River and has set their goal at 9.5 mg/L. Total Kjehldahl Nitrogen (TKN) is the sum of all organic nitrogen. A standard for all stream based nitrogen was due out from MPCA in 2011.

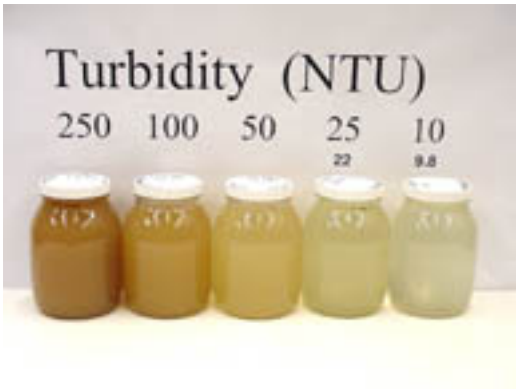
pH:

The acidic or basic nature of water is generally quantified by the negative logarithm of the hydrogen ion concentration. A pH value of 7 is considered neutral condition, a pH value of less than 7 is considered acidic and a pH value of greater than 7 is considered basic. The farther the value is from 7 the stronger the acid or base. PH levels in streams with a lot of aquatic plant growth may increase as photosynthesis occurs during the day and decrease during the night. Extreme pH levels can cause insoluble toxic metals become soluble, thus increasing levels of toxicity. The normal range for this eco-region is between 8.0 and 8.2.

Phosphorous:

Phosphorous is a requirement of aquatic plants. Phosphorous is available in dissolved or particulate form and in organic and inorganic form. Organic particulate phosphorous can come from living or dead plankton and from detritus. Inorganic phosphorous is the form that is plants require. Different plant species require different ratios of nitrogen to phosphorous. In most cases phosphorous is the limiting factor in plant growth in aquatic systems. Sources of excess phosphorous may include: wastewater treatment plants, fertilizers, improper handling of livestock waste, and poor septic systems. The MPCA guideline for total phosphorous is .2 mg/L. The normal range for this eco-region is between .16 and .33 mg/L.

Turbidity:



Examples of what various levels of turbidity look like.

Turbidity is a measure of water clarity. Suspended materials in water generally reduce the amount of light that can pass through it. When water has a high turbidity level the temperature rises because the suspended materials absorb more heat. The cloudier water also prevents light from getting to plants and reduces photosynthesis which lowers dissolved oxygen levels. When suspended sediments settle out they can inhibit mussels, larvae and egg development. Some sources of turbidity are algal growth, eroding stream banks, soil erosion and waste discharge. The MPCA standard for turbidity is 25 NTU, anything above that shows signs of impairment.

Total Suspended Solids:

Total suspended solids (TSS) are organic or inorganic materials that are suspended in the water column. TSS is closely related to turbidity and transparency. The suspended material absorbs heat and increases the water temperature. Some sources of TSS are runoff, waste water, algae, eroding stream banks, and bottom feeding fish (carp). The MPCA has set a standard of 60 mg/L and anything above that shows signs of impairment.

Transparency Tube:

Brian Mixon taking a Transparency Tube reading
Photo by Thomas Oots

Transparency Tube (T-tube) is closely related to both TSS and turbidity. Sampling is done by looking through a water sample in a clear plastic tube and recording when the bottom becomes visible. It is generally used as a simple and economical way to sample water clarity. This is the monitoring that is done by citizen stream monitors throughout the state. A relationship can be developed within a watershed between T-tube readings and both TSS and Turbidity. The MPCA standard for T-tube is 20 cm anything below that is considered impaired. To be listed as impaired there must be 10 percent of the samples and at least 3 total samples must be below the 20 cm standard.

4. Monitoring Results

Clean Water Legacy Sampling Set

Blooming Prairie Tributary:

Overview

Blooming Prairie Tributary is sampled at the crossing of Mower County Road 1 about .5 miles before it enters the Cedar River. There is a 5700 acre watershed above the sampling site. The headwaters are in Blooming Prairie and then the stream runs mostly through agricultural areas. This tributary has reaches where the stream is well buffered and reaches where it is farmed up to the bank. The watershed has the highest percentage of developed lands compared to the other monitoring sites.

Blooming Prairie Tributary Watershed Land Use

Types	Percent
Barren	0.01%
Row Crops	72.14%
Forested	1.72%
Developed	14.74%
Grassland/Pasture/Hay	11.04%
Wetland	0.30%
Open Water	0.04%

Installing the staff gage on the culvert at Blooming Prairie Tributary where is crosses Mower County Road 2

Monitoring Results

Conductivity

High: .80 mS/cm **Low: .36 mS/cm** **Ave: .63 mS/cm**

Blooming Prairie Tributary had the highest average of conductivity. The average has been

higher than the other sampled streams since 2008. The average is well above the range for a good mixed fishery (.150-500 mS/cm). This may cause problems for some fish and macroinvertibrates. The average from this year is similar to results from previous years.

Dissolved Oxygen

High: 13.86 mg/L **Low: 7.99 mg/L** **Ave: 10.57 mg/L**

The high occurred at the end of the year. The average DO measurement was the highest of the sample set. The average has been steadily increasing since 2008.

Nitrogen

Nitrate- Nitrite	**High: 10.4 mg/L**	**Low: 2.98 mg/L**	**Ave: 6.66 mg/L**
TKN	**High: 2.3 mg/L**	**Low: .2 mg/L**	**Ave: 1.09 mg/L**

Nitrate-Nitrite levels did exceed the federal nitrogen standard of 10 mg/L for drinking water in just 1 of the 16 samples. The average was the lowest of the 2011 sample set. The average was the highest average collected at this site since 2008.

TKN levels averaged on the lower end of the sampling set. The average falls within the range of data collected at this site since 2008.

pH

High: 8.63 **Low: 7.64** **Ave: 8.18**

The average sample was within the eco-region normal range (8-8.2). The average was on highest for this sampling season. The average has slowly declined in the last 3 years (8.32, 8.21, and 8.17).

Phosphorus

Total High: .53 mg/L	**Low: .08 mg/L**	**Ave: .29 mg/L**
Ortho High: .47 mg/L	**Low: .04 mg/L**	**Ave: .19 mg/L**

Total phosphorous averages were above the MPCA state standard (.2 mg/L). Ten of the 16 samples tested at this site exceeded the MPCA standard for total phosphorous. Seven of the 16 samples exceeded the eco-region normal (.16-.33 mg/L). Total phosphorous was had the highest average, high, and low levels except for Cedar River at Mower Co. 28. Both of these sites have a waste water treatment plant upstream from the sampling site. The phosphorous levels correlated well with the output of the waste water treatment plants. The site average is the lowest for this site since 2008.

Ortho Phosphorous also had the highest average, high, and low except for the Cedar River at Mower County 28. Ortho phosphorous levels reduced from 2010 average of .33 mg/L.

Total Suspended Solids

High: 29 mg/L **Low: 2 mg/L** **Ave: 8 mg/L**

None of the 16 samples exceeded the MPCA standard of 60 mg/L. The average samples were the lowest of the 2011. The low was the minimum that the lab could sample for. The average sample falls within the range of past sampling.

Transparency

High: 60 cm **Low: 3 cm** **Ave: 48.5 cm**

One of the 16 samples was below the MPCA standard (20 cm). There were 14 of the 16 samples that were at the highest we could sample at 60 cm. The average was the highest of this sampling set. Transparency average increased from 2010 (48.5 cm). This trend was seen in most of the monitoring sites.

Turbidity

High: 80.1 FNU **Low: 0 FNU** **Ave: 13.63 FNU**

Two of the 8 samples were at or above the MPCA standard (25 FNU). The average was the lowest of the sampling year.

Cedar River at 335th St:

Overview

This site is sampled on 335th St in Mower County, just southeast of Blooming Prairie. There is about a 57,000 acre watershed above the site. The watershed includes the towns of Blooming Prairie and Hayfield. The beaver dam that developed late in the sampling season in 2008 and reappeared early summer may have skewed some of the data in 2009. The dam was still having some effects in the 2011 season. Land use in this watershed is similar to the site on the Middle Fork of the Cedar River.

Cedar River at 335th Watershed Land Use	
Types	**Percent**
Barren	0.06%
Row Crops	78.12%
Forested	1.95%
Developed	10.49%
Grassland/Pasture/Hay	8.91%
Wetland	0.45%
Open Water	0.02%

Conductivity

High: .60 mS/cm **Low: .26 mS/cm** **Ave: .52 mS/cm**

The average ranked in the middle of our sampling set. The average was the highest at this site since 2008. The average is just above the range for a good mixed fishery (.150-500 mS/cm).

Dissolved Oxygen

High: 12.96 mg/L **Low: 4.64 mg/L** **Ave: 9.49 mg/L**

The average ranks in the middle of this sampling set. The average is the highest average at this site since we started monitoring in 2008. One of the 14 samples was below the 5mg/L that is the minimum to support healthy aquatic life. The low was on October 13 (4.64 mg/L).

Nitrogen

Nitrate- Nitrite High: 19.2 mg/L Low: 3.53 mg/L Ave: 10.69 mg/L

TKN High: 2.6 mg/L Low: .2 mg/L Ave: 1.4 mg/L

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 7 of the 14 samples at this site. The average was in the higher range for this year sample set. The average was an increased and is steadily rising from 2008 average (7.17 mg/L), 2009 average (7.79 mg/L), and 2010 (10.16 mg/L).

TKN levels averaged in the middle of sampling set. The average is with the average rage that has been seen in the last 4 years.

pH

High: 8.68 Low: 7.63 Ave: 8.17

The average pH was in the eco-region average of 8-8.2. The average, high and low were also in the upper range of this sampling set. This was very close to the 2008 average (8.2), the 2009 average (8.14) and 2010 average (8.17).

Phosphorus

Total High: .62 mg/L Low: .05 mg/L Ave: .14 mg/L

Ortho High: .21 mg/L Low: .01 mg/L Ave: .07 mg/L

Total phosphorous averages were below the MPCA state standard (.2mg/L). Three of the 14 samples tested at this site exceeded the MPCA standard for total phosphorous. The samples were within the averages that we have seen in past sampling efforts.

Ortho phosphorous levels were similar to 2010 (.6 mg/L) and have been declining compared to the previous averages 2008 (.12 mg/L) and 2009 (.09 mg/L).

Total Suspended Solids

High: 198 mg/L Low: 2 mg/L Ave: 25.3 mg/L

One of the 13 samples exceeded the MPCA standard (60mg/L) and eco-region normal levels. The low was the minimum that the lab could sample for. The average was higher than 2009 (14.8 mg/L) and less than the 2010 average (34.4 mg/L) and the 2008 average (64.3 mg/L).

Transparency

High: 60 cm **Low: 3.5 cm** **Ave: 47.39 cm**

One of the 14 samples was below the MPCA standard (20 cm). Seven of the 14 samples were 60 or clearer the highest reading we can sample. The sample average was above the average for this sampling year. The average for this year is similar to that collected in years past.

Turbidity

High: 608.3 FNU **Low: 0.1 FNU** **Ave: 91.9 FNU**

One of the 7 samples was above the estimated 25 FNU standard. The average is extremely skewed by the one high sample.

Cedar River at Mower County Road 2:

Overview

This site is sampled at Mower County Road 2, just East of Lansing. There is about a 102,000 acre watershed above this sampling site. The watershed includes the cities of Hayfield, Blooming Prairie, Waltham, and portions of Sargeant. This site also has a Minnesota DNR flood warning system.

MPCA survey crew with a bin full of fish collected on the Cedar River

Monitoring Results

Conductivity

High: .57 mS/cm **Low: .28 mS/cm** **Ave: .51 mS/cm**

The average was in the middle of this sampling set. The average is just above range for a good mixed fishery (.150-500 mS/cm). The average is in the range of previous averages in 2008 (.48 mS/cm), 2009 (.52 mS/cm), and 2010 (.44 mg/L).

Dissolved Oxygen

High: 12.86 mg/L **Low: 6.6 mg/L** **Ave: 9.14 mg/L**

All samples are above 5mg/L that is the minimum to support healthy aquatic life. None of the over 300 samples taken since 1967 were below 5 mg/L. The average from 1967 to 2007 was 10.75 mg/L. The average is between the averages in 2008 (8.64 mg/L), 2009 (9.79 mg/L) and 2010 (9.03 mg/L).

Nitrate-Nitrite

High: 15.1 mg/L **Low: 1.18 mg/L** **Ave: 8.63 mg/L**

Seven of the 13 samples were above the 10mg/L federal drinking water standard. The average is below the average of the sample set. From 1980 to 2010 samples have exceeded the MPCA standard in 31 of the 235 samples. The average over that same time frame was 6.15 mg/L.

pH

High: 8.46 **Low: 7.63** **Ave: 8.10**

The average was within the eco-region normal range (8-8.2). The average was in the middle of the sampling set. The average showed a slight decrease from averages in 2008 (8.24), 2009 (8.18), and 2010 (8.11). The average of over 300 samples from 1967 to 2009 was 7.97. The average was 7.83 from in 95 samples from 1967 to 1976.

Phosphorus

Total High: .61 mg/L **Low: .08 mg/L** **Ave: .15 mg/L**

Ortho High: .17 mg/L **Low: .02 mg/L** **Ave: .06 mg/L**

Total phosphorous averages were above the MPCA state standard (.2mg/L). One of the 13 samples were above the MPCA standard. The average was in the middle of the sampling set. The average was .207 mg/L on over 280 samples from 1967-2009.

The ortho phosphorous average was on the lower end of this sample set. The average is the lowest of the most recent sampling averages from 2008 (.08 mg/L), 2009 (.11 mg/L), and 2010 (.06 mg/L).

Suspended Solids

Total High: 140 mg/L **Low: 2.0 mg/L** **Ave: 24.5 mg/L**

One of the 13 total suspended solid samples exceeded the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). The average was in the middle of this sampling set. The average was 27.8 mg/L of 274 samples taken from 1967 to 2009. The 2011 average is higher the

average in 2008 (2.87 mg/L), and lower than the averages in 2009 (11.29 mg/L) and 2010 (61.9 mg/L).

Transparency

High: 60 cm **Low: 4.5 cm** **Ave: 41.5 cm**

Two of the 13 samples were below the 20 cm estimated standard. There were 60 samples taken from 1997 to 2009 with an average of 51.2 cm. Some of these samples used a 100 cm tube, for those we set the max at 60 cm which is the tube length that is currently being used. Six of the 13 samples from 2011 were 60 cm or clearer. The average was on the lower end of the sample set.

Turbidity

Field High: 153.9 FNU **Low: 0.0 FNU** **Ave: 31.8 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) once in 6 field samples. There was an increase compared to 2009 field average (6.95 FNU) and a decrease from 2010 (60.7 FNU).

Cedar River at Mower County Road 28:

Overview

This site is sampled at the Mower County Road 28 Bridge south of Austin. There is about a 256,000 acre watershed above the site. The watershed includes the cities of Blooming Prairie, Hayfield, Waltham, Lansing, Austin, and portions of Sargeant. This site has the USGS stream gauging station.

Cedar River At Co. 28 Watershed Land Use	
Barren	**0.03%**
Row Crops	**68.52%**
Forested	**2.72%**
Developed	**12.08%**
Grassland/Pasture/Hay	**14.37%**
Wetland	**1.32%**
Open Water	**0.96%**

Bryan Spindler with the MPCA stream monitoring crew with a large carp that was shocked on the Cedar River

Monitoring Results

Conductivity

High: .71 mS/cm **Low: .42 mS/cm** **Ave: .46 mS/cm**

The average is on the lower end for this year sampling and within the range for a good mixed fishery (.150-.500 mS/cm). There was sampling done in 2007, 2008, 2009, and 2010 with an average of .53 mS/cm.

Dissolved Oxygen

High: 12.89 mg/L Low: 5.06 mg/L Ave: 9.18 mg/L

All samples are above 5mg/L that is the minimum to support healthy aquatic life. This was on the lower end for average of this sample set. There were 36 samples taken from 1952 to 1973 with an average of 7.13 mg/L. Seventy samples were also taken from 2007 to 2008 with an average of 9.4 mg/L.

Nitrate-Nitrite

High: 12.6 mg/L Low: 5.94 mg/L Ave: 9.04 mg/L

Five of the 13 samples were above the 10 mg/L Federal drinking water standard. The average for this site was below the average of sample set. The average shows an increase from the average in 2009 (8.1 mg/L) and 2010 (8.7 mg/L). There were 85 samples collected from 2007 to 2009 with an average of 8.2 mg/L.

pH

High: 8.59 Low: 7.58 Ave: 7.99

The average was just below the eco-region normal range (8-8.2). The average was on the upper end of the sampling set. The average of over 34 samples from 1953 to 1973 was 7.86. The average was 7.86 from 74 samples from 2007 to 2008. The average decreased from the averages in 2008 (8.32), 2009 (8.18) and 2010 (8.16).

Phosphorus

Total High: 1.05 mg/L Low: .16 mg/L Ave: .48 mg/L

Ortho High: .47 mg/L Low: .09 mg/L Ave: .22 mg/L

Total phosphorous averages were above the MPCA state standard (.2mg/L). Eleven of the thirteen samples were above the MPCA standard. The average was the highest of the sampling set as it was in 2009 and 2010. There were 71 samples taken from 2007 to 2008 with an average of .303 mg/L. This site is below a waste water treatment plan and there appears to be a correlation with that and it is amplified with low water conditions.

The ortho phosphate average was the highest of the 2009, 2010, and 2011 sample sets. There were 69 samples taken from 2007 and 2008 with an average of .220 mg/L.

Suspended Solids

Total High: 234 mg/L Low: 4 mg/L Ave: 38.9 mg/L

Two of the 13 total suspended solid samples exceeded the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). The average was high for this sample set. The average was 28.6 mg/L of 271 samples taken from 1967 to 2008. The average is increased from the averages of 2009 (22.7 mg/L) and 2010 (33.7 mg/L).

Transparency

High: 60 cm **Low: 3.5 cm** **Ave: 37.3 cm**

Five of the 13 of the samples were 60 cm or clearer. Two of the 13 samples were below the 20 cm estimated MPCA standard. There were 59 samples taken from 1997 to 2009 with an average of 49.3 cm. Some of these samples used a 100 cm tube, for those we set the max at 60 cm which is the tube length that is currently being used. Eight of those 59 samples were below the 20 cm estimated standard. This year's average is lower than the average in 2009 (49.9 cm) and 2010 (40.9 cm).

Turbidity

High: 992.5 FNU **Low: 0 FNU** **Ave: 208.3 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) in 3 of the 6 field samples. The average was one of the highest of the TMDL sampling set.

Dobbins Creek at Mower County Road 61:

Overview

Dobbins Creek is sampled at Mower County Road 61 about .5 miles before it enters East Side Lake and about 1.75 miles before the junction with the Cedar River in Austin. There is about a 22,500 acre watershed above the sampling site. The watershed includes the Jay C. Hormel Nature Center, Austin Country Club, and Nicholville. The land use in this watershed is similar to that of the sampling site of Judicial Ditch #5.

Dobbins Creek at Mower County Road 61 Watershed Land Use	
Types	**Percent**
Barren	**0.00%**
Row Crops	**71.77%**
Forested	**1.95%**
Developed	**10.73%**
Grassland/Pasture/Hay	**15.13%**
Wetland	**0.42%**
Open Water	**0.01%**

Monitoring Results

Conductivity

High: .49 mS/cm **Low: .20 mS/cm** **Ave: .42 mS/cm**

The average is within the range for a good mixed fishery (.150-500 mS/cm). This was the lowest of this sample set and it was also in 2010. This site was the second lowest of those sampled in 2008 and 2009. The average is similar to the averages in 2008(.385 mS/cm), 2009 (.42 mS/cm), and 2010 (.38 mS/cm).

Dissolved Oxygen

High: 13.1 mg/L **Low: 7.27 mg/L** **Ave: 9.7 mg/L**

All samples are above 5mg/L that is the minimum to support healthy aquatic life. The average was on the higher end of this sample set. The average is between the averages from 2008 (8.86 mg/L), 2009 (10.13 mg/L), and 2010 (9.2mg/L).

Nitrate-Nitrite

High: 11 mg/L **Low: 1.8 mg/L** **Ave: 6.84 mg/L**

Two of the 11 samples were above the 10 mg/L federal drinking water standard. The average was slightly below the average of this sample set. The average showed a slight increase over the 2009 average (6.07 mg/L).

pH

High: 8.48 **Low: 7.43** **Ave: 8.06**

The average was within the eco-region normal range (8-8.2). It is also the middle of this sampling set and similar to the averages in 2008 (8.14), 2009 (8.10), 2010 (8.10).

Phosphorus

Total High: .60 mg/L **Low: .02 mg/L** **Ave: .16 mg/L**

Ortho High: .40 mg/L **Low: .01 mg/L** **Ave: .11 mg/L**

Total phosphorous averages were below the MPCA state standard (.2mg/L). Three of the 11 samples were above the MPCA standard. The average was on the lower end of the sampling set and is an increase to the averages 2008 (.076 mg/L) and 2009 (.07 mg/L).

Ortho phosphorous average was above the average of this sample set. The average increased from the averages in 2008 (.045 mg/L) and 2009 (.04 mg/L).

Suspended Solids

Total High: 303 mg/L **Low: 2.0 mg/L** **Ave: 37.8 mg/L**

Two of the 13 total suspended solid samples exceeded the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). The average was in the upper end of this sampling set. The average was 15.8 mg/L of 48 samples taken from 2000 to 2009.

Transparency

High: 60 cm **Low: 3 cm** **Ave: 39.6 cm**

Four of the 14 samples fell below the 20 cm estimated standard. Seven of the 14 samples were 60 cm or clearer. The average was in the lower end of the sample set. The average showed a decrease from the limited late season 2008 average (58.7 cm), 2009 Average (53.6 cm), and 2010 (39.3). From 1987 to 2009 there were 92 samples taken with an average of 40.9 cm. Nineteen of those samples were below the 20 cm estimated standard.

Turbidity

Field High: 418.9 FNU **Low: 0.0 FNU** **Ave: 84.8 FNU**

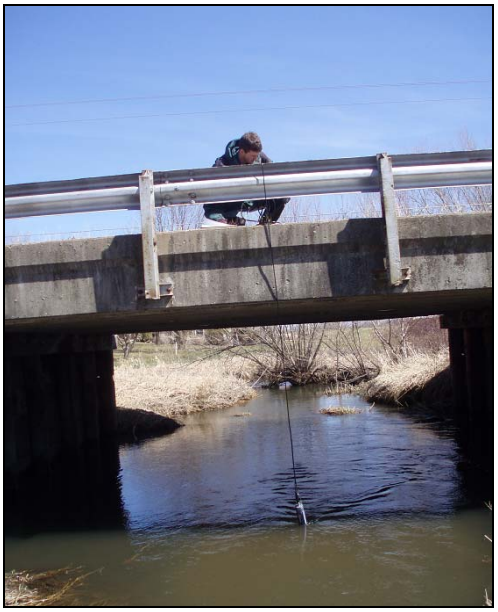
The samples at this site exceeded the estimated MPCA standard (25 NTU) two times in 6 samples. The average is above the average for this sample set.

County Ditch #5 at Co. 25:

Overview

County Ditch #5 is sampled at the Mower County Road 25 crossing about .75 miles before it enters the Cedar River and is an agricultural drainage ditch. There is about a 7640 acre watershed above the sampling site. There is not much of a buffer on the upper portions of the ditch. The land use is similar to that of the Rose Creek at 570th Ave.

Judicial Ditch #5 Watershed Land Use	
Types	**Percent**
Barren	**0.01%**
Row Crops	**74.29%**
Forested	**2.34%**
Developed	**9.11%**
Grassland/Pasture/Hay	**13.82%**
Wetland	**0.40%**
Open Water	**0.02%**



Monitoring on County Ditch #5 at the Mower County 25 Bridge

Monitoring Results

Conductivity

High: .58 mS/cm **Low: .27 mS/cm** **Ave: .49 mS/cm**

The average is within the range of a good mixed fishery (.150-500 mS/cm). The average is similar to the 2008, 2009, 2010 sample averages (.49 mS/cm, .55mS/cm, and .47 mS/cm).

Dissolved Oxygen

High: 12.5 mg/L **Low: 5.1 mg/L** **Ave: 9.7 mg/L**

All samples are above 5 mg/L that is the minimum to support healthy aquatic life. The average was slightly above the average of the sample set. The average is within range of the 2008 average (10.38 mg/L), 2009 average (9.7 mg/L) and 2010 average (9.2 mg/L).

Nitrogen

Nitrate- Nitrite	**High: 12.8 mg/L**	**Low: 5.8 mg/L**	**Ave: 9.2 mg/L**
TKN	**High: 2.0 mg/L**	**Low: .5 mg/L**	**Ave: 1.2 mg/L**

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 6 of the 14 samples at this site. The average was highest for both the 2009 and 2008 sample set and near the high of 2010.

TKN averages are slightly below the average for the sample set. The average was between 2008 average (1.5 mg/L) and the 2009 (1.1 mg/L) and the same as the 2010 average.

pH

High: 8.41 **Low: 7.38** **Ave: 7.99**

The average is just below the eco-region normal range (8-8.2). The average falls below the average of the sampling set. The average is should an abnormal decrease from the 3 previous years samples that averaged a pH of 8.13. The pH average overall for the whole sample set did show a decrease, the decrease at this site was one of the largest.

Phosphorus

Total High: .52 mg/L	**Low: .03 mg/L**	**Ave: .14 mg/L**
Ortho High: .21 mg/L	**Low: .03 mg/L**	**Ave: .09 mg/L**

Total phosphorous averages were below the MPCA state standard (.2mg/L). Two of the 14 samples were higher than the MPCA standard. The average was higher than both the 2008 average (.09 mg/L) and 2009 average (.1 mg/L) and lower than the 2010 average (.16 mg/L). It was near the average for the sample set.

Ortho phosphorous levels were in the middle compared to the rest of the sampling set. The average has remained steady from previous years samples in 2008 (.085 mg/L), 2009 (.09 mg/L), and 2010(.08 mg/L).

Total Suspended Solids

High: 104 mg/L **Low: 2 mg/L** **Ave: 19.67 mg/L**

One of the 13 samples exceeded the 60 mg/L MPCA standard. The average is on the lower end of the sample set and has been consistently lower than all the average samples taken in the last 4 years.

Transparency

High: 60 cm **Low: 5 cm** **Ave: 53 cm**

One of the 14 samples were at or below the 20 cm estimated standard. Eleven of the 14 samples were 60 cm. The average reading was the highest in 4 years of sampling averages from 2008 (49.1 cm), 2009 (52.6 cm) and 2010 (44.1 cm).

Turbidity

High: 137.2 FNU **Low: 0.0 FNU** **Ave: 24.84 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) once times in 6 samples. This year is a smaller sample set but does remain on the lower end of previous years sample averages from 2008 (27.1 FNU), 2009 (7.6 FNU), 2010 (43.1 FNU).

County Ditch #5 at 255th St:

Overview

County Ditch #5 at 255th St is sampled at the Mower County Road 255th St crossing about 1.5 miles before it enters the Cedar River. There is about a 6600 acre watershed above the sampling site and is an agricultural drainage ditch. There is not much of a buffer on the upper portions of the ditch.

Conductivity

High: .58 mS/cm **Low: .28 mS/cm** **Ave: .49 mS/cm**

The average is within the range of a good mixed fishery (.150-500 mS/cm). As expected the average is similar to what was seen on the other JD #5 sites.

Dissolved Oxygen

High: 13.68 mg/L **Low: 4.11 mg/L** **Ave: 9.59 mg/L**

One of the 13 samples was below the 5 mg/L that is the minimum to support healthy aquatic life. The average was about the average of the sample set.

Nitrogen

Nitrate- Nitrite High: 13.1 mg/L Low: 6.15 mg/L Ave: 9.49 mg/L

TKN High: 2.4 mg/L Low: .5 mg/L Ave: 1.22 mg/L

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 6 of the 14 samples at this site. As expected the average was between the other 2 other JD #5 sites.

TKN averages are slightly below the average for the sample set. The average was the highest of the three JD #5 sites.

pH

High: 8.29 Low: 7.34 Ave: 7.92

The average is just below the eco-region normal range (8-8.2). The average falls below the average of the sampling set. The average falls in the middle of the three JD #5 sites.

Phosphorus

Total High: .71 mg/L Low: .05 mg/L Ave: .19 mg/L

Ortho High: .29 mg/L Low: .01 mg/L Ave: .08 mg/L

Total phosphorous averages were below the MPCA state standard (.2mg/L). Three of the 14 samples were higher than the MPCA standard. The average was the highest of the 3 JD #5 sites. It was near the average for the sample set.

Ortho phosphorous levels were in the middle compared to the rest of the sampling set. The ortho phosphorus average was in the middle of the JD #5 sites.

Total Suspended Solids

High: 108 mg/L Low: 2 mg/L Ave: 15.1 mg/L

One of the 14 samples exceeded the 60 mg/L MPCA standard. The average is on the lower end of the sample set and in the middle of the three JD #5 sites.

Transparency

High: 60cm Low: 4 cm Ave: 52.9 cm

One of the 14 samples was at or below the 20 cm estimated standard. Eleven of the 14 samples were 60 cm. The average sample was above the average for this sample set. The average was in the middle of the three JD# 5 sites.

Turbidity

High: 342.3 FNU Low: 0.0 FNU Ave: 74.0 FNU

The samples at this site exceeded the estimated MPCA standard (25 NTU) twice in 6 samples. The average was higher than most but it is hard to be to critical with just six samples

County Ditch #5 at 262nd St:

Overview

County Ditch #5 at 262nd St is sampled at the Mower County Road 262nd St crossing about 3.4 miles before it enters the Cedar River. There is about a 4920 acre watershed above the sampling site and is an agricultural drainage ditch. There is not much of a buffer on the upper portions of the ditch.

Conductivity

High: .57 mS/cm Low: .30 mS/cm Ave: .49 mS/cm

The average is within the range of a good mixed fishery (.150-500 mS/cm). As expected the average is similar to what was seen on the other JD #5 sites.

Dissolved Oxygen

High: 13.75 mg/L Low: 6.07 mg/L Ave: 9.78 mg/L

None of the 13 samples was below the 5 mg/L that is the minimum to support healthy aquatic life. The average was a little higher than average of the sample set.

Nitrogen

Nitrate- Nitrite High: 14.5 mg/L Low: 7.46 mg/L Ave: 11.45 mg/L

TKN High: 2.0 mg/L Low: .4 mg/L Ave: 1.05 mg/L

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 10 of the 14 samples at this site. The average was the highest of the 3 JD #5 sites. This was the highest sample set and was over 2 mg/L above the average for the sample set.

TKN averages were the lowest of the JD #5 samples and the entire sample set.

pH

High: 8.22 Low: 7.31 Ave: 7.90

The average is just below the eco-region normal range (8-8.2). The average falls below the average of the sampling set. The average is the lowest of the three JD #5 sites.

Phosphorus

Total High: .43 mg/L Low: .04 mg/L Ave: .10 mg/L

Ortho High: .18 mg/L Low: .02 mg/L Ave: .06 mg/L

Total phosphorous averages were below the MPCA state standard (.2mg/L). Two of the 14 samples were higher than the MPCA standard. The average was the highest of the three JD #5 sites. It was near the average for the sample set.

Ortho phosphorous levels were low compared to the rest of the sampling set. The ortho phosphorus average was the lowest of the JD #5 sites.

Total Suspended Solids

High: 88 mg/L Low: 2 mg/L Ave: 14.3 mg/L

One of the 14 samples exceeded the 60 mg/L MPCA standard. The average is on the lower end of the sample set and the lowest of the three JD #5 sites.

Transparency

High: 60cm Low: 6 cm Ave: 53.6 cm

One of the 13 samples was at or below the 20 cm estimated standard. Eleven of the 13 samples were 60 cm. The average sample was one of the highest of this sample set. The average was the highest of the three JD# 5 sites.

Turbidity

High: 111.3 FNU Low: 0.0 FNU Ave: 18.3 FNU

The samples at this site exceeded the estimated MPCA standard (25 NTU) once in 6 samples. The average was on the lower end of the sample set and the lowest of the three JD #5 sites.

Lansing Tributary:

Overview

Lansing Tributary is sampled at the crossing at Mower County Road 2 about .5 miles before its junction with the Cedar River. Above the sampling site there is about 3250 acres of watershed. This tributary runs mainly through farmed fields and runs through the city of Lansing. The watershed has the lowest percentage of barren, wetland, and open water compared to the other monitoring sites.

Lansing Tributary Watershed Land Use	
Types	**Percent**
Barren	**0.00%**
Row Crops	**74.29%**
Forested	**1.02%**
Developed	**10.38%**
Grassland/Pasture/Hay	**14.21%**
Wetland	**0.10%**
Open Water	**0.00%**

Monitoring Results

Conductivity

High: .58 mS/cm **Low: .28 mS/cm** **Ave: .51 mS/cm**

The average was slightly above the range for a good mixed fishery (.150-500 mS/cm). The average was the same as the 2010 average and split the averages from the 2008 (.50 mS/cm) and 2009 (.55 mS/cm). The average was slightly above average for the sample set.

Dissolved Oxygen

High: 12.6 mg/L **Low: 7.09 mg/L** **Ave: 9.33 mg/L**

All samples are above 5 mg/L minimum to support healthy aquatic life. The average sample was slightly below average compared to this sampling set. The average is the highest of the 4 years of sampling (2008, (9.3 mg/L) 2009, (8.9 mg/L) and 2010 (8.25 mg/L)).

Nitrogen

Nitrate- Nitrite High: 13.7 mg/L Low: 6.46 mg/L Ave: 9.67 mg/L

TKN High: 2.1 mg/L Low: .4 mg/L Ave: 1.05 mg/L

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 7 of the 14 samples at this site. The average was on the high side for the 2011 sample set. The average was above the 2008 (8.3 mg/L) and 2009 (8.4 mg/L) averages, and slightly below the 2010 average(9.75 mg/L).

TKN levels were in the lowest end of the sampling set. TKN levels decreased from 2008 (1.34 mg/L) and are similar to the 2009 and 2010 averages both 1.05 mg/L.

pH

High: 8.46 **Low: 7.65** **Ave: 8.05**

The average is with in the eco-region normal range (8-8.2) and falls in the middle of the sampling set. This year's average was slightly lower than the 2008 average (8.11), the 2009 average (8.08) and the 2010 (8.06).

Phosphorus

Total High: .47 mg/L **Low: .03 mg/L** **Ave: .11 mg/L**

Ortho High: .17 mg/L **Low: .01 mg/L** **Ave: .06 mg/L**

Total phosphorous averages were below the MPCA state standard (.2mg/L). Two of the 14 samples were above the MPCA standard and one exceeded the eco-region normal (.16-.33 mg/L). The average was between the 2008 and 2009 averages both .09 mg/L and the 2010 average .17 mg/L.

Ortho Phosphorous levels were in the middle of the sampling set. Ortho phosphorous averages are lower than or equal to sampling from 2008 (.06 mg/L), 2009 (.8 mg/L), and 2010 (.07 mg/L) averages.

Total Suspended Solids

High: 100 mg/L **Low: 2 mg/L** **Ave: 11.4 mg/L**

One of the samples exceeded the 60 mg/L MPCA standard. The average was one of the lowest of the sample set. The results are the highest of the data collected in 2001 (8.99 mg/L), 2008 (9.2 mg/L), 2009 (5.5 mg/L) and 2010 (9.6 mg/L).

Transparency

High: 60 cm **Low: 4.5 cm** **Ave: 54.6 cm**

One of the 15 samples fell below the 20 cm estimated standard. Thirteen of 15 samples were 60 cm or clearer. This was the clearest of all the sample set. This average is on the high end of the samples from 2008 (51.9 cm), 2009 (55.5 cm), and 2010 (50.3 cm).

Turbidity

High: 145.1 FNU **Low: 0.0 FNU** **Ave: 23.9 FNU**

In one of the 6 samples the estimated MPCA standard (25 NTU) was exceeded. The average was on the lower end of this year's sample set. The average was the highest of the site samples with averages from 2008 (21.6 FNU), 2009 (2.5 FNU), and 2010(9.2 FNU).

Rose Creek at Mower County Road 29:

Overview

This site is sampled at Mower County Road 29 about .5 miles before the junction with the Cedar River. There is about a 42,200 acre watershed above the sampling site. The watershed includes contains the town of Rose Creek and Elkton and a portion of the City of Dexter.

Rose Creek at Mower County Road 29 Watershed Land Use	
Types	**Percent**
Barren	**0.02%**
Row Crops	**72.70%**
Forested	**2.97%**
Developed	**10.52%**
Grassland/Pasture/Hay	**13.03%**
Wetland	**0.70%**
Open Water	**0.07%**

Monitoring Results

Conductivity

High: .53 mS/cm **Low: .15 mS/cm** **Ave: .43 mS/cm**

The average is in the lower end of this sampling set. The average is within the range for a good mixed fishery (.150-500 mS/cm). The average has been very steady compared to the 2008 average (.42 mS/cm) and the 2009 and 2010 average (.44 mS/cm).

Dissolved Oxygen

High: 12.92 mg/L Low: 6.92 mg/L Ave: 9.86 mg/L

All samples are above 5 mg/L that is the minimum to support healthy aquatic life. The average sample is on the higher end of this sampling set. The average is inline with the 2008 average (10.06 mg/L), 2009 average (9.8 mg/L), and 2010 (9.7 mg/L). In 1973 there was one DO sample taken with 10.5 mg/L.

Nitrogen

Nitrate- Nitrite High: 16.40 mg/L Low: .87 mg/L Ave: 7.84 mg/L

TKN High: 7.4 mg/L Low: .2 mg/L Ave: 1.80 mg/L

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water at this site in seven of the 14 samples. The average for this site was on the lower end of the sample set. The average has increased over the 2008 (5.48 mg/L), 2009 (5.87 mg/L) and 2010 (6.93 mg/L) averages.

Average TKN levels were the highest for this sample set. The average is heavily weighted by the March 23 sample of 7.4 mg/L. The average was higher than the 2008 average (1.27 mg/L), 2009 average (1.03 mg/L) and 2010 average (1.22 mg/L). TKN was sampled in 1973 with a result of .77mg/L.

pH

High: 8.57 Low: 7.36 Ave: 8.01

The average was within the eco-region normal range (8-8.2). The average was on the lower end of the sampling set. This year is a change from the previous year's averages when averages were the highest of the 2008, 2009, 2010 sample sets. The average was well below the 2008 average (8.28), 2009 average (8.25) and 2010 average (8.28).

Phosphorus

Total High: .78 mg/L Low: .02 mg/L Ave: .18 mg/L

Ortho High: .20 mg/L Low: .01 mg/L Ave: .06 mg/L

Total phosphorous averages were below the MPCA state standard (.2mg/L). Six of the 14 samples were above the MPCA standard; this is an increase for prior years. The average has increased

from the 2008 (.113 mg/L), 2009 (.11 mg/L) and 2010 (.10 mg/L) averages. There was one sample taken in 1973 with a result of .09 mg/L.

Ortho Phosphorous levels were right on average compared to the rest of the sampling set. The average was the lowest of previous sampling from the 2008 average (.097 mg/L), 2009 average (.07 mg/L), and 2010 (.10 mg/L).

Total Suspended Solids

High: 610 mg/L Low: 2 mg/L Ave: 92.3 mg/L

Four of the 14 samples exceeded the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). The average was higher than the 2008 average (40.6 mg/L), 2009 average (24.2 mg/L), and 2010 (71.9 mg/L). The average of the samples in 2001 was 44.5 mg/L and in 2000 was 12.1 mg/L.

Transparency

High: 60 cm Low: 1.5 cm Ave: 34.3 cm

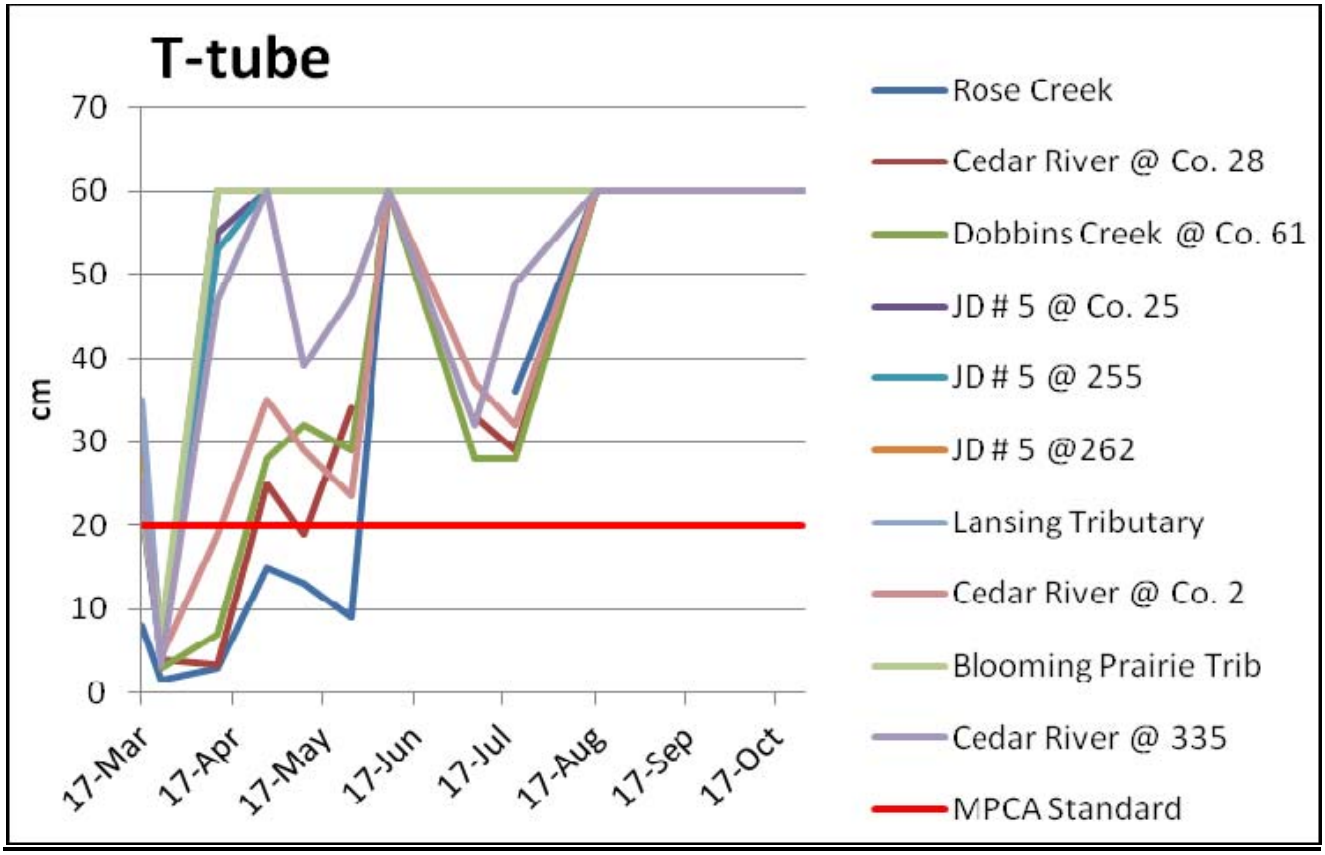
Six of 13 samples fell below the 20 cm estimated standard. Six of 13 samples were 60 cm or clearer. The average is the lowest of this sampling set. In 2000, 1 of 10 samples was below 20 cm, 2001, 5 of 21 were below 20 cm, 2008, 2 of 16 were below 20 cm, 2009, 2 of 18 were below 20 cm, and 2010, 2 of 11 were below 20 cm. The average in 2000 was 51.5 cm, 39.2 cm in 2001, in 2008 was 49.8 cm, in 2009 was 52.7 cm and in 2010 was 50.6. This year goes against the previous trend of high t-tube and higher end of the sample set.

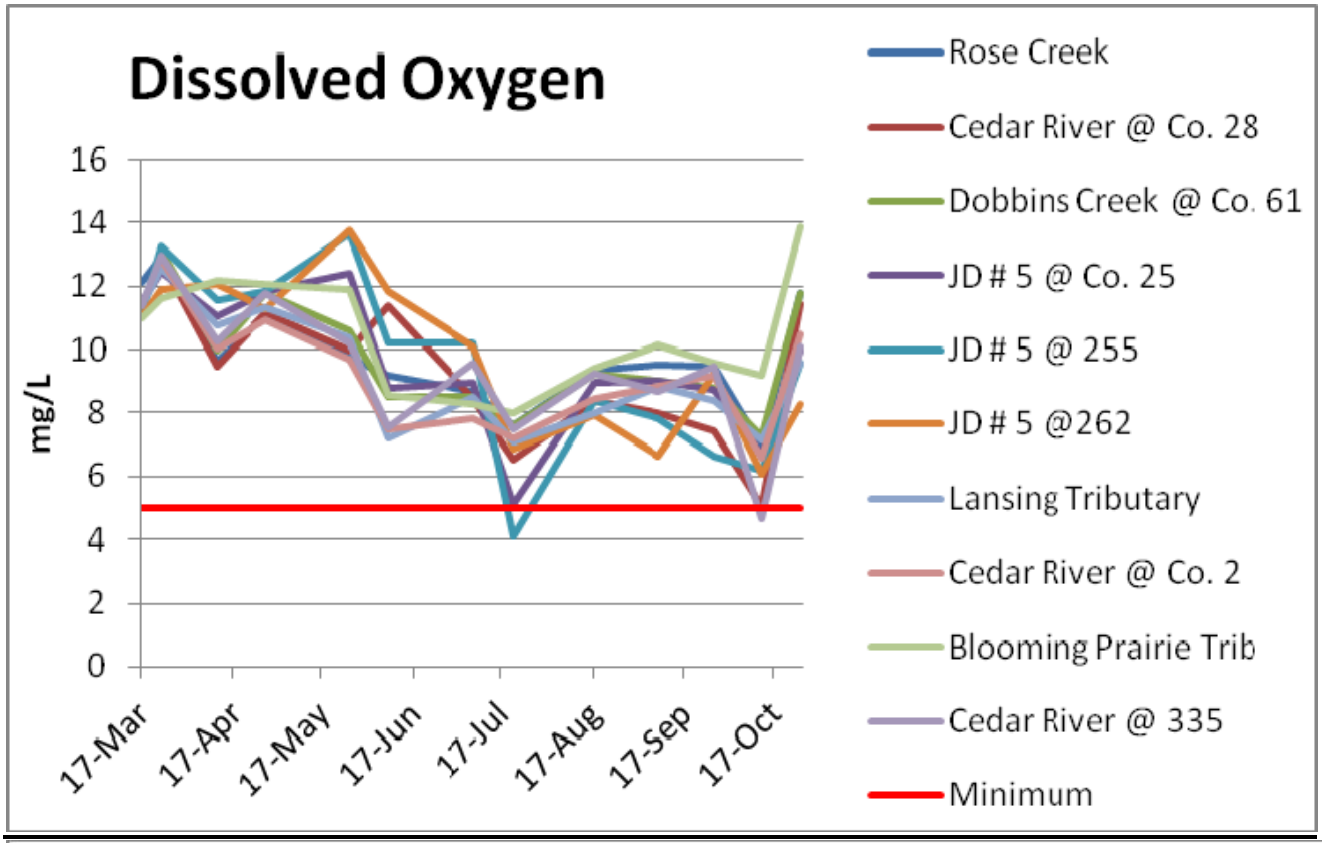
Turbidity

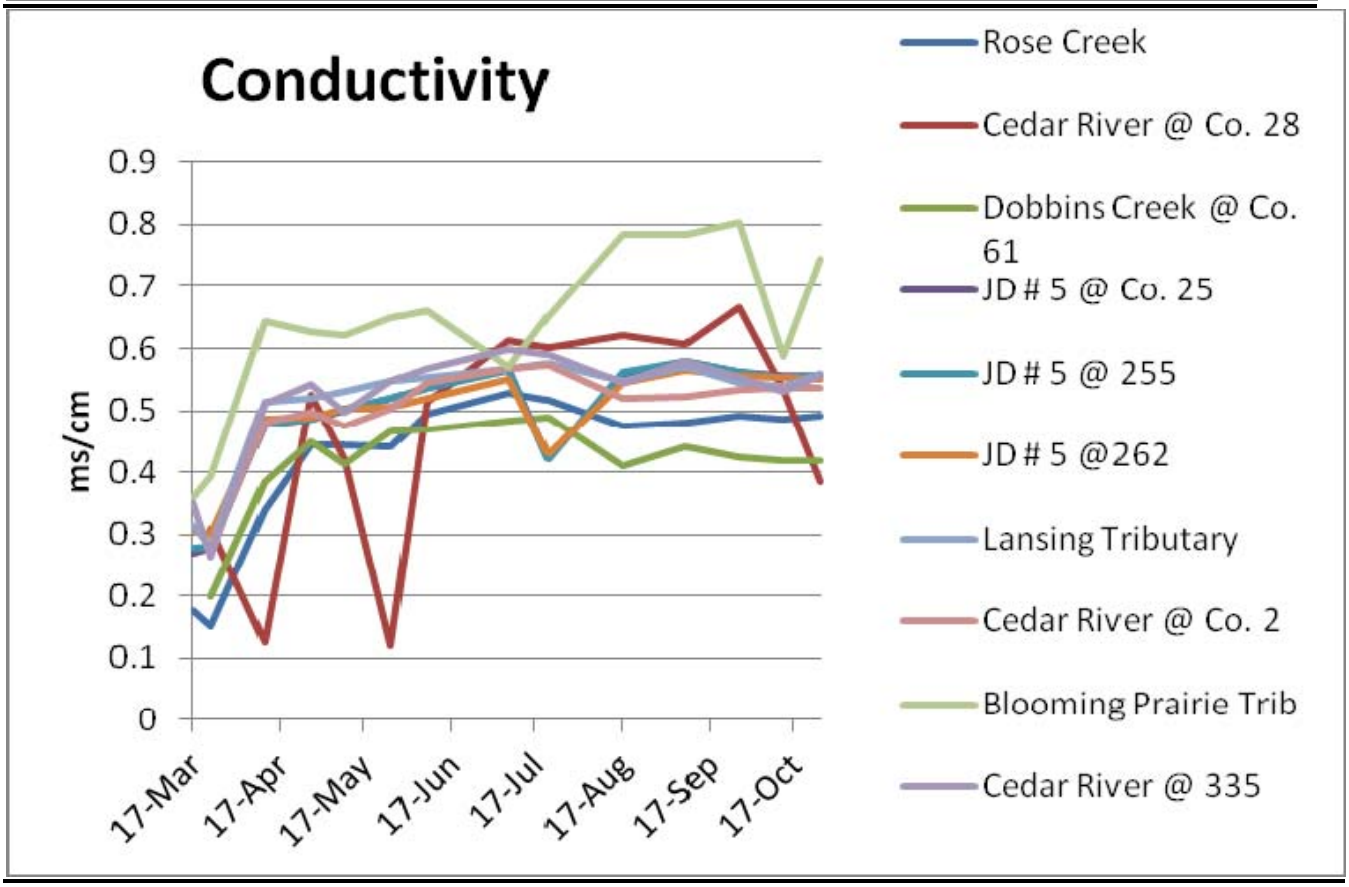
High: 850.2 FNU Low: 0.0 FNU Ave: 231.6 FNU

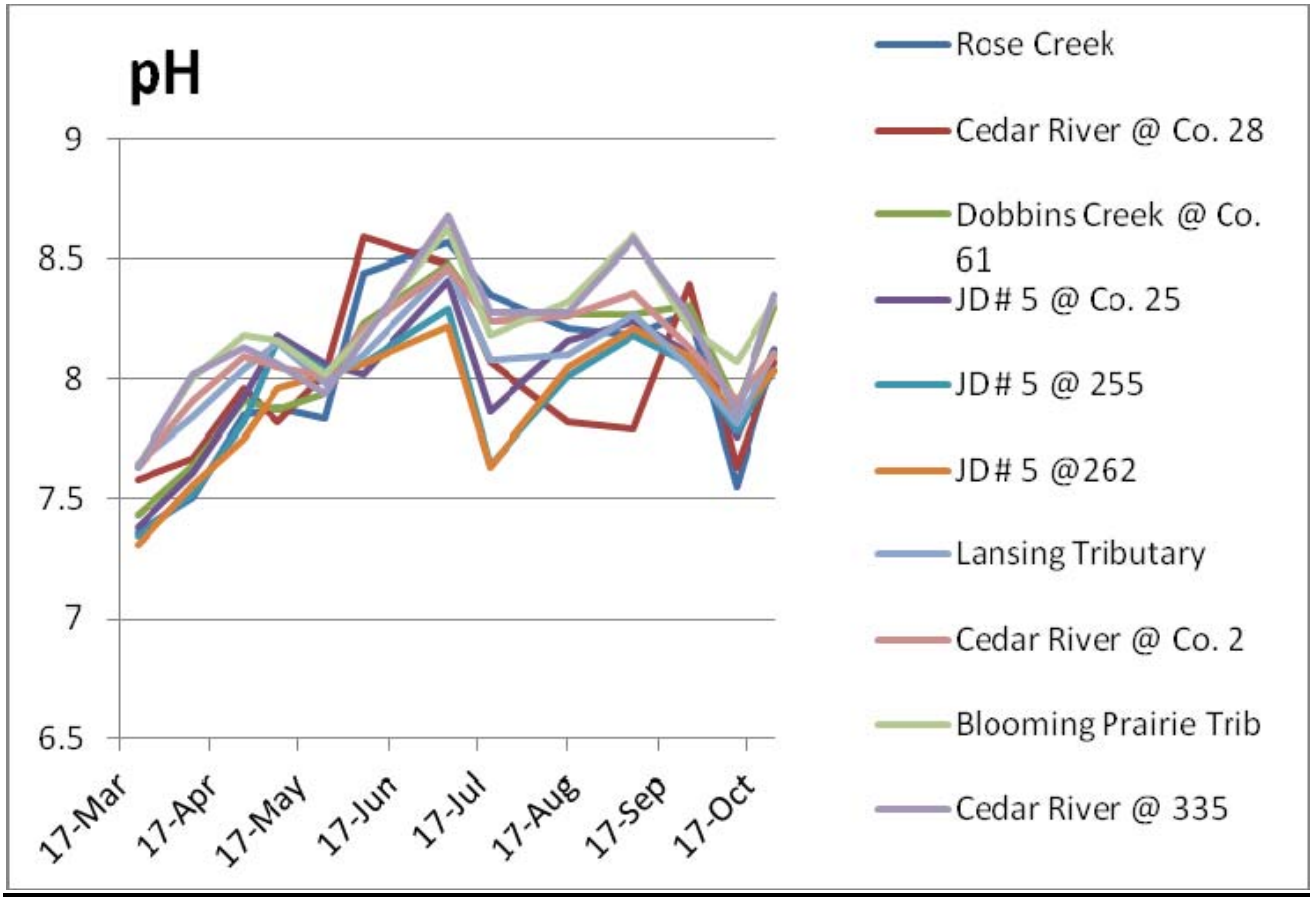
The samples at this site exceeded the estimated MPCA standard (25 NTU) four times in 7 samples. Four of the 7 samples were above the eco-region normal range (5.2-22NTU). The average is on the higher end of the sampling set. The stream has a tendency to show extreme highs and lows in turbidity. This was the highest average of the sample set, in the past this was more one of the lowest sample sites. The average is much higher than the 2008 (72.5 FNU), 2009 (17.5 FNU), and 2010 (44.3 FNU) averages. The average is similar to the average seen at the other Rose Creek site (53.6 FNU).

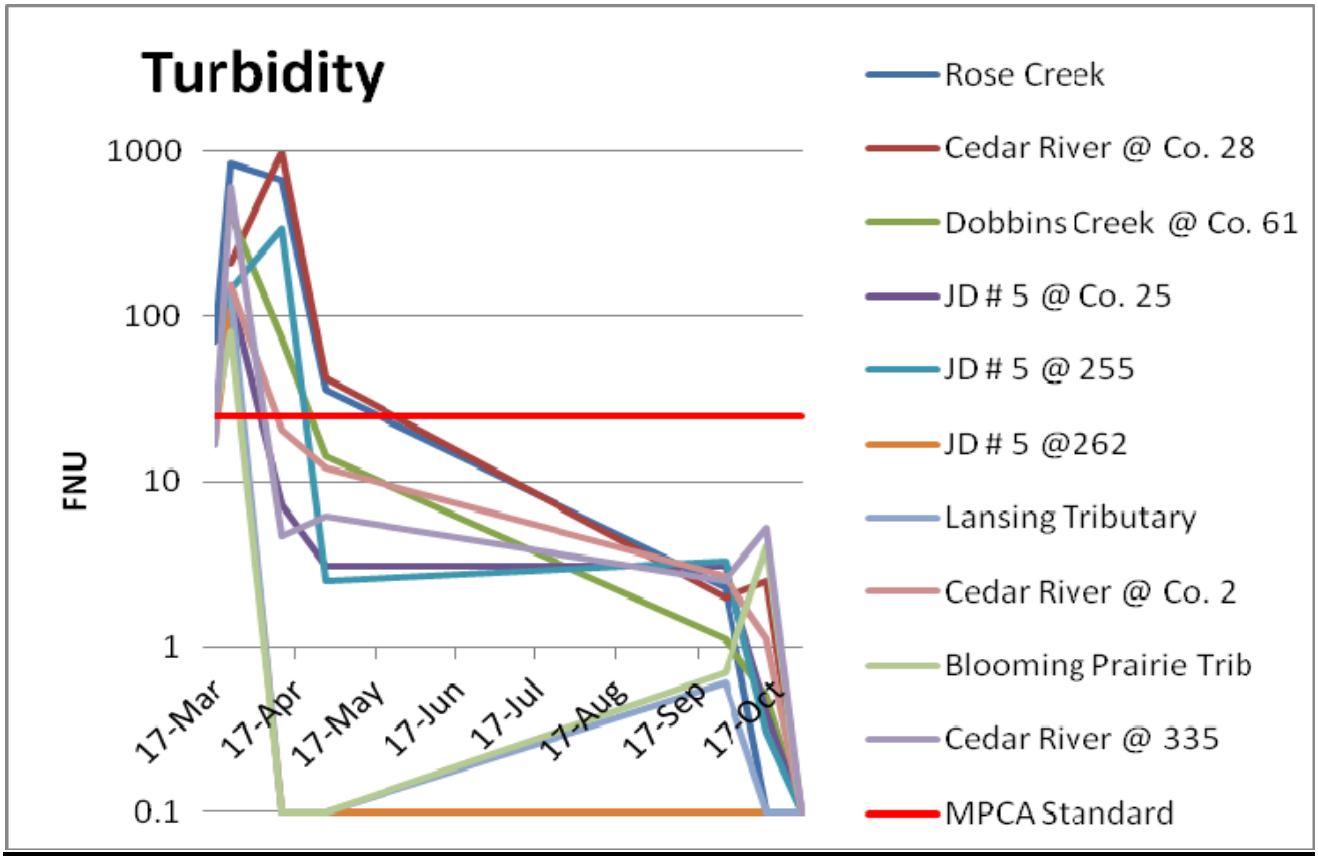
5. Charts

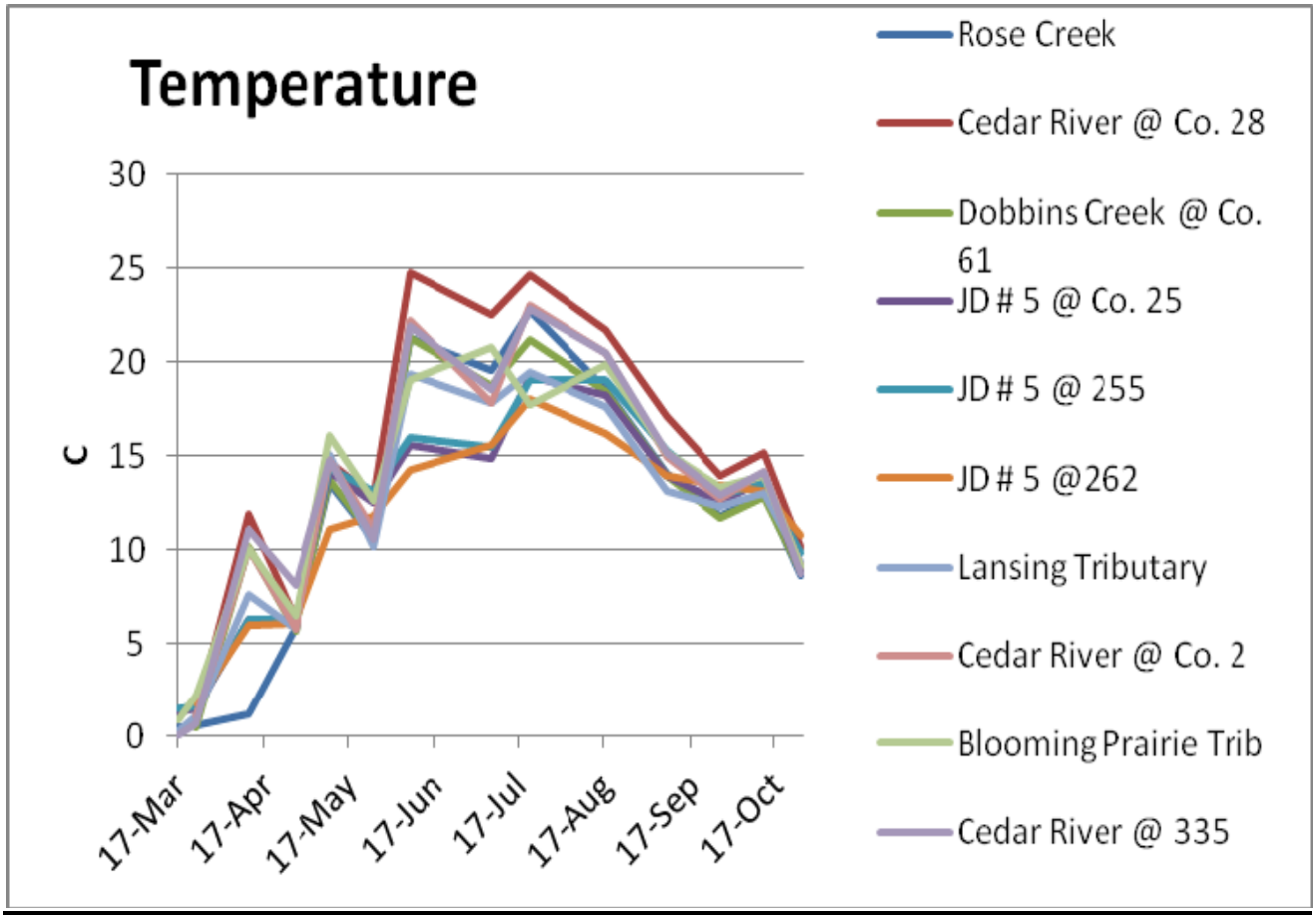

T-tube
70
60
50
40
30
20
10
0
cm
17-Mar
17-Apr
17-May
17-Jun
17-Jul
17-Aug
17-Sep
17-Oct
Rose Creek
Cedar River @ Co. 28
Dobbins Creek @ Co. 61
JD # 5 @ Co. 25
JD # 5 @ 255
JD # 5 @262
Lansing Tributary
Cedar River @ Co. 2
Blooming Prairie Trib
Cedar River @ 335
MPCA Standard

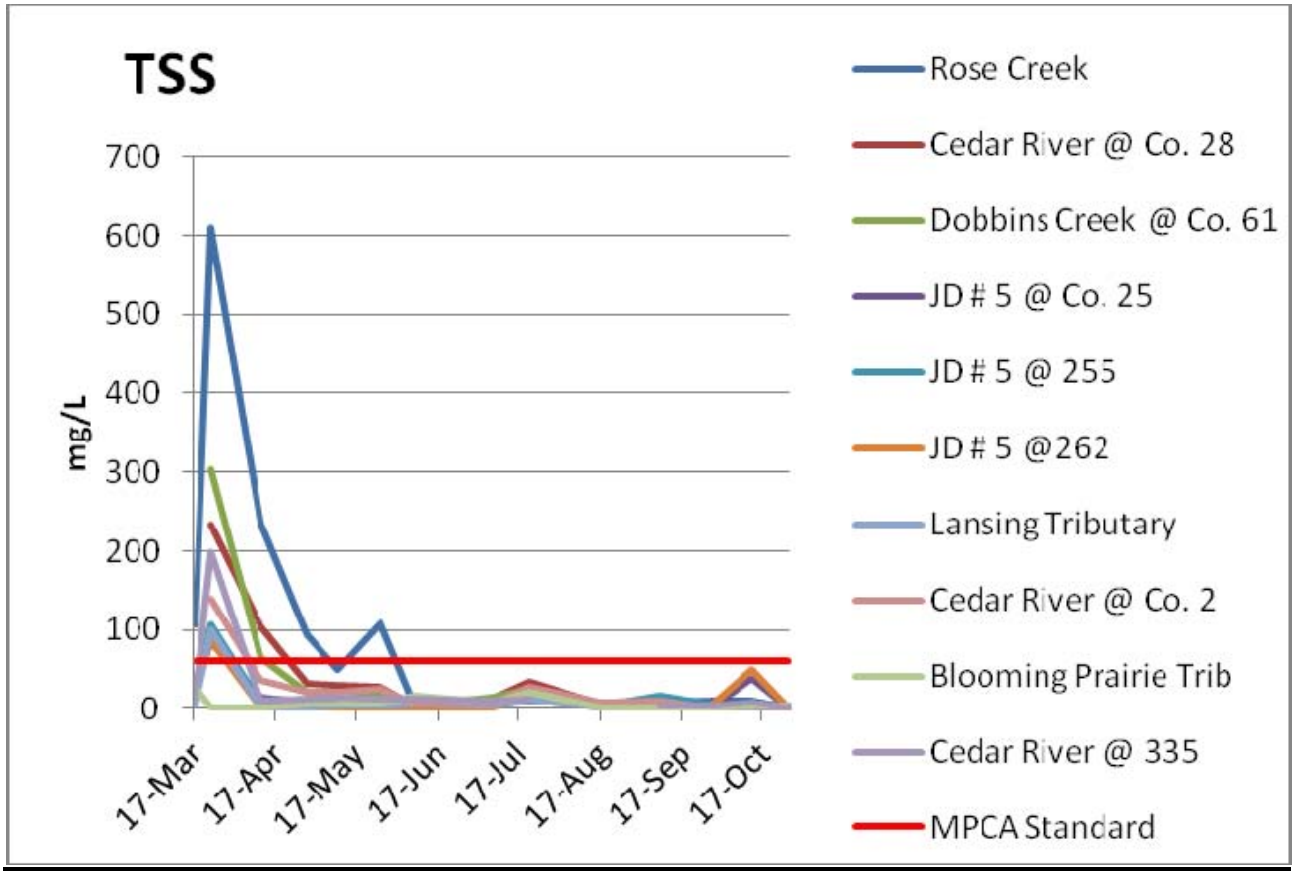

Dissolved Oxygen
mg/L
16
14
12
10
8
6
4
2
0
17-Mar
17-Apr
17-May
17-Jun
17-Jul
17-Aug
17-Sep
17-Oct
Rose Creek
Cedar River @ Co. 28
Dobbins Creek @ Co. 61
JD # 5 @ Co. 25
JD # 5 @ 255
JD # 5 @262
Lansing Tributary
Cedar River @ Co. 2
Blooming Prairie Trib
Cedar River @ 335
Minimum

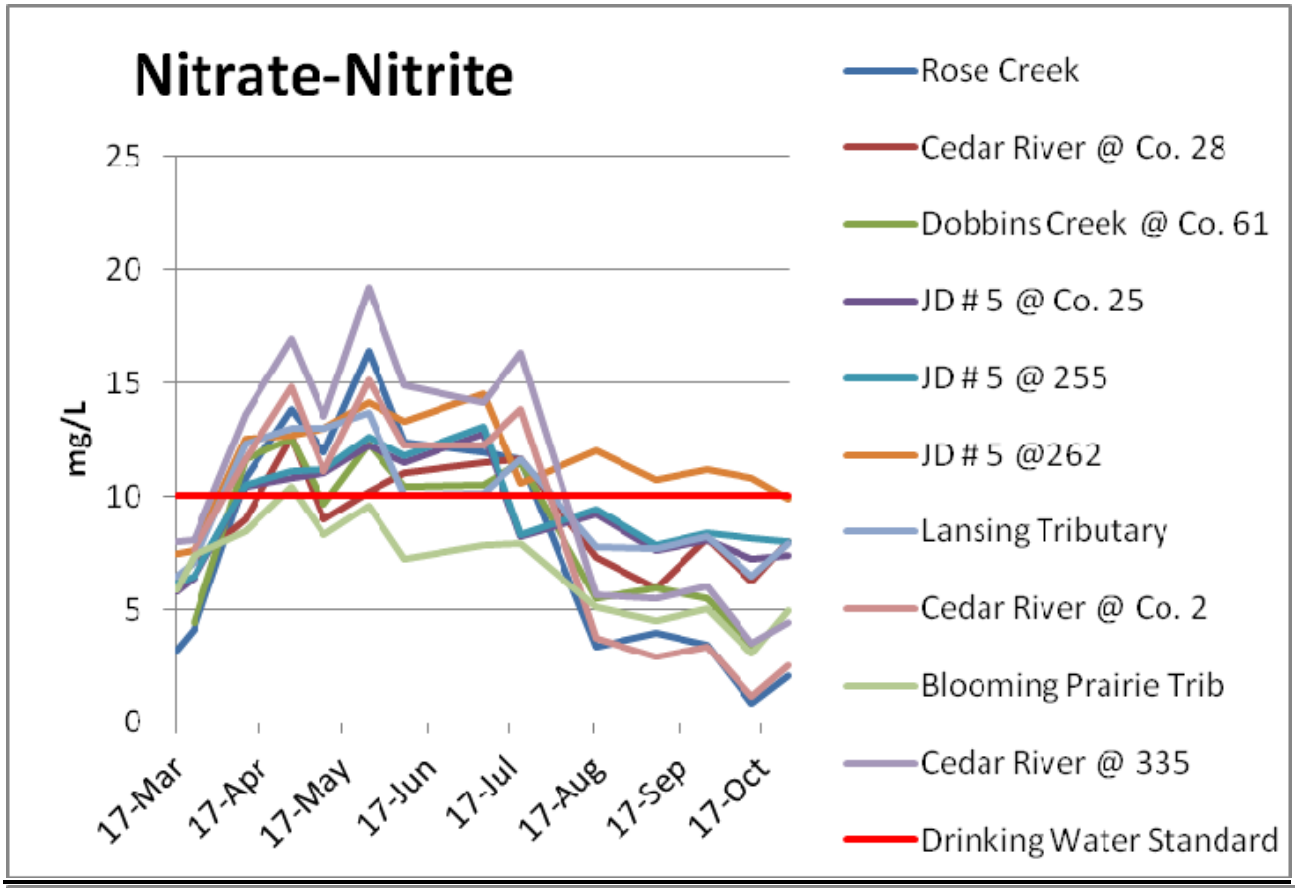

Conductivity
ms/cm
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
17-Mar
17-Apr
17-May
17-Jun
17-Jul
17-Aug
17-Sep
17-Oct
Rose Creek
Cedar River @ Co. 28
Dobbins Creek @ Co. 61
JD # 5 @ Co. 25
JD # 5 @ 255
JD # 5 @262
Lansing Tributary
Cedar River @ Co. 2
Blooming Prairie Trib
Cedar River @ 335

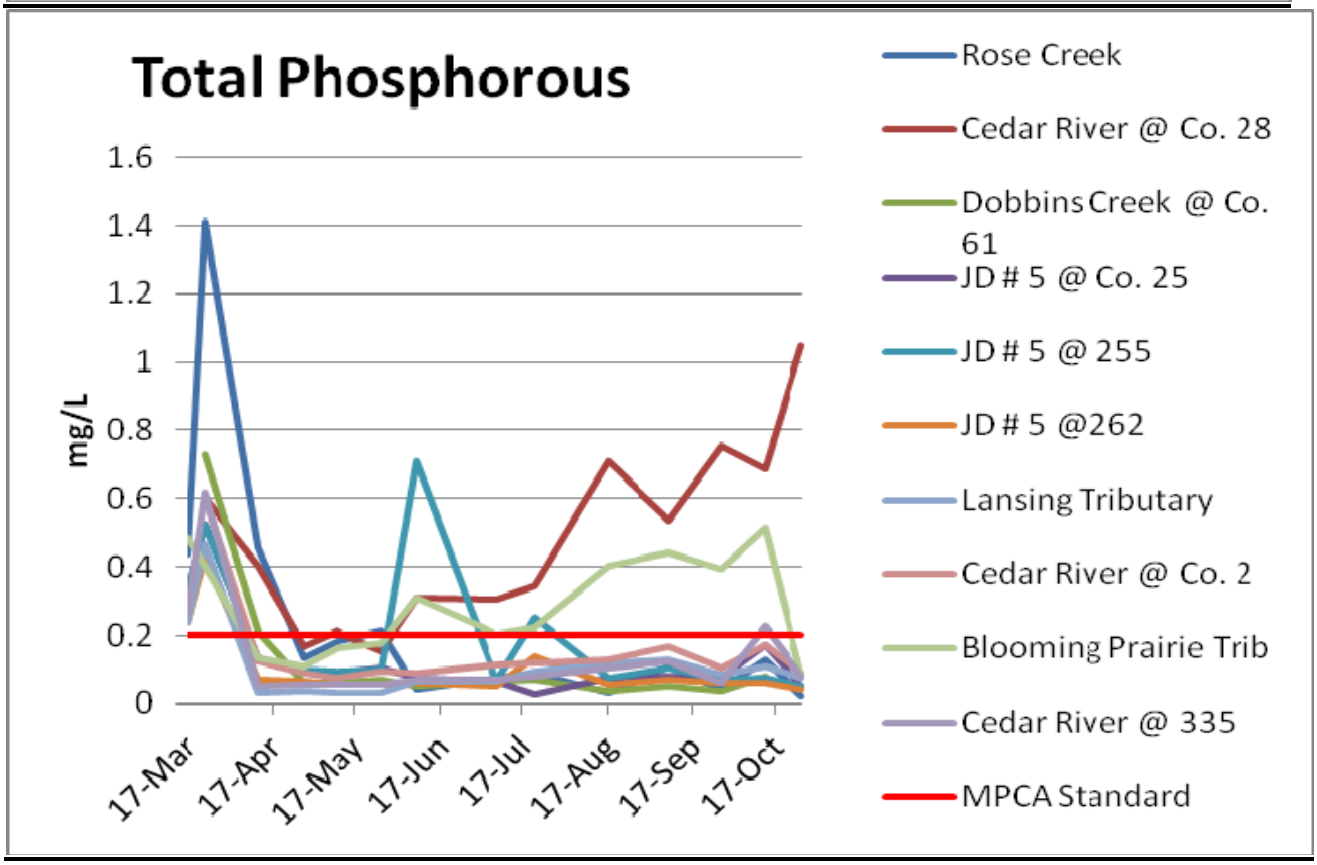

pH
9
8.5
8
7.5
7
6.5
17-Mar
17-Apr
17-May
17-Jun
17-Jul
17-Aug
17-Sep
17-Oct
Rose Creek
Cedar River @ Co. 28
Dobbins Creek @ Co. 61
JD # 5 @ Co. 25
JD # 5 @ 255
JD # 5 @262
Lansing Tributary
Cedar River @ Co. 2
Blooming Prairie Trib
Cedar River @ 335

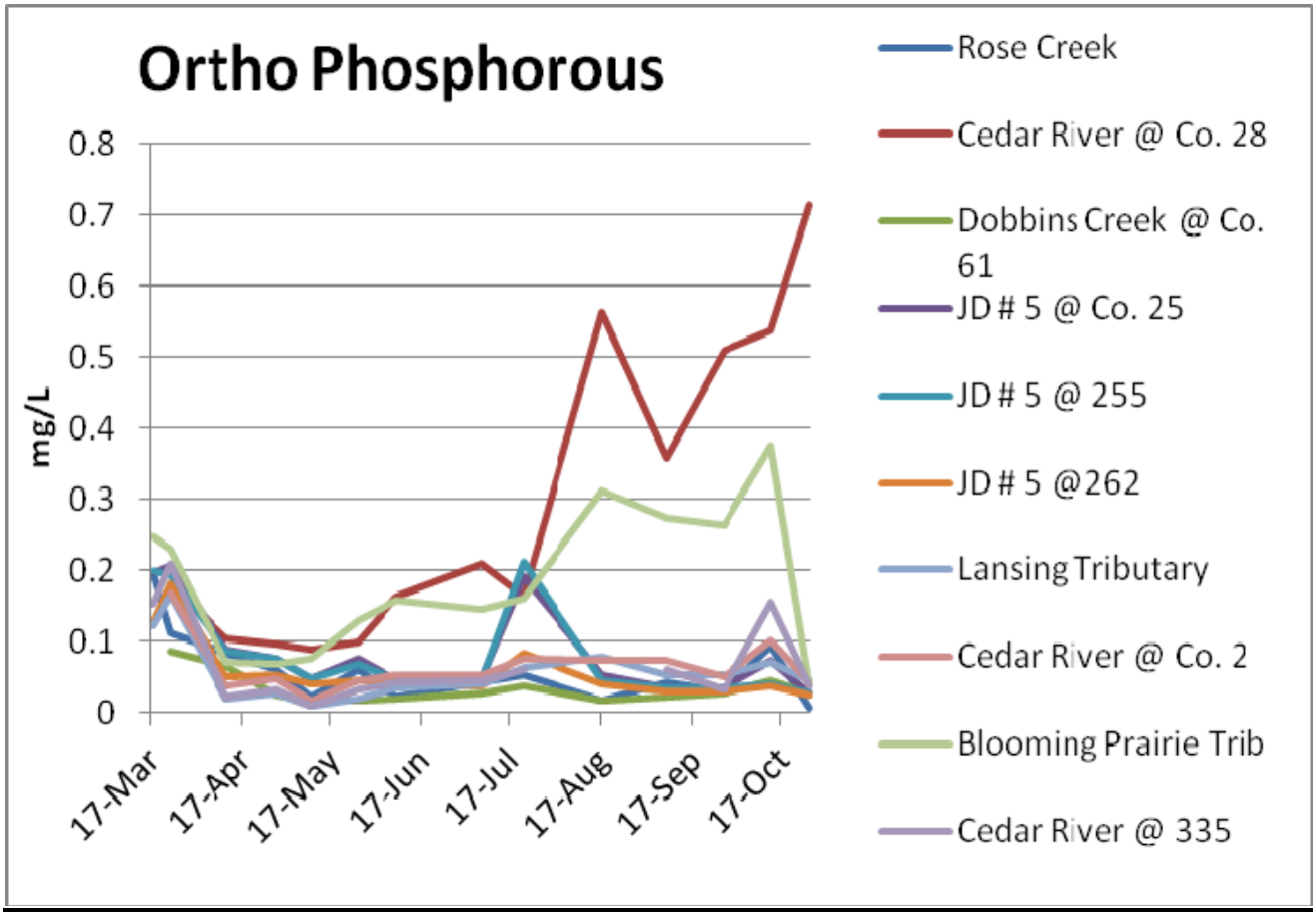

Turbidity
FNU
1000
100
10
1
0.1
17-Mar
17-Apr
17-May
17-Jun
17-Jul
17-Aug
17-Sep
17-Oct
Rose Creek
Cedar River @ Co. 28
Dobbins Creek @ Co. 61
JD # 5 @ Co. 25
JD # 5 @ 255
JD # 5 @262
Lansing Tributary
Cedar River @ Co. 2
Blooming Prairie Trib
Cedar River @ 335
MPCA Standard

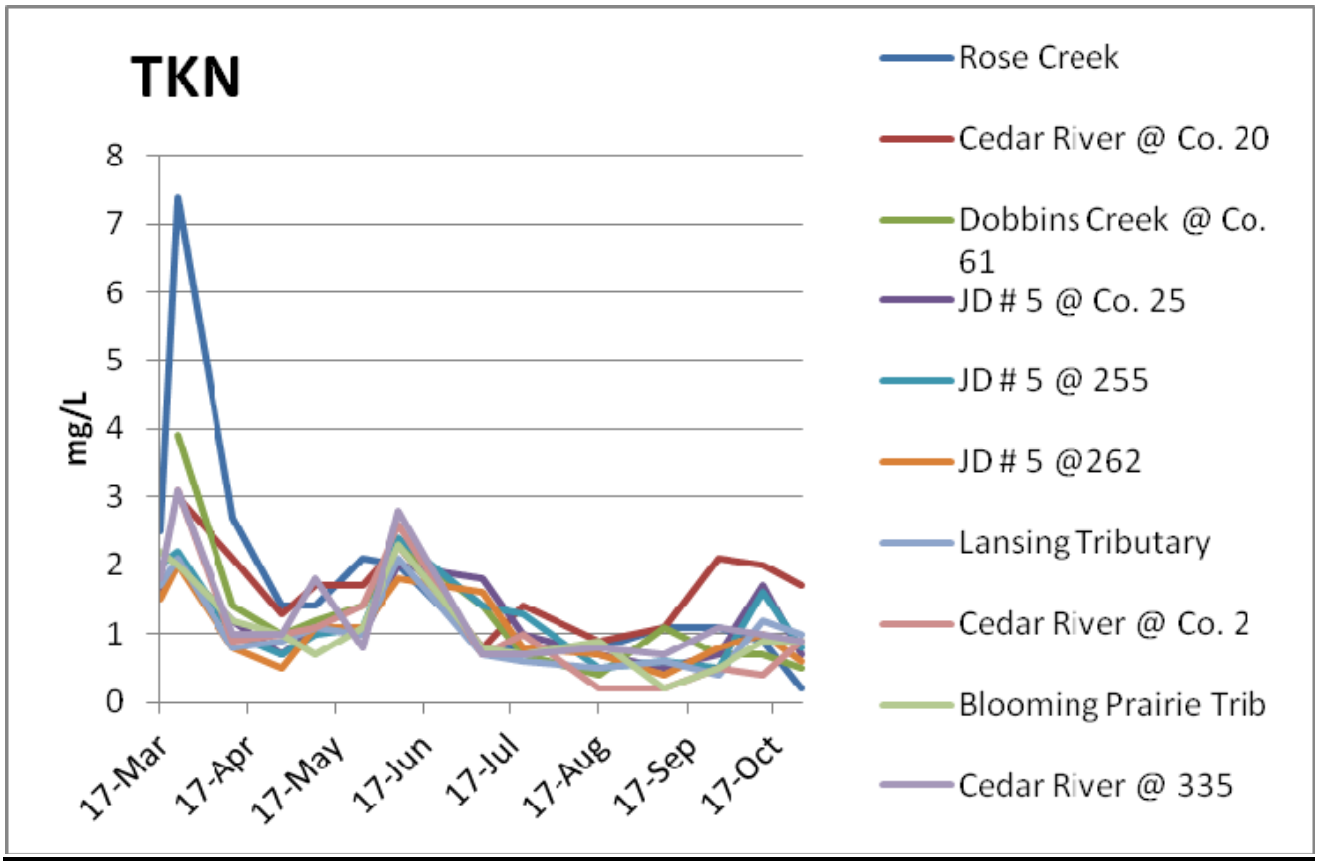

Temperature
C
30
25
20
15
10
5
0
17-Mar
17-Apr
17-May
17-Jun
17-Jul
17-Aug
17-Sep
17-Oct
Rose Creek
Cedar River @ Co. 28
Dobbins Creek @ Co. 61
JD # 5 @ Co. 25
JD # 5 @ 255
JD # 5 @262
Lansing Tributary
Cedar River @ Co. 2
Blooming Prairie Trib
Cedar River @ 335


TSS
mg/L
700
600
500
400
300
200
100
0
17-Mar
17-Apr
17-May
17-Jun
17-Jul
17-Aug
17-Sep
17-Oct
Rose Creek
Cedar River @ Co. 28
Dobbins Creek @ Co. 61
JD # 5 @ Co. 25
JD # 5 @ 255
JD # 5 @262
Lansing Tributary
Cedar River @ Co. 2
Blooming Prairie Trib
Cedar River @ 335
MPCA Standard


Nitrate-Nitrite
mg/L
25
20
15
10
5
0
17-Mar
17-Apr
17-May
17-Jun
17-Jul
17-Aug
17-Sep
17-Oct
Rose Creek
Cedar River @ Co. 28
Dobbins Creek @ Co. 61
JD # 5 @ Co. 25
JD # 5 @ 255
JD # 5 @262
Lansing Tributary
Cedar River @ Co. 2
Blooming Prairie Trib
Cedar River @ 335
Drinking Water Standard


Total Phosphorous
mg/L
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
17-Mar
17-Apr
17-May
17-Jun
17-Jul
17-Aug
17-Sep
17-Oct
Rose Creek
Cedar River @ Co. 28
Dobbins Creek @ Co. 61
JD # 5 @ Co. 25
JD # 5 @ 255
JD # 5 @262
Lansing Tributary
Cedar River @ Co. 2
Blooming Prairie Trib
Cedar River @ 335
MPCA Standard


Ortho Phosphorous
mg/L
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
17-Mar
17-Apr
17-May
17-Jun
17-Jul
17-Aug
17-Sep
17-Oct
Rose Creek
Cedar River @ Co. 28
Dobbins Creek @ Co. 61
JD # 5 @ Co. 25
JD # 5 @ 255
JD # 5 @262
Lansing Tributary
Cedar River @ Co. 2
Blooming Prairie Trib
Cedar River @ 335


TKN
mg/L
8
7
6
5
4
3
2
1
0
17-Mar
17-Apr
17-May
17-Jun
17-Jul
17-Aug
17-Sep
17-Oct
Rose Creek
Cedar River @ Co. 20
Dobbins Creek @ Co. 61
JD # 5 @ Co. 25
JD # 5 @ 255
JD # 5 @262
Lansing Tributary
Cedar River @ Co. 2
Blooming Prairie Trib
Cedar River @ 335

6. References

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