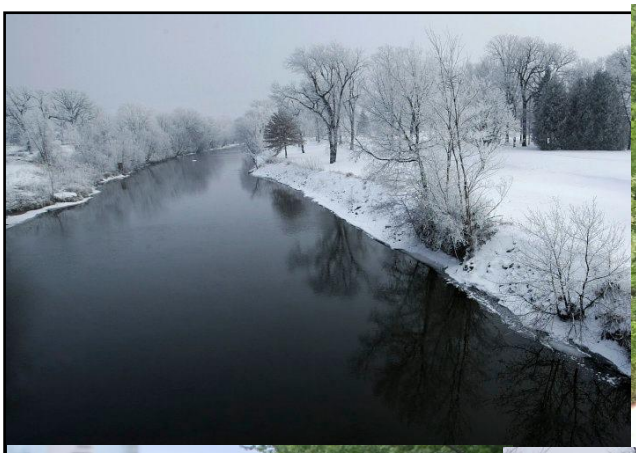
Cedar River Watershed

2013

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

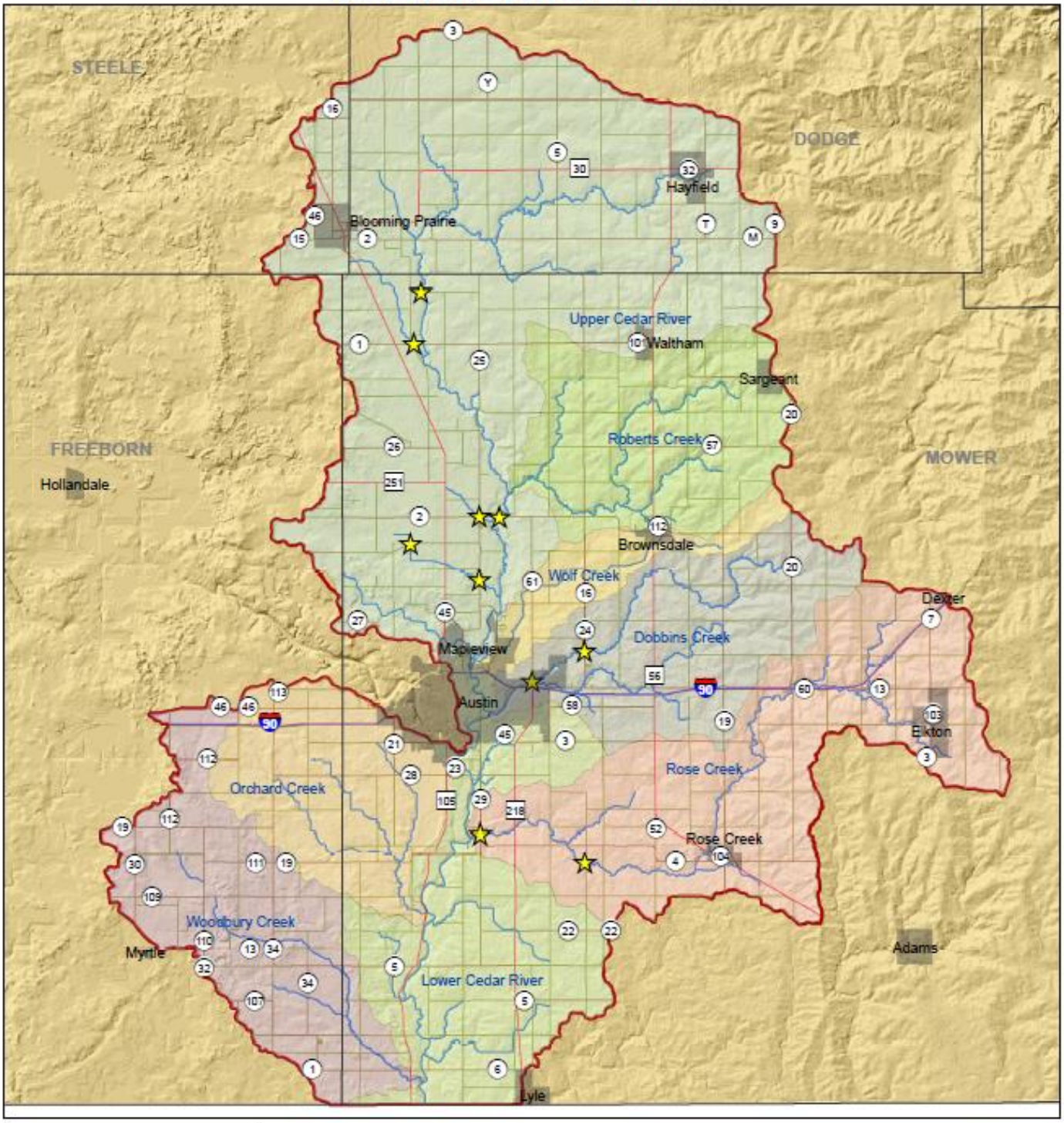
In 2013 the Cedar River Watershed District funded the sampling on 10 sites in the watershed. A map can be found on the next page. The following sites were covered and sampled by the Mower SWCD:

- Blooming Prairie Tributary at Mower Co. 1
- Cedar River at 335th St
- Cedar River at Mower Co. 2
- Dobbins Creek at Mower Co. 61
- Dobbins Creek at Mower Co. 24
- JD #5 at Mower Co. 25
- JD #5 at 262nd St
- Lansing Tributary at Mower Co. 2
- Rose Creek at Mower Co. 29
- Rose Creek at 570th Ave

2013 Highlights:

- Multiple snowmelts occurred in the spring, followed by several rainfalls that kept the soil saturated throughout early summer. The summer and fall were very dry.
- Total precipitation was 0.9 inches above the normal average precipitation for this area of 31.1 inches. The Mower County average rainfall was over 25 inches by the end of June!
- Total suspended solids concentrations ranged from <2 mg/L to 318 mg/L compared to the state guideline of 60 mg/L
- Rose Creek had the worst turbidity and highest TSS levels due to heavy rains in the watershed.
- Dobbins Creek had the highest E. coli concentrations.
- Nitrate levels were very high in 2013 due to 2011 and 2012 being very dry and building up residual nitrate levels in the soil. Our wet spring flushed out the nitrates.

CEDAR RIVER WATERSHED DISTRICT
MONITORING SITES



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 occasionally E. Coli.

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.

E. Coli:

Escherichia coli (E. coli) are used as an indicator of possible sewage contamination because of its presence, commonly found in human and warm blooded animals. E. coli is a single species of fecal coli form bacteria. Fecal coli form testing was primary bacteria indicator until recently when EPA recommended that E. coli was a better indicator of health risks. The bacteria itself is not harmful but is an indicator of the presence of possible disease causing bacteria, viruses and protozoa. It would be too costly, difficult and time consuming to test for all the possible viruses, bacteria and protozoa. In addition to the potential health risk fecal bacteria can also increase turbidity and reduce dissolved oxygen levels. Common sources of fecal contamination are sewage treatment plants, individual septic systems, domestic and wildlife manure, and storm runoff. The proposed standard for E.Coli is 126 cfu/100 mL monthly average, and 1,260 cfu/100 mL maximum. CFU stands for colony forming unit and is a direct count from a plate. MPN stands for the most probable number and is an estimate. This

is the second series of E. coli samples ever taken. Past samples taken were fecal coli form. MPCA is in the process of switching to an E. coli standard instead of the fecal coli form.

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 is supposed to be done.

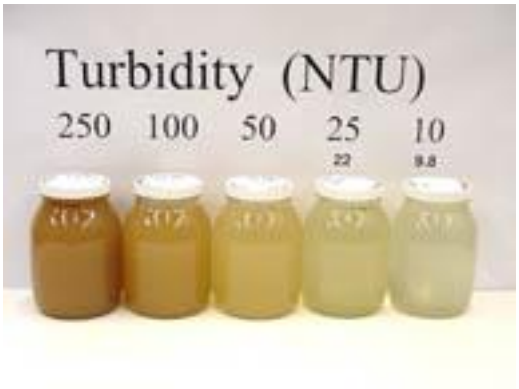
pH:

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.

Sechi Tube:

Sechi Tube (T-tube) is closely related to both TSS and turbidity. Sampling is done by looking through 100 cm water sample in a clear plastic tube and recording when the sechi disk 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 sechi tube readings and both TSS and Turbidity. The MPCA standard for sechi 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

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%

View Downstream of the Blooming Prairie Tributary monitoring site on Mower County Road 1

Monitoring Results

Conductivity

High: .78 mS/cm **Low: .40 mS/cm** **Ave: .55 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 macroinvertebrates. The average from this year is even higher than the results from previous years. Low rain fall late in the season and continuous wastewater outputs probably have a fact in the results.

Dissolved Oxygen

High: 10.83 mg/L Low: 7.82 mg/L Ave: 9.12 mg/L

The highs occurred at the beginning of the year as expected with lower water temperatures and higher flows. The levels remained above the 5 mg/L standard in the extreme low flow conditions throughout the monitoring season.

E. Coli

High: 435 mpn/100mL Low: 59.4 mpn/100mL Ave: 268.3 mpn/100mL

The limited sampled set average was above the MPCA standard (126mpn/100mL). The average is lower than sample average in 2012 (791 mpn/mL) 2009 (848 mpn/100mL) and 2008 (1410 mpn/mL). Similar samples were taken in the past for Fecal Coli form averaging in 547 mpn/100mL (2000) and 1052 mpn/100mL (2001) with all averages higher than the standard.

Nitrogen

Nitrate- Nitrite High: 19.5 mg/L Low: 3.57 mg/L Ave: 11.37 mg/L

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 6 of the 10 samples. Nitrate numbers were high earlier in the season and dropped later into the year. This is most likely due to increased nitrogen residing in the soil over our past two dry years. The wet spring caused these built-up nitrates to leach out of the soil into our surface waters.

pH

High: 7.93 Low: 7.41 Ave: 7.73

The average sample was near 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 4 years (8.32, 8.21, and 8.17, 8.18).

Phosphorus

Total High: .61 mg/L Low: .14 mg/L Ave: .34 mg/L

Ortho High: .40 mg/L Low: .10 mg/L Ave: .25 mg/L

Total phosphorous averages were above the MPCA state standard (.2 mg/L). 7 of the 12 samples exceeded the MPCA standard for total phosphorous. 5 of the 12 samples exceeded the eco-region normal (.16-.33 mg/L). When compared to the other monitoring sites, BPT had the highest average and low total phosphorus concentrations. This site has a waste water treatment plant upstream from the sampling site that is the main source of phosphorus input.

Ortho Phosphorous also highest average and low total phosphorus concentrations when compared among the other monitoring sites.

Total Suspended Solids

High: 16 mg/L **Low: 5 mg/L** **Ave: 10.4 mg/L**

None of the 12 samples exceeded the MPCA standard of 60 mg/L. This is the third year in a row without exceeding the standard. The average sample falls within the range of past sampling.

Transparency

High: 60 cm **Low: 33 cm** **Ave: 55.3 cm**

None of the 16 samples was below the MPCA standard (20 cm). 8 of the 10 samples were at the highest level we could sample (60cm). Transparency average with a 60-cm tube was 2010 (48.5 cm) and 2011 (54.3cm), and (92.58) with a 100cm tube in 2012.

Turbidity

High: 9.0 FNU **Low: 0 FNU** **Ave: 3.25FNU**

None of the 12 samples were at or above the MPCA standard (25 FNU). Even during times of high flow, the maximum turbidity level did not exceed the MPCA standard.

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 2012-13 seasons.

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: .17 mS/cm** **Ave: .46 mS/cm**

The average ranked in the middle of our sampling set. The average was similar to the past 3 years. The average is just within the range for a good mixed fishery (.150-500 mS/cm).

Dissolved Oxygen

High: 11.69 mg/L **Low: 7.75 mg/L** **Ave: 9.21 mg/L**

All of the samples were above 5mg/L that is the minimum to support healthy aquatic life.

E. Coli

High: 501.2 mpn/100mL Low: 107.1 mpn/100mL Ave: 242.05 mpn/100mL

None of the samples exceeded the estimated MPCA threshold standard (1260CFU/100mL). However, the average exceeded the estimated MPCA average standard (126CFU/100mL).

Nitrogen

Nitrate- Nitrite High: 28.8 mg/L Low: 1.26 mg/L Ave: 16.11 mg/L

6 of the 10 samples for Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking. The average Nitrate concentration exceeded the federal nitrogen standard by 6.11 mg/L. This site had the highest peak Nitrate levels compared to all of our other monitoring sites. Nitrate numbers were very high from after snowmelt until August.

pH

High: 8.13 Low: 7.48 Ave: 7.82

The average pH was in the eco-region average of 8-8.2. The average, high and low were all about the average for this sampling set. This year's average was lower than the 2008 average (8.2), the 2009 average (8.14) and 2010 average (8.17).

Phosphorus

Total High: .69 mg/L Low: .04 mg/L Ave: .20 mg/L

Ortho High: .52 mg/L Low: .02 mg/L Ave: .12 mg/L

Total phosphorous averages the MPCA state standard (.2mg/L). 3 of the 10 samples tested at this site exceeded the MPCA standard for total phosphorous. The rest of the samples were within the averages that we have seen in past sampling efforts. The orthophosphorous average concentration was equal to or above the averages in previous years. This site had the highest maximum orthophosphorus concentration among all of the other Cedar River Watershed monitoring sites. Phosphorus readings were high until the beginning of the growing season.

Total Suspended Solids

High: 60 mg/L Low: 5 mg/L Ave: 20.10 mg/L

One of the 12 samples exceeded the MPCA standard (60mg/L) and eco-region normal levels. The average was higher than 2009 (14.8 mg/L) and less than the averages 2008 (64.3 mg/L), 2010 (34.4 mg/L), 2011 (25.3 mg/L), and 2012 (21.5 mg/L).

Transparency

High: 60 cm **Low: 9 cm** **Ave: 43 cm**

Two of the 12 samples was below the MPCA standard (20 cm).

Turbidity

High: 66 FNU **Low: 0 FNU** **Ave: 12.76 FNU**

One of the 12 samples was above the estimated 25 FNU standard. This year along with previous sampling efforts have shown the site to exceed the standard about once a year.

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 Minnesota DNR continuous automated stage and flow tracking equipment along with a flood warning system.

Monitoring during high flows on May 6th 2013

Monitoring Results

Conductivity

High: .57 mS/cm **Low: .18 mS/cm** **Ave: .41 mS/cm**

The average is within the 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), 2010 (.44 mg/L) 2011 (.51 mg/L), and 2012 (.52 mg/L).

Dissolved Oxygen

High: 11.74 mg/L Low: 7.59 mg/L Ave: 9.23 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 within the range of averages from 2008 (8.64 mg/L), 2009 (9.79 mg/L), 2010 (9.03 mg/L), 2011 (9.14 mg/L), and 2012 (8.60 mg/L).

E. Coli

High: 579.4 mpn/100mL Low: 66.3 mpn/100mL Ave: 300.7 mpn/100mL

None of the four samples exceeded the estimated MPCA threshold standard (1260CFU/100mL). The average did exceeded the estimated MPCA average standard (126CFU/100mL). The average was on the lower end of the sample set.

Nitrate-Nitrite

High: 23.8 mg/L Low: 1.48 mg/L Ave: 13.22 mg/L

6 of the 10 samples were above the 10mg/L federal drinking water standard. The average ranks in the middle among the other monitoring sites. Nitrate levels peaked between snowmelt and the growing season.

pH

High: 8.14 Low: 7.87 Ave: 8.14

The average was within the eco-region normal range (8-8.2). The average was in the middle of the sampling set. The average is similar to recent results in 2008 (8.24), 2009 (8.18), 2010 (8.11), 2011 (8.10), and 2012 (8.05). 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: .58 mg/L Low: .07 mg/L Ave: .21 mg/L

Ortho High: .40 mg/L Low: .04 mg/L Ave: .12 mg/L

Total phosphorous averages were above the MPCA state standard (.2mg/L). 4 of the 10 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. Peak concentrations occurred in the spring, and diminished when the growing season began.

The ortho phosphorous average was on the lower end of this sample set. The average is within range of the most recent sampling averages from 2008 (.08 mg/L), 2009 (.11 mg/L), 2010 (.19 mg/L), 2011 (.06 mg/L), and 2012 (.10 mg/L).

Suspended Solids

Total High: 58 mg/L **Low: 3.0 mg/L** **Ave: 16.8 mg/L**

None of the 12 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 average from 2013 falls in the range of averages in 2008 (2.87 mg/L), 2009 (11.29 mg/L), 2010 (61.9 mg/L), 2011 (24.5 mg/L), and 2012 (12.0 mg/L). The peak concentration occurred during our largest rain event on May 18th-20^{t}

Transparency

High: 60 cm **Low: 9.5 cm** **Ave: 38.95 cm**

3 of the 10 samples was 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. The average transparency was in the middle when compared to the other Cedar River Watershed monitoring sites.

Turbidity

Field High: 62.0 FNU **Low: 0.0 FNU** **Ave: 14.12 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) 1 out of 10 field samples. There was an increase compared to 2009 average (6.95 FNU) and 2012 average (7.86 FNU), and a decrease from 2010 average (60.7 FNU) and 2011 average (31.8 FNU).

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 during high flows on May 6th 2013

Monitoring Results

Conductivity

High: .48 mS/cm **Low: .24 mS/cm** **Ave: .35 mS/cm**

The average is within the range for a good mixed fishery (.150-500 mS/cm). This site was the second lowest of those sampled this year and in 2008 and 2009. The average is similar to the averages in 2008(.385 mS/cm), 2009 (.42 mS/cm), 2010 (.38 mS/cm) 2011 (.42 mS/cm), and 2012 (46mS/cm).

Dissolved Oxygen

High: 9.6 mg/L **Low: 7.8 mg/L** **Ave: 9.61 mg/L**

All samples are above 5mg/L that is the minimum to support healthy aquatic life. The average was about the average of this sample set. The average is within the range of recent samples in 2008 (8.86 mg/L), 2009 (10.13 mg/L), 2010 (9.2mg/L) 2011 (9.7mg/L), and 2012 (8.76mg/L).

E. Coli

High: 1203.3 mpn/100mL Low: 135.4 mpn/100mL Ave: 641.23 mpn/100mL

1 of the 4 samples exceeded the estimated MPCA threshold standard (1260CFU/100mL). The average also exceeded the estimated MPCA average standard (126CFU/100mL).

Nitrate-Nitrite

High: 19.9 mg/L **Low: 1.73 mg/L** **Ave: 11.45 mg/L**

5 of the 10 samples were above the 10 mg/L federal drinking water standard. The average was towards the lower end when compared to the other CRWD monitoring sites. The average concentration is above the samples in 2009 (6.07 mg/L), 2010 (6.84 mg/L) 2011 (8.59mg/L), and 2012 (4.93mg/L). The average was much higher than at previous years at this site due to residual nitrate build-up resulting from lower than average rainfall in 2011 and 2012.

pH

High: 8.26 **Low: 7.47** **Ave: 7.83**

The average was just below the eco-region normal range (8-8.2). It is similar to the averages of the other CRWD sites in 2013. It is the lowest of the recent averages in 2008 (8.14), 2009 (8.10), 2010 (8.10), 2011 (8.06), and 2012 (8.01)

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Phosphorus

Total High: .29 mg/L Low: .04 mg/L Ave: .13 mg/L

Ortho High: .18 mg/L Low: .01 mg/L Ave: .06 mg/L

The total phosphorous average was below the MPCA state standard (.2mg/L). 3 of 10 samples were above the MPCA standard. The average was on the lower end of the sampling set and is within the range of average concentrations from 2008 (.076 mg/L), 2009 (.07 mg/L), 2010(.16mg/L), 2011(.13mg/L), and 2012 (.07mg/L).

Ortho phosphorous average was also on the lower end of the averages when compared to the other CRWD sites. The average was comparable to others in 2008 (.045 mg/L), 2009 (.04 mg/L), and 2010 (.03 mg/L) after the high average in 2011(.11mg/L), and 2012 (.03 mg/L).

Suspended Solids

Total High: 63.0 mg/L Low: 2.0 mg/L Ave: 16.3mg/L

Only 1 of the 10 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 lower end when compared to other CRWD sites in 2013. The average was 15.8 mg/L of 48 samples taken from 2000 to 2009.

Transparency

High: 60 cm Low: 7.5 cm Ave: 37.75 cm

2 of the 10 samples fell below the 20 cm estimated standard. The sample average was on the lower end when compared to the other CRWD sites in 2013. 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: 72.1 FNU Low: 0 FNU Ave: 15.88 FNU

The samples at this site exceeded the estimated MPCA standard (25 NTU) 3 times in 10 samples. The average is one of the highest when compared to the other CRWD sites in 2013.

Dobbins Creek at Mower County Road 24:

Overview

Dobbins Creek is sampled at Mower County Road 24 about 2.4 miles before it enters East Side Lake and about 3.5 miles before the junction with the Cedar River in Austin. There is about a 13,400 acre watershed above the sampling site.

Monitoring on July 1st, 2013

Monitoring Results

Conductivity

High: .51 mS/cm **Low: .16 mS/cm** **Ave: .32 mS/cm**

The average is within the range for a good mixed fishery (.150-500 mS/cm). This was the lowest average conductivity when compared to the other CRWD monitoring sites in 2013.

Dissolved Oxygen

High: 12.21 mg/L **Low: 7.89 mg/L** **Ave: 10.22 mg/L**

All samples are above 5mg/L that is the minimum to support healthy aquatic life. The average was one of the highest when compared to the other CRWD sites.

E. Coli

High: 2419.6 mpn/100mL Low: 727 mpn/100mL Ave: 1996 mpn/100mL

3 of the 4 samples exceeded the estimated MPCA threshold standard (1260CFU/100mL). The average was well above the estimated MPCA average standard (126CFU/100mL). This monitoring site had the highest maximum, average, and lowest E. Coli readings among the rest of the monitoring sites. These extreme results are the worst in the Cedar River Watershed.

Nitrate-Nitrite

High: 21.4 mg/L Low: 1.54 mg/L Ave: 12.82mg/L

6 of the 10 samples were above the 10 mg/L federal drinking water standard. The average falls in the middle of the other average concentrations among the CRWD monitoring sites in 2013.

pH

High: 8.76 Low: 7.45 Ave: 7.93

The average was above the eco-region normal range (8-8.2). This site has one of the highest pH averages among the other 2013 CRWD sites.

Phosphorus

Total High: .37 mg/L Low: .05 mg/L Ave: .16 mg/L

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

The total phosphorous average was below the MPCA state standard (.2mg/L). 4 of the 10 samples were above the MPCA standard. The average was on the lower end of the sampling set.
Ortho phosphorous average was also on the lower end when compared to the averages of the other CRWD 2013 sites.

Suspended Solids

High: 88 mg/L Low: 2mg/L Ave: 37.3mg/L

Only 1 of the 10 total suspended solid samples exceeded the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). This site had one of the highest averages when compared to the other CRWD 2013 monitoring sites.

Transparency

High: 60 cm Low: 6 cm Ave: 31.33 cm

4 of the 10 samples fell below the 20 cm estimated standard. Dobbins Creek had the second lowest average transparency readings among all of the sites in the watershed.

Turbidity

Field High: 93.4 FNU **Low: 1.0 FNU** **Ave: 27.42 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) 6 times out of 12 samples. The average is the second lowest out of all the CRWD monitoring sites, following Rose Creek.

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: .65 mS/cm **Low: .29 mS/cm** **Ave: .46 mS/cm**

The average is within the range of a good mixed fishery (.150-500 mS/cm). The average falls within the range of recent sampling averages in 2008, 2009, 2010, 2011, and 2012 (.49 mS/cm, .55mS/cm, .47 mS/cm, .49 mS/cm, and .56mS/cm).

Dissolved Oxygen

High: 12.21 mg/L **Low: 7.89 mg/L** **Ave: 8.45 mg/L**

All samples are above 5 mg/L that is the minimum to support healthy aquatic life. The average was slightly below 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 (9.2 mg/L) 2011 average (9.7 mg/L), and 2012 average (8.4 mg/L).

E. Coli

High: 260.3 MPN/100mL Low: 127.4 MPN/100mL Ave: 185.5 MPN/100mL

The average did exceeded the estimated MPCA average standard (126CFU/100mL). The average is on the lower end of the historic averages from 2008 (132 MPN/100mL), 2009 (1132 MPN/100mL), 2010 (1296MPN/100mL), and 2012 (636.4 MPN/100mL).

Nitrogen

Nitrate- Nitrite High: 24.6 mg/L Low: 3.58 mg/L Ave: 18.26 mg/L

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 9 of the 10 samples at this site. The average was the second highest among all of the other CRWD monitoring sites. The only site that had a higher average concentration was JD #5 in the upper reach of the watershed.

pH

High: 8.15 Low: 7.43 Ave: 7.77

The average is just below the eco-region normal range (8-8.2). It is still within a good range for a mixed fishery.

Phosphorus

Total High: .37 mg/L Low: .07 mg/L Ave: .18 mg/L

Ortho High: .22 mg/L Low: .04 mg/L Ave: .10 mg/L

Total phosphorous averages were below the MPCA state standard (.2mg/L). 3 of the 10 samples were higher than the MPCA standard. The average was higher than the 2008 (.09 mg/L), 2009 (.1 mg/L), 2010 (.16 mg/L), 2011 (.14 mg/L), and 2012 averages (.15 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), 2010(.08 mg/L) 2011(.09 mg/L), and 2012 (.11 mg/L).

Total Suspended Solids

High: 40 mg/L **Low: 2 mg/L** **Ave: 9.3 mg/L**

None of the 10 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 most of the average samples taken in the last 5 years.

Transparency

High: 60 cm **Low: 9 cm** **Ave: 51.5 cm**

1 of the 10 samples was at or below the 20 cm estimated standard. The average transparency was the second highest among the other 2013 CRWD monitoring sites.

Turbidity

High: 48.8 FNU **Low: 0.0 FNU** **Ave: 6.51 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) in 1 of 10 samples. This year's turbidity average falls within the range of other samples taken in 2008 (27.1 FNU), 2009 (7.6 FNU), 2010 (43.1 FNU), 2011 (24.8 FNU), and 2012 (2.46NTU).

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. This site was sampled only 7 times this season because the ditch dried out after July 16th sampling.

Conductivity

High: .51 mS/cm **Low: .35 mS/cm** **Ave: .41 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. The average decreased slightly from the previous year's average (.53 mS/cm).

Dissolved Oxygen

High: 13.05 mg/L **Low: 5.82 mg/L** **Ave: 9.92 mg/L**

None of the 7 samples were below the 5 mg/L that is the minimum to support healthy aquatic life. The average was in the middle of the sample set. The flow stopped in early August, and the stream dried up. Last year's average was 7.74 mg/l.

Nitrogen

Nitrate- Nitrite High: 27.00 mg/L Low: 7.14 mg/L Ave: 21.61 mg/L

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 6 of the 7 samples at this site. The average was the highest when compared to all of the other CRWD monitoring sites in 2013. Nitrate levels remained high throughout the year.

pH

High: 8.04 Low: 7.34 Ave: 7.61

The average is just below the eco-region normal range (8-8.2). The average was the lowest of the sampling set.

Phosphorus

Total High: .28 mg/L Low: .08 mg/L Ave: .14 mg/L

Ortho High: .15 mg/L Low: .05 mg/L Ave: .09 mg/L

2 of the 7 samples were higher than the the MPCA state standard of .20 mg/L. This site had one of the lower total phosphorus averages.

Ortho phosphorous levels were low compared to the rest of the sampling set.

Total Suspended Solids

High: 27 mg/L Low: 2 mg/L Ave: 9 mg/L

None of the 7 samples exceeded the 60 mg/L MPCA standard. The average was one of the lowest of the sample set.

Transparency

High: 100 cm Low: 45 cm Ave: 92.14 cm

None of the 7 samples were at or below the 20 cm estimated standard. Six of the 7 samples were 100 cm. The average sample was one of the highest of this sample set. The average was the highest of the JD# 5 sites although a limited sample set.

Turbidity

High: 9.4 FNU Low: 0.0 FNU Ave: .47 FNU

The samples at this site exceeded the estimated MPCA standard (25 NTU) in 1 of 7 samples.

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: .29 mS/cm Ave: .46 mS/cm

The average was within 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), 2009 (.55 mS/cm), 2010 (.51 mS/cm), 2011 (.51 mS/cm), and 2012 (.53 mS/cm). The average was right on the average for the sample set.

Dissolved Oxygen

High: 11.49 mg/L Low: 7.54 mg/L Ave: 8.89 mg/L

All samples were above 5 mg/L minimum to support healthy aquatic life. The average sample was the lowest when compared to all of the other CRWD monitoring sites. This year's average falls within the range of average concentrations in (2008, (9.3 mg/L) 2009, (8.9 mg/L), 2010 (8.25 mg/L), 2011 (9.33 mg/L), and 2012 (7.87 mg/L).

E. Coli

High: 648 MPN/100mL Low: 243 MPN/100mL Ave: 235 MPN/100mL

None of the three samples exceeded the estimated MPCA threshold standard (1260CFU/100mL). The average exceeded the estimated MPCA average standard (126CFU/100mL). The average was lower than sample concentrations in 2008 (1170 MPN/100mL), 2009 (606 MPN/100mL) averages, 2010 (506 MPN/100mL), and 2012 (378.5 MPN/100mL).

Nitrogen

Nitrate- Nitrite High: 23.8 mg/L Low: 3.07 mg/L Ave: 14.8 mg/L

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 7 of th 10 samples at this site. The average was the highest when compared to previous averages in 2008 (8.3 mg/L), 2009 (8.4 mg/L), 2010 (9.75 mg/L), 2011 (9.67 mg/L), and 2012 (6.48 mg/L).

pH

High: 7.99 **Low: 7.63** **Ave: 7.81**

The average is within the eco-region normal range (8-8.2) and falls below the average of the sampling set. This average has maintained the steady decline since 2008 (8.11), 2009 (8.08), 2010 (8.06), 2011 (8.05), and 2012 8.03.

Phosphorus

Total High: .25 mg/L **Low: .04 mg/L** **Ave: .12 mg/L**

Ortho High: .18 mg/L **Low: .03 mg/L** **Ave: .06 mg/L**

1 of the 10 samples taken exceeded the MPCA state standard (.2mg/L). The average is the lowest among all of the other CRWD monitoring sites in 2013. The average is in line with the averages in 2008, (.09 mg/L), 2009 (.09 mg/L), 2010 (.17 mg/L), 2011 (.11 mg/L), and 2012 (.12 mg/L). Ortho Phosphorous levels were in the middle of the sampling set. Ortho phosphorous averages are higher than or equal to sampling from 2008 (.06 mg/L), 2009 (.8 mg/L), 2010 (.07 mg/L), 2011 (.06 mg/L), and 2012 averages (.08).

Total Suspended Solids

High: 9 mg/L **Low: 2 mg/L** **Ave: 4.1 mg/L**

None of the 10 samples exceeded the 60 mg/L MPCA standard. The average was the lowest of the samples set. The results are the lowest when compared to averages in 2001 (8.99 mg/L), 2008 (9.2 mg/L), 2009 (5.5 mg/L), 2010 (9.6 mg/L) 2011 (11.4mg/L), and 2012 (7.08 mg/L).

Transparency

High: 60 cm **Low: 38 cm** **Ave: 57 cm**

None of the 12 samples fell below the 20 cm estimated standard. This was the clearest of the entire sample set for the 3rd year in a row.

Turbidity

High: 15.5 FNU **Low: 0.0 FNU** **Ave: 3.1 FNU**

In none of the 12 samples the estimated MPCA standard (25 NTU) was exceeded. The average was the lowest of this year's sample set. The average turbidity was within the averages in 2008 (21.6 FNU), 2009 (2.5 FNU), 2010 (9.2 FNU), 2011 (23.9 FNU), and 2012 (1.45 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: .58 mS/cm **Low: .29 mS/cm** **Ave: .35 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 falls within the ranges of averages in 2008 (.42 mS/cm), 2009(.44 mS/cm), 2010 average (.44 mS/cm), 2011(.43mS/cm), and 2012 (.48 mS/cm).

Dissolved Oxygen

High: 12.43 mg/L Low: 8.53 mg/L Ave: 10.23 mg/L

All samples are above 5 mg/L that is the minimum to support healthy aquatic life. The average dissolved oxygen concentration is the highest among all of the CRWD monitoring sites in 2013. The average is the highest of the averages from 2008 (10.06 mg/L), 2009 (9.8 mg/L), 2010 (9.7 mg/L), 2011 (9.86 mg/L), and 2012 (9.58 mg/L). In 1973 there was one DO sample taken with 10.5 mg/L.

E. Coli

High: 920.8 MPN/100mL Low: 63.1 MPN/100mL Ave: 411.68 MPN/100mL

None of the three samples exceeded the estimated MPCA threshold standard (1260CFU/100mL). The average exceeded the estimated MPCA average standard (126CFU/100mL). The average was in the middle of this sample set. The average returns to the previous averages in 2008 (221.0 MPN/100mL) and 2009 (202.1 MPN/100mL) after a spike in 2010 (1226.4MPN/100mL).

Nitrogen

Nitrate- Nitrite High: 20.2 mg/L Low: 1.18 mg/L Ave: 11.37 mg/L

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 6 of the 10 samples. Last year the standard was exceeded in half of the samples. The average for this site was on the lower end of the sample set. The average was the lowest of the most recent sample averages in 2008 (5.48 mg/L), 2009 (5.87 mg/L), 2010 (6.93 mg/L), 2011 (7.84), and 2012 (4.12 mg/L).

pH

High: 8.57 Low: 7.57 Ave: 7.98

The average was within the eco-region normal range (8-8.2). The average was the highest of the sampling. The average is on the lower end of averages in 2008 (8.28), 2009 (8.25), 2010 (8.28), 2011 (8.01), and 2012 (8.27 mg/L).

Phosphorus

Total High: .77 mg/L Low: .05 mg/L Ave: .22 mg/L

Ortho High: .12 mg/L Low: .01 mg/L Ave: .06 mg/L

The average total phosphorus concentration exceeded the MPCA state standard (.2mg/L). 4 of the 10 samples were above the MPCA standard. The average was the highest from all of our previous studies in 2008 (.113 mg/L), 2009 (.11 mg/L) and 2010 (.10 mg/L), 2011(.18 mg/L), and 2012 (.09 mg/L).

Rose Creek had the highest average phosphorus concentration, along with the highest peak phosphorus concentration among all of the CRWD 2013 monitoring results. This is due to the Rose Creek watershed receiving the largest amount and most intensive rainfalls when compared to the other watersheds.

Ortho Phosphorous levels were on the lower end of the sampling set. The average was the similar when compared to previous sampling averages from 2008 (.097 mg/L), 2009 (.07 mg/L), 2010 (.10 mg/L), 2011(.06 mg/L), and 2012 (.05 mg/L).

Total Suspended Solids

High: 189 mg/L **Low: 3 mg/L** **Ave: 44.4 mg/L**

2 of the 10 samples exceeded the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). The average was on the high end of the averages in 2008 (40.6 mg/L), 2009 (24.2 mg/L), 2010 (71.9 mg/L), 2011 (92.3 mg/L), and 2012 (6.92 mg/L). The average of the samples in 2001 was 44.5 mg/L and in 2000 was 12.1 mg/L.

Transparency

High: 100 cm **Low: 14 cm** **Ave: 90.1 cm**

6 of 10 samples fell below the 20 cm estimated standard. The average is the second worst in the sampling set following behind the other Rose Creek Site. 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, 2010, 2 of 11 were below 20 cm, 2011, 6 of 13 were below 20 cm, 2012 one of 12 was below 20cm.

Turbidity

High: 350 FNU **Low: 0.0 FNU** **Ave: 68.51 FNU**

2 samples at this site exceeded the estimated MPCA standard (25 NTU) out of 10 samples. The average turbidity level exceeded the MPCA standard The average is on the higher end of the sampling set. This site had the highest average and highest peak level of all of the CRWD monitoring sites. The average still fell within the range of averages in 2008 (72.5 FNU), 2009 (17.5 FNU), 2010 (44.3 FNU), 2011 (231.6 FNU), and 2012 (3.14 FNU).

Rose Creek at 570th Ave:

Overview

This site is sampled at 570th Ave in Mower County. There is about a 31,300 acre watershed above the sampling point. The watershed includes contains the town of Rose Creek and Elkton and a portion of the City of Dexter.

Rose Creek at 570th Watershed Land Use	
Types	**Percent**
Barren	**0.01%**
Row Crops	**73.41%**
Forested	**2.88%**
Developed	**10.57%**
Grassland/Pasture/Hay	**12.56%**
Wetland	**0.48%**
Open Water	**0.09%**

Conductivity

High: .52 mS/cm **Low: .18 mS/cm** **Ave: .35 mS/cm**

The average was on the lower end of the sampling set. The average is within the range for a good mixed fishery (.150-500 mS/cm). The average is on the lower end of averages from 2008 (.42 mS/cm), 2009 (.45 mS/cm) 2010 (.43 ms/cm), and 2012 (.46 mS/cm).

Dissolved Oxygen

High: 11.58 mg/L Low: 7.95 mg/L Ave: 9.57 mg/L

All samples are above 5 mg/L that is the minimum to support healthy aquatic life. This sample set was higher end when compared to the other averages of this sampling set. The average is above the range of averages of 2009 (8.24 mg/L) and 2010 (9.1mg/L), and 2012 (8.15 mg/L).

E. Coli

High: 1203.3 MPN/100mL Low: 149.3 MPN/100mL Ave: 620.7 MPN/100mL

The average exceeded the estimated MPCA average standard (126CFU/100mL). The average is on the middle of the historic averages from 2008 (132 MPN/100mL), 2009 (1132 MPN/100mL), 2010 (1296MPN/100mL), and 2012 (431.5 MPN/100mL).

Nitrogen

High: 21.1 mg/L Low: .97mg/L Ave: 11.41 mg/L

6 of the 10 samples was above the 10 mg/L federal drinking water standard. The average also exceeded the federal drinking water standard. The average was the highest of averages from 2009 (5.34 mg/L), 2010 (7.49 mg/L), and 2012 (3.87 mg/L).

pH

High: 8.88 Low: 7.53 Ave: 7.92

The average was within the eco-region normal range (8-8.2). The average was in the lower end of the samples set. The average was similar to pervious averages in 2008 (8.30), 2009 (8.15), 2010 (8.18), and 2012 (8.16).

Phosphorous

Total High: .65 mg/L Low: .07 mg/L Ave: .21 mg/L

Ortho High: .11 mg/L Low: .01 mg/L Ave: .05 mg/L

Total phosphorous averages exceeded the MPCA state standard (.2mg/L). 3 of the 10 samples were above the MPCA standard. The average one of the higher averages when compared to the rest of the sampling set. The average increased from the averages from 2008 (.134 mg/L), 2009 (.09 mg/L), 2010 (.22 mg/L), and 2012 (.12 mg/L). Rose Creek had the highest peak phosphorus concentration.

The orthophosphate sample average was the lowest average of this sample set. The sample average is on the low end of averages from 2008 (.04 mg/L) and 2009 (.05 mg/L), 2010 (.11 mg/L), and 2012 (.05 mg/L).

Suspended Solids

Total High: 318 mg/L Low: 2.0 mg/L Ave: 76.3 mg/L

2 of the 10 suspended solid samples were above the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). The average also exceeded the standard. The average is comparable to the averages 2008 (8.75 mg/L) and 2009 (17.6 mg/L), 2010 (90 mg/L), and 2011 (17.17 mg/L). Rose Creek had the highest TSS average and peak concentrations among all of the CRWD monitoring sites.

Transparency

High: 60 cm Low: 4 cm Ave: 20.7 cm

6 of the 10 samples fell below the 20 cm estimated standard. Rose Creek had the worst transparency readings when compared to the rest of the 2013 CRWD monitoring sites.

Turbidity

Field High: 256.4 FNU Low: 2.9 FNU Ave: 61.12 FNU

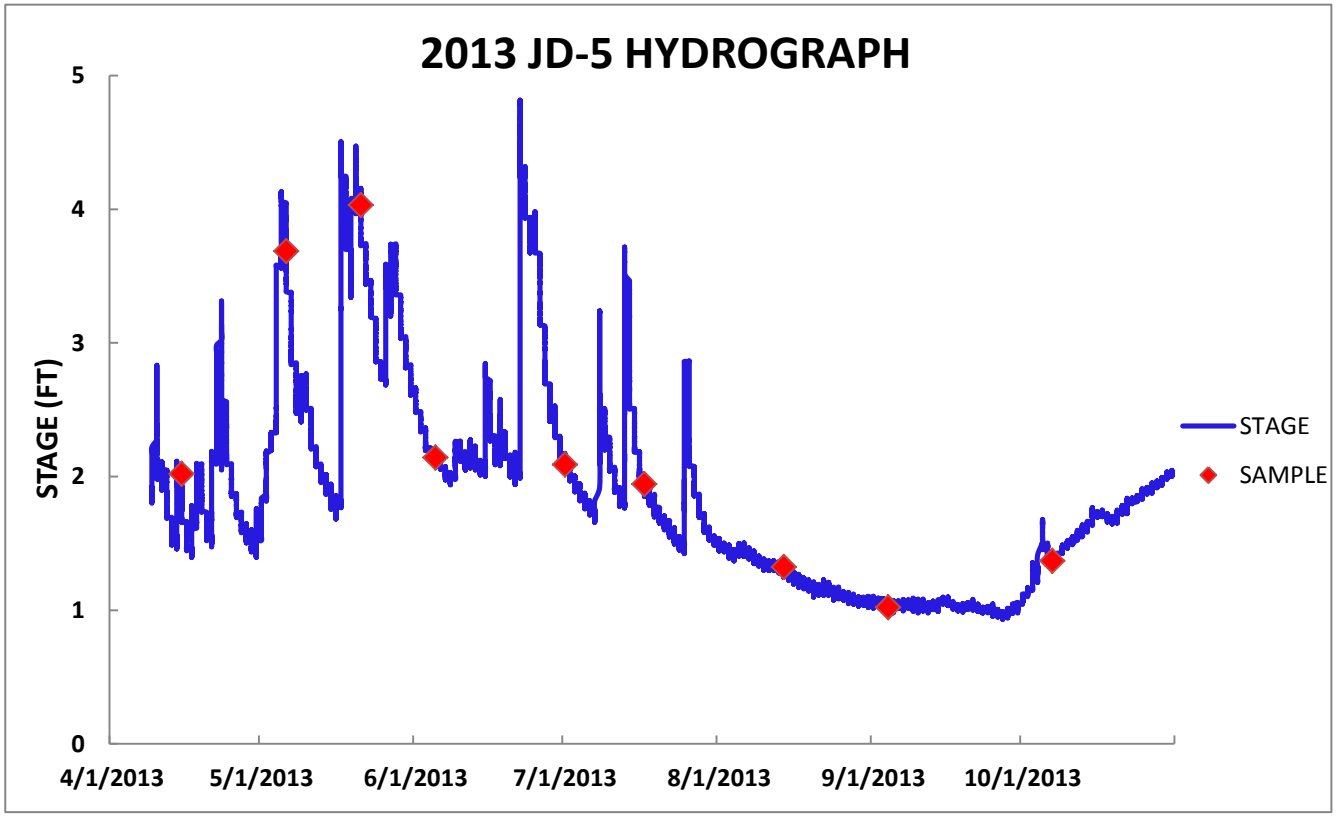
6 of the 10 field samples, along with the average turbidity exceeded the estimated MPCA standard (25 NTU). The average turbidity is the highest when compared to 2008 (3.1 FNU) and 2009 (11.8 FNU), 2010 (53.7 NTU), and 2012 (8.28 FNU).

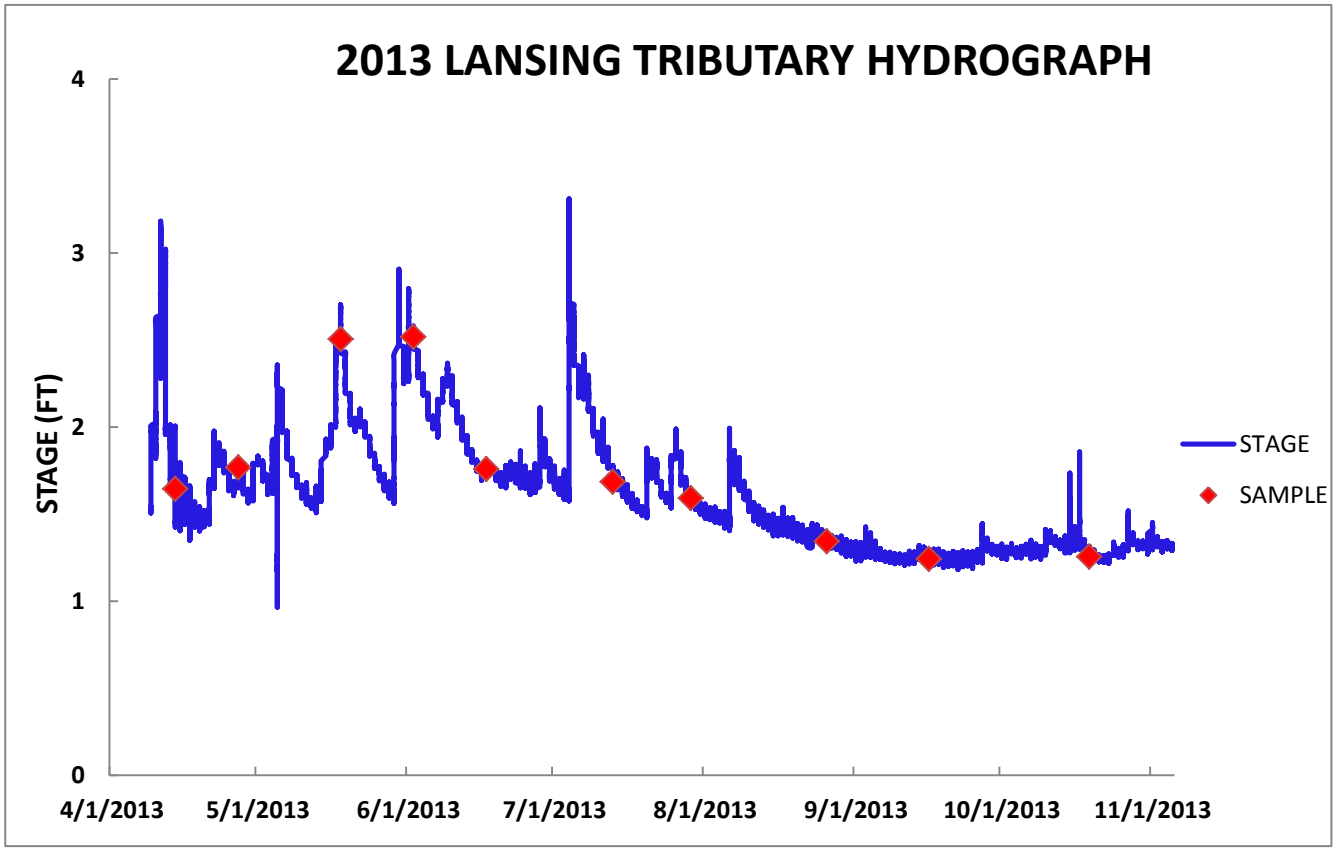
Water Temperature

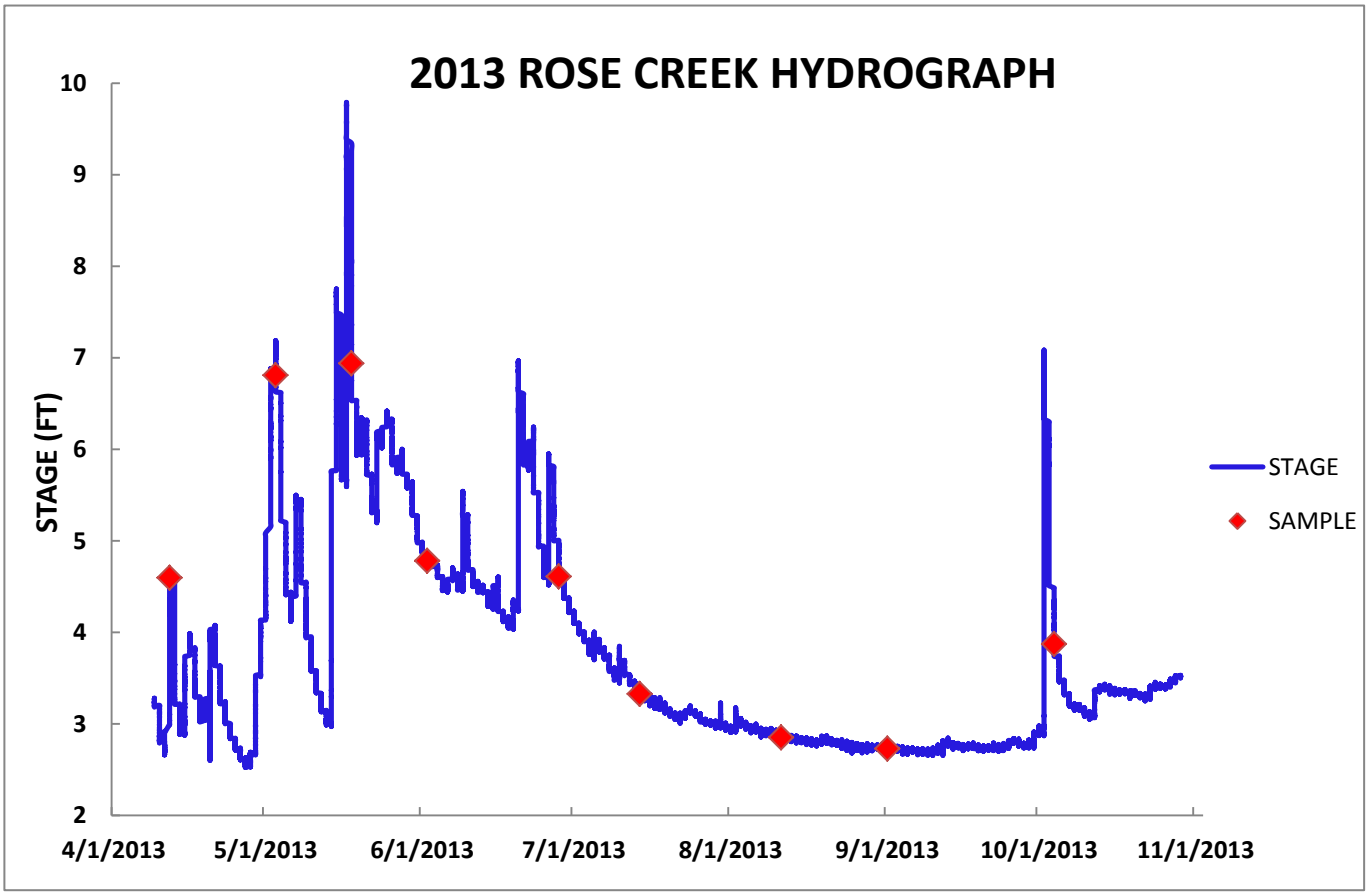
High: 25.25 Degrees Celcius Average: 13.41 Degrees Celcius

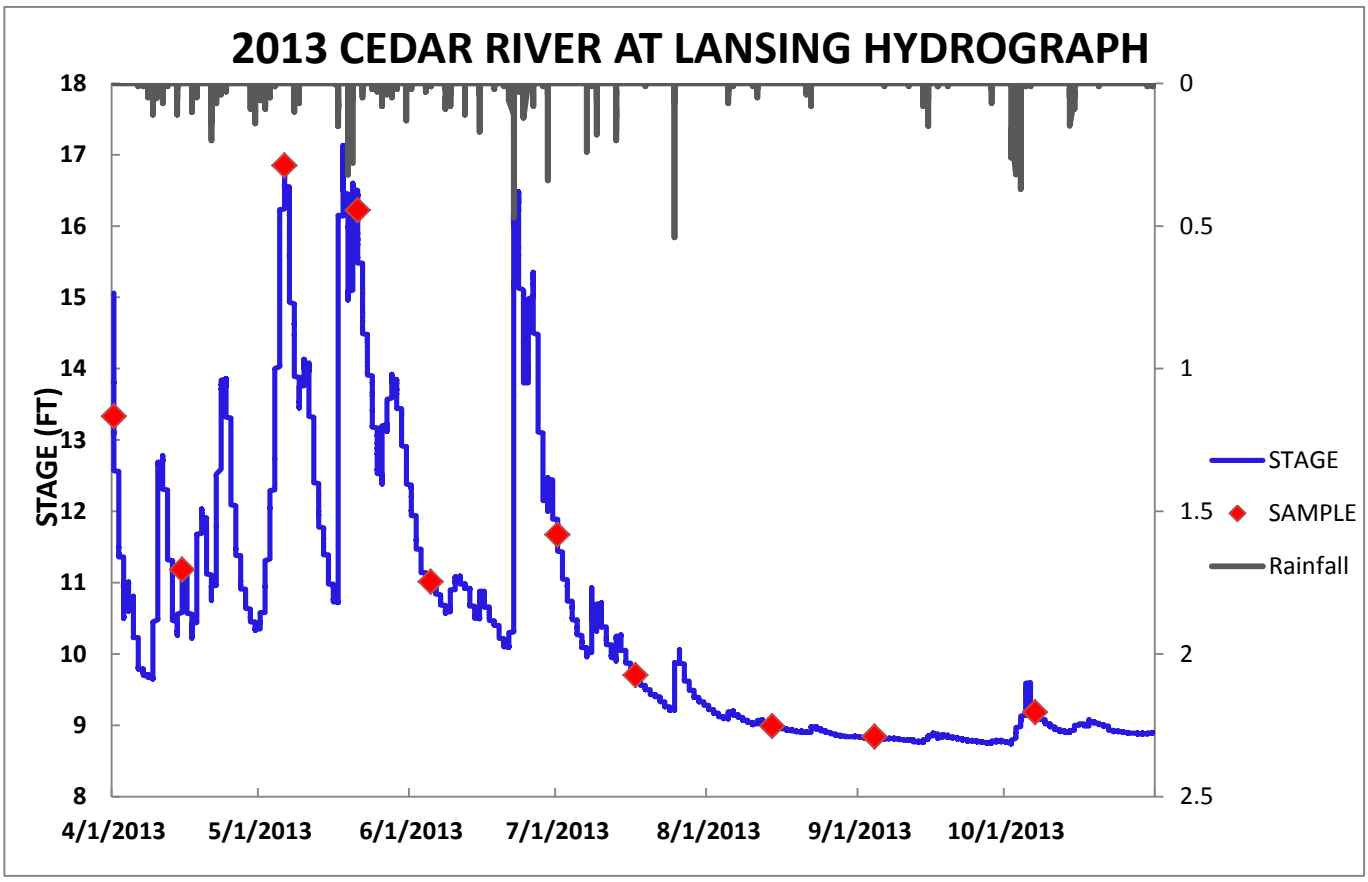
Rose Creek had the highest peak and average temperatures. This can be threatening to aquatic life.

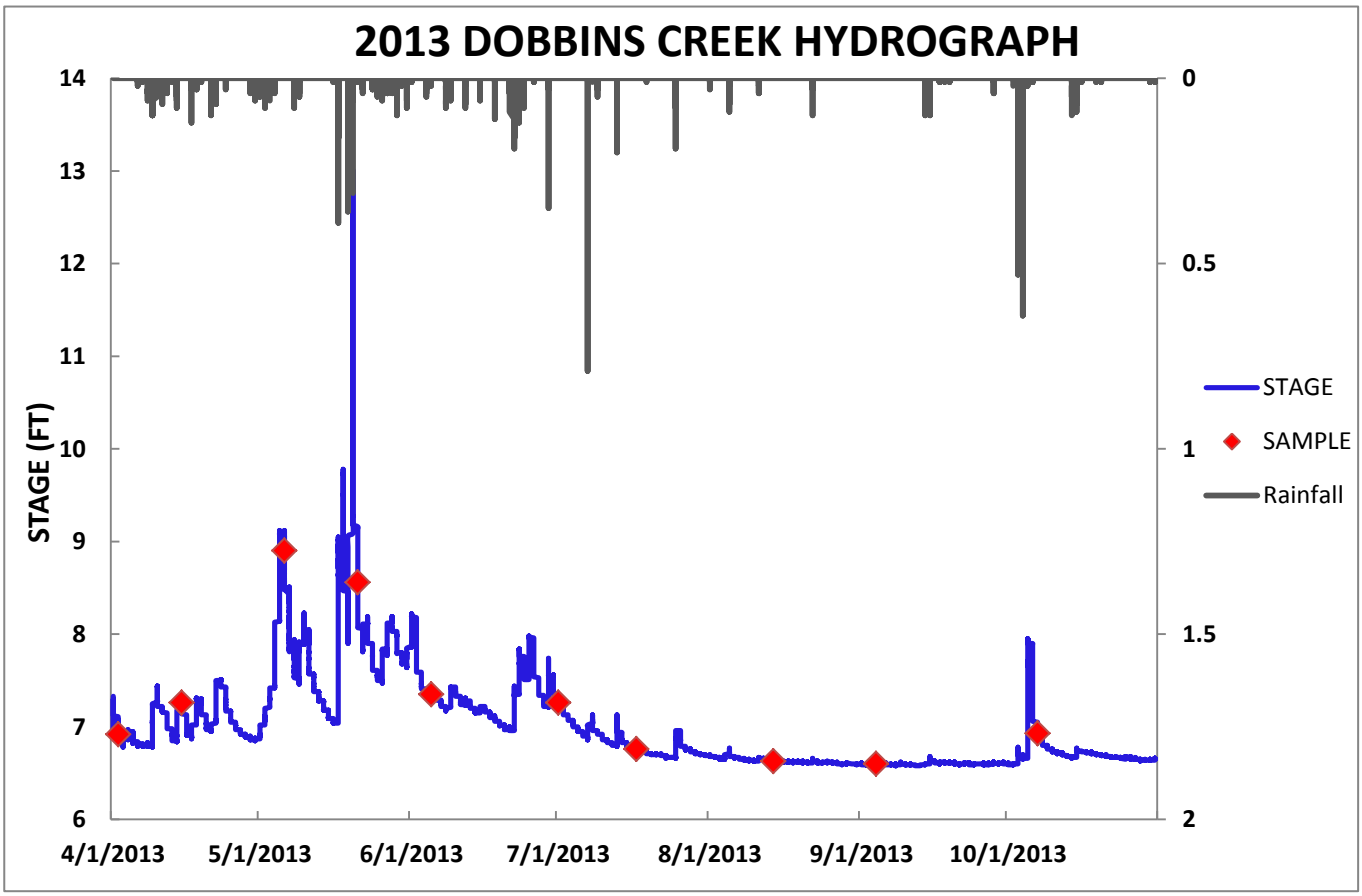
5. Charts

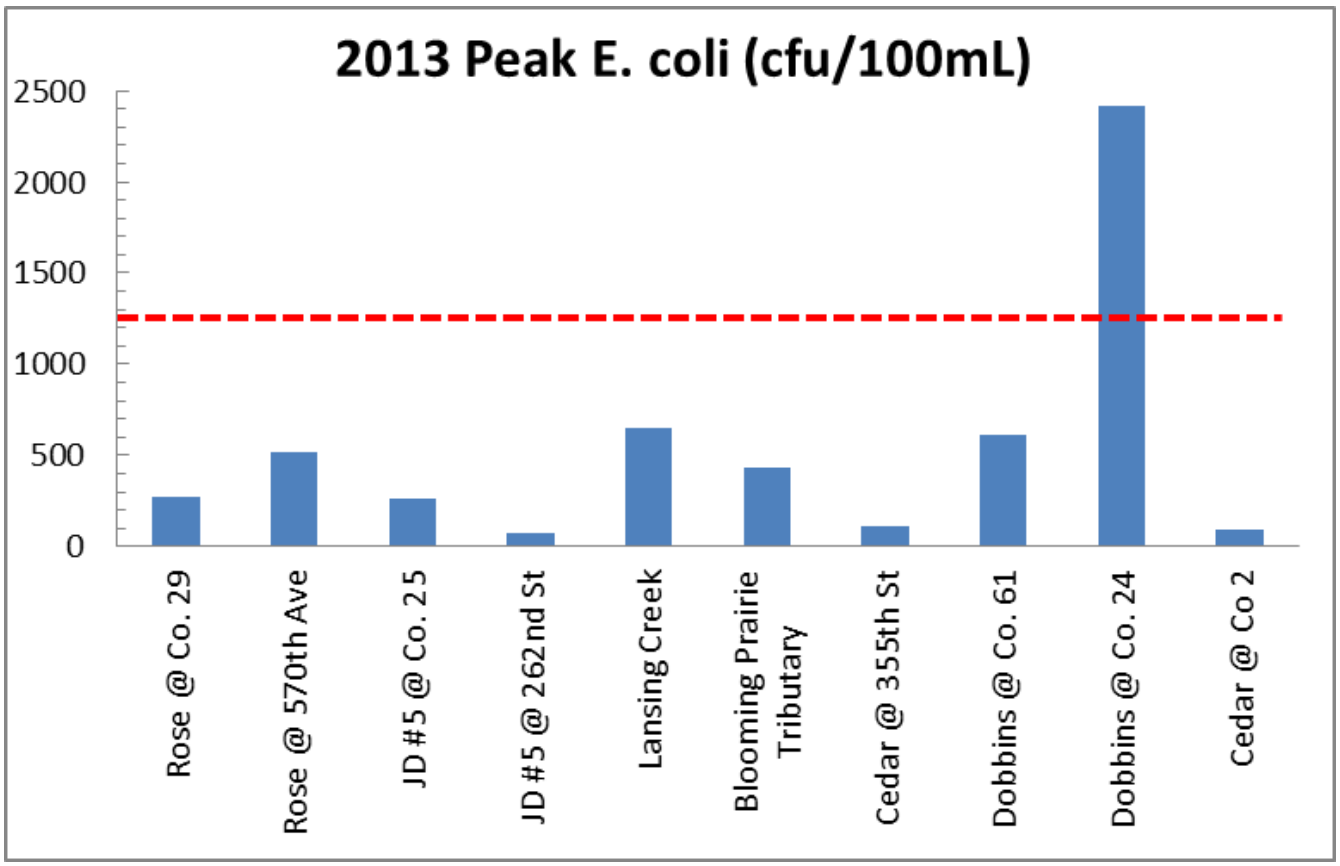

2013 JD-5 HYDROGRAPH
STAGE (FT)
0
1
2
3
4
5
4/1/2013
5/1/2013
6/1/2013
7/1/2013
8/1/2013
9/1/2013
10/1/2013
STAGE
SAMPLE

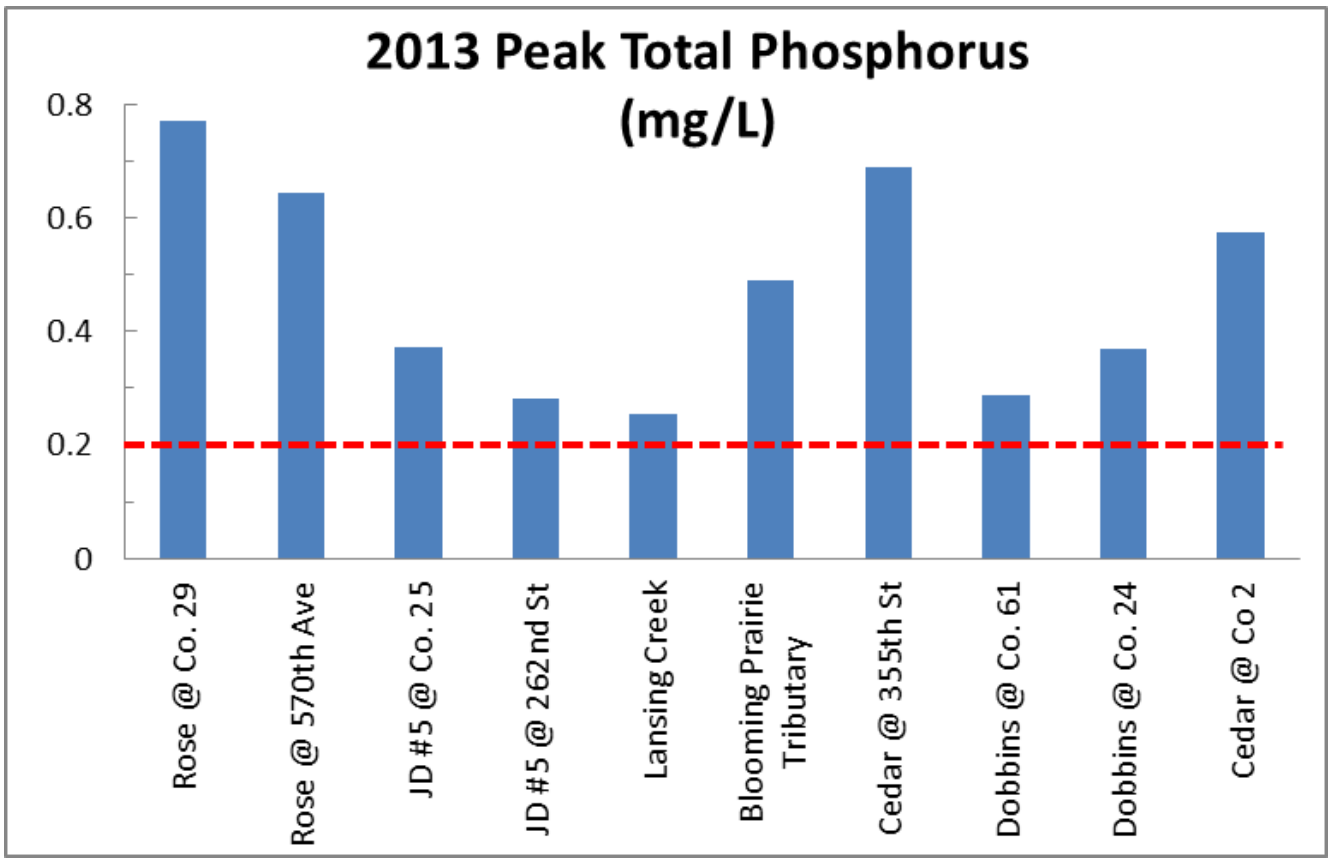

2013 LANSING TRIBUTARY HYDROGRAPH
STAGE (FT)
0
1
2
3
4
4/1/2013
5/1/2013
6/1/2013
7/1/2013
8/1/2013
9/1/2013
10/1/2013
11/1/2013
STAGE
SAMPLE

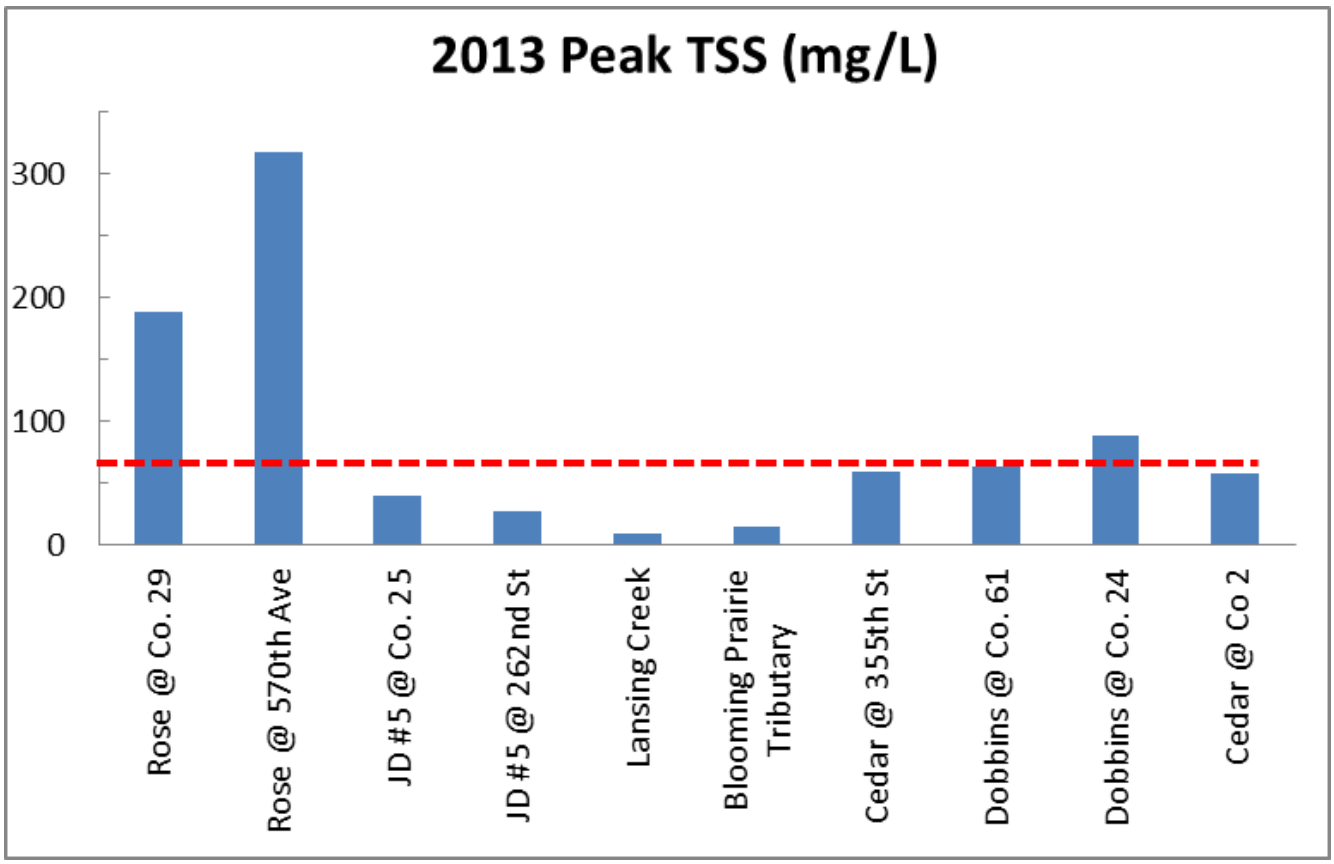

2013 ROSE CREEK HYDROGRAPH
STAGE (FT)
10
9
8
7
6
5
4
3
2
4/1/2013
5/1/2013
6/1/2013
7/1/2013
8/1/2013
9/1/2013
10/1/2013
11/1/2013
STAGE
SAMPLE

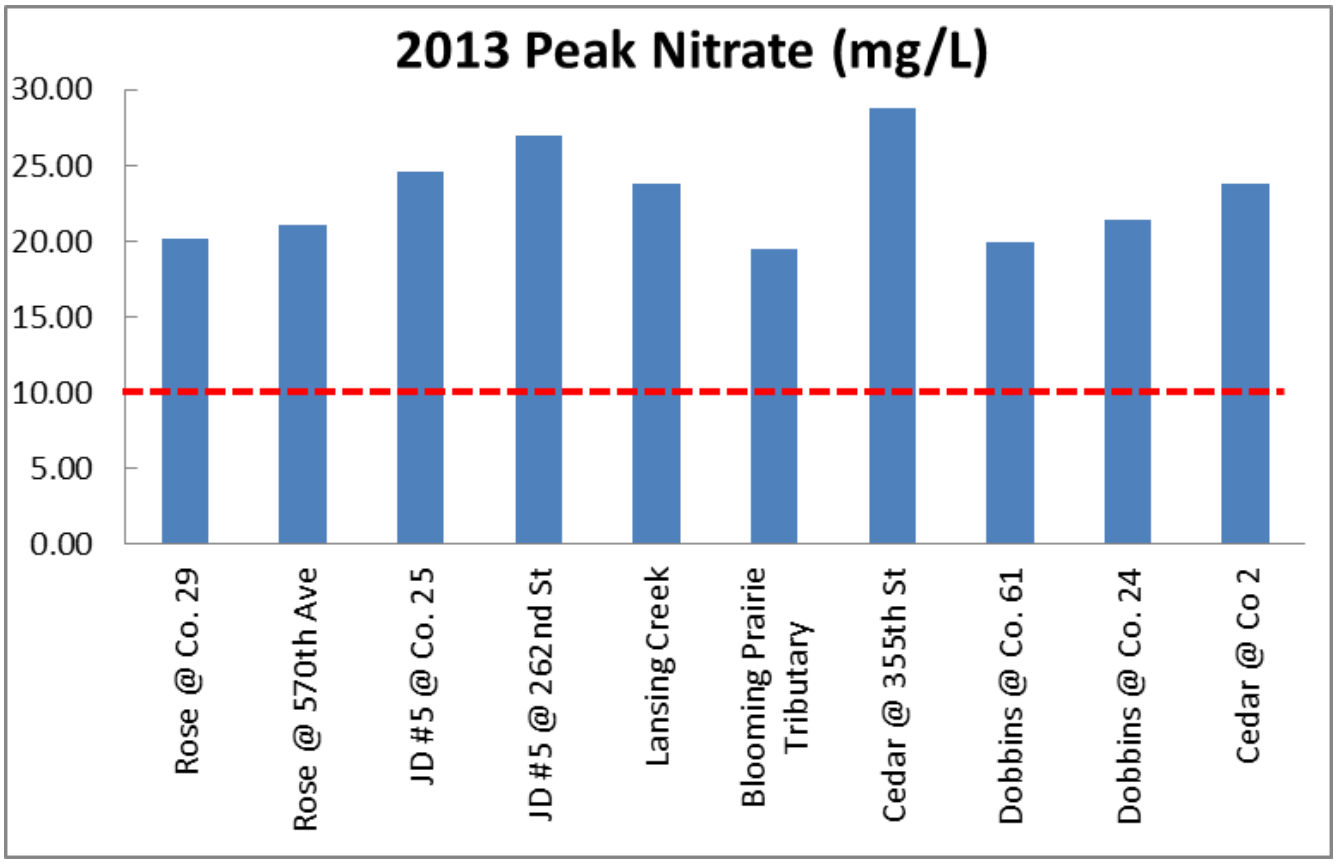

2013 CEDAR RIVER AT LANSING HYDROGRAPH
STAGE (FT)
18
17
16
15
14
13
12
11
10
9
8
0
0.5
1
1.5
2
2.5
4/1/2013
5/1/2013
6/1/2013
7/1/2013
8/1/2013
9/1/2013
10/1/2013
STAGE
SAMPLE
Rainfall

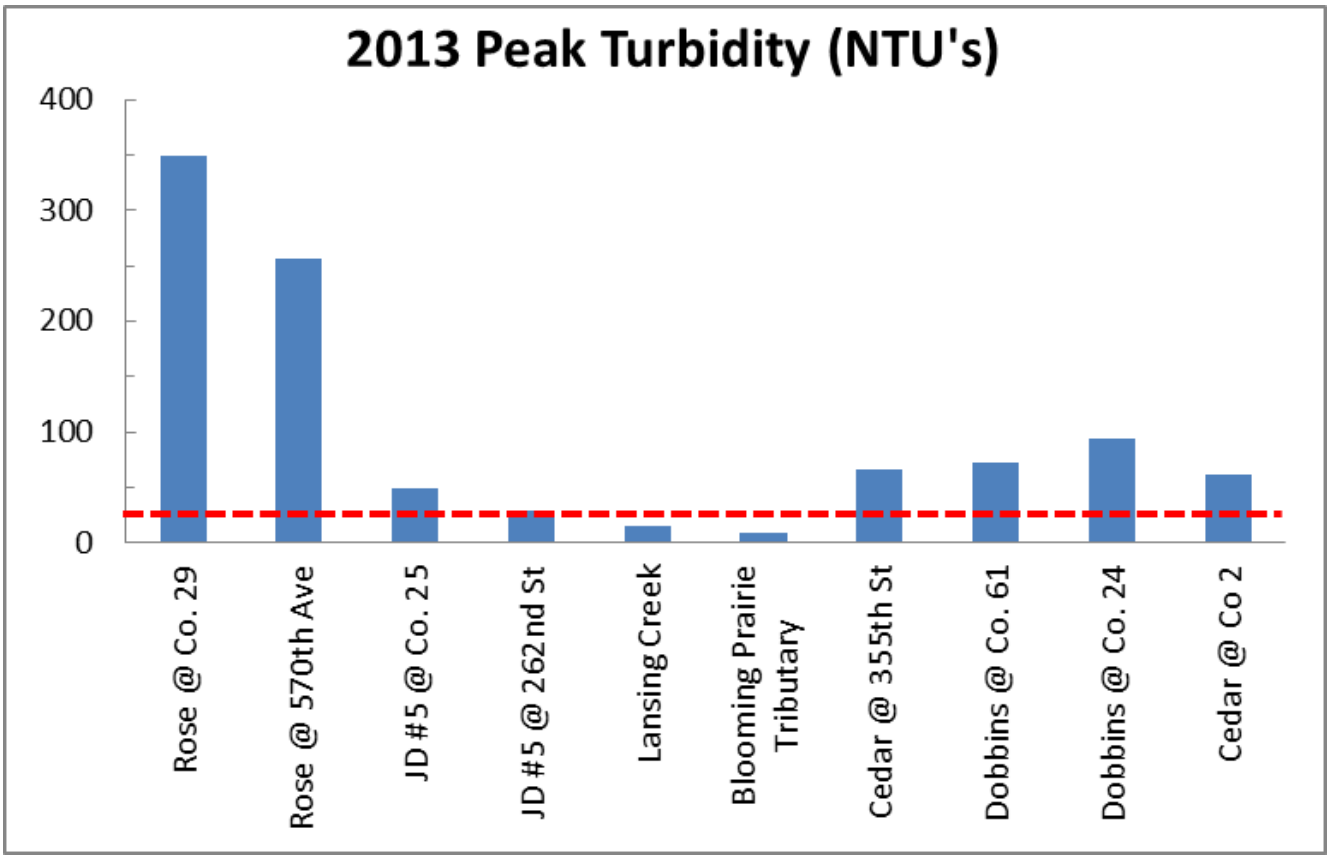

2013 DOBBINS CREEK HYDROGRAPH
STAGE (FT)
14
13
12
11
10
9
8
7
6
0
0.5
1
1.5
2
4/1/2013
5/1/2013
6/1/2013
7/1/2013
8/1/2013
9/1/2013
10/1/2013
STAGE
SAMPLE
Rainfall

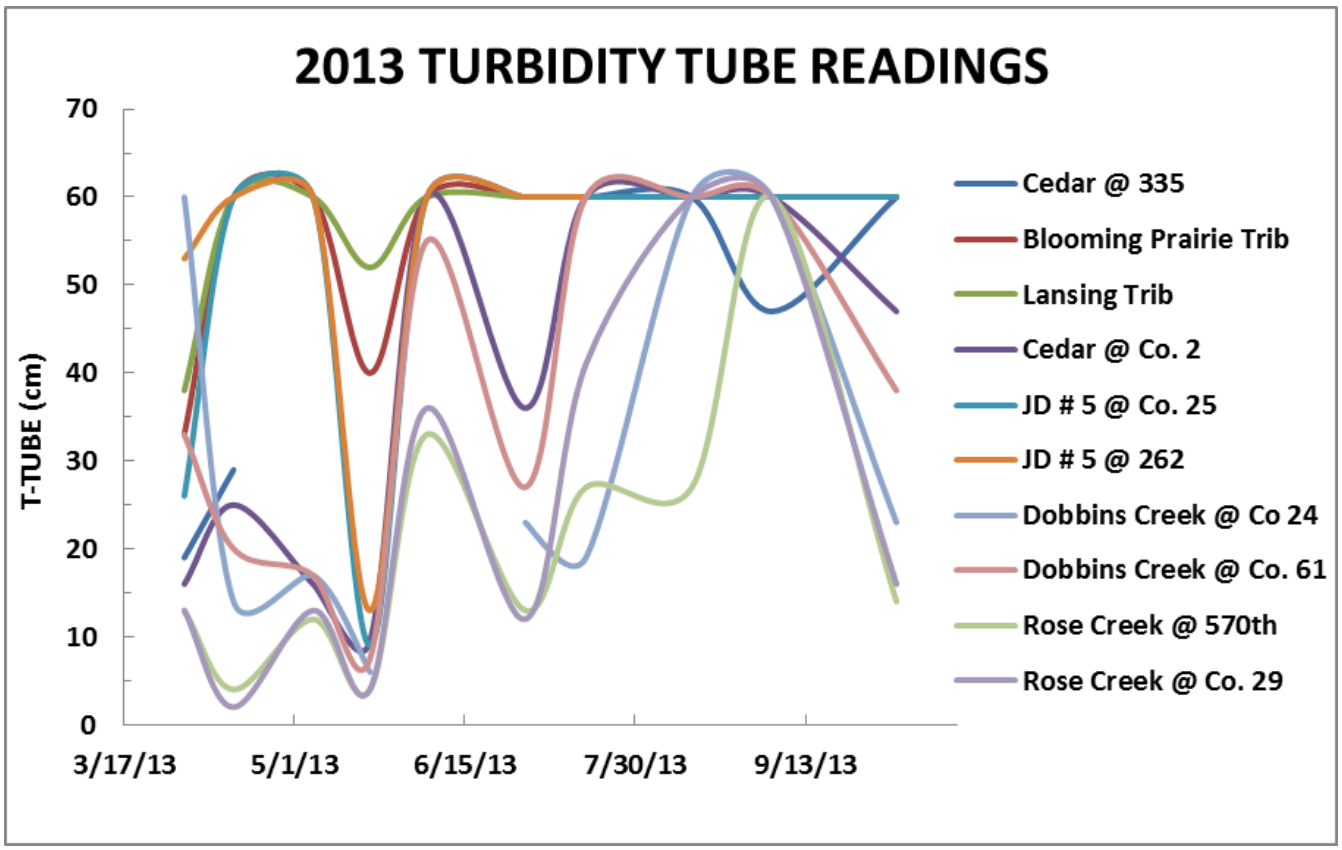

2013 Peak E. coli (cfu/100mL)
2500
2000
1500
1000
500
0
Rose @ Co. 29
Rose @ 570th Ave
JD #5 @ Co. 25
JD #5 @ 262nd St
Lansing Creek
Blooming Prairie Tributary
Cedar @ 355th St
Dobbins @ Co. 61
Dobbins @ Co. 24
Cedar @ Co 2

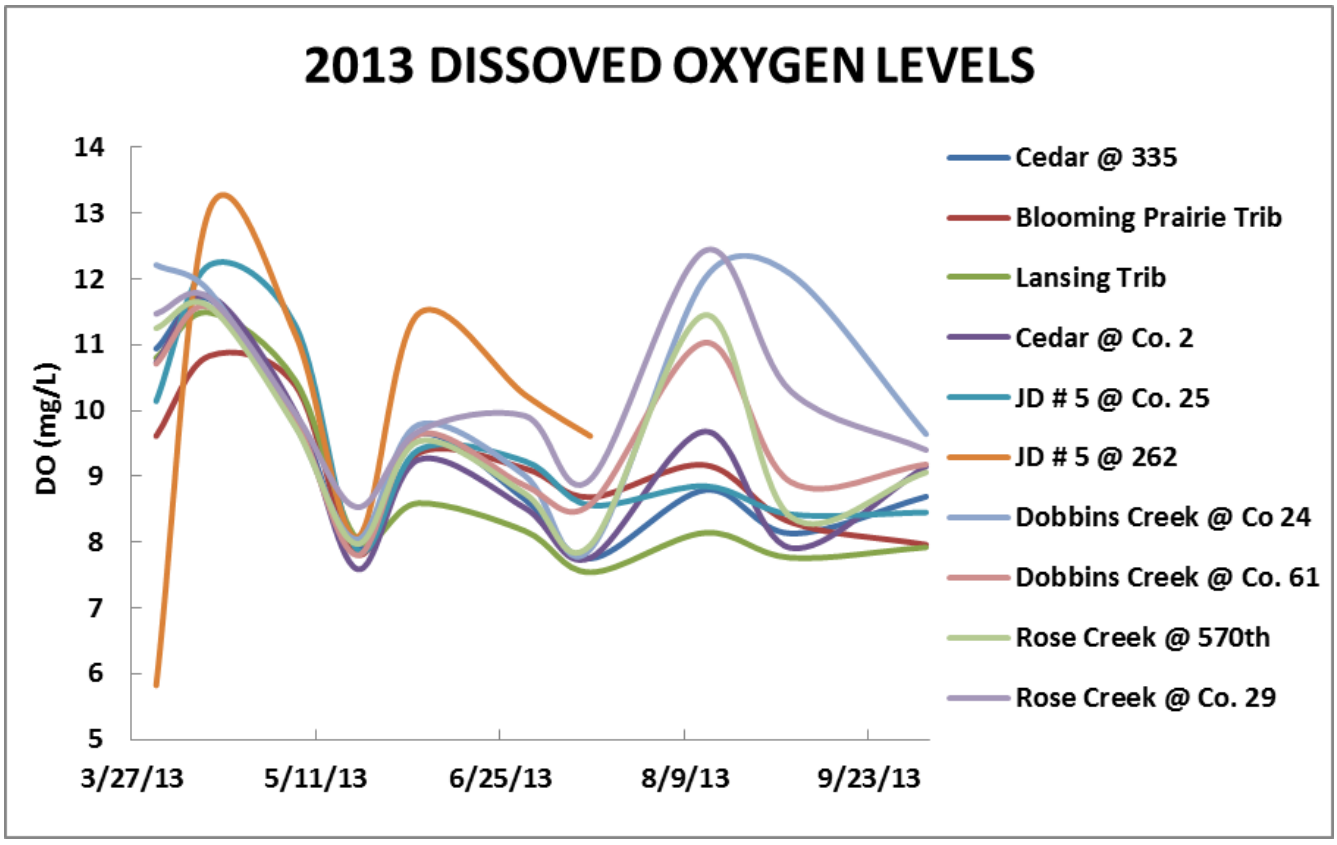

2013 Peak Total Phosphorus (mg/L)
0.8
0.6
0.4
0.2
0
Rose @ Co. 29
Rose @ 570th Ave
JD #5 @ Co. 25
JD #5 @ 262nd St
Lansing Creek
Blooming Prairie Tributary
Cedar @ 355th St
Dobbins @ Co. 61
Dobbins @ Co. 24
Cedar @ Co 2

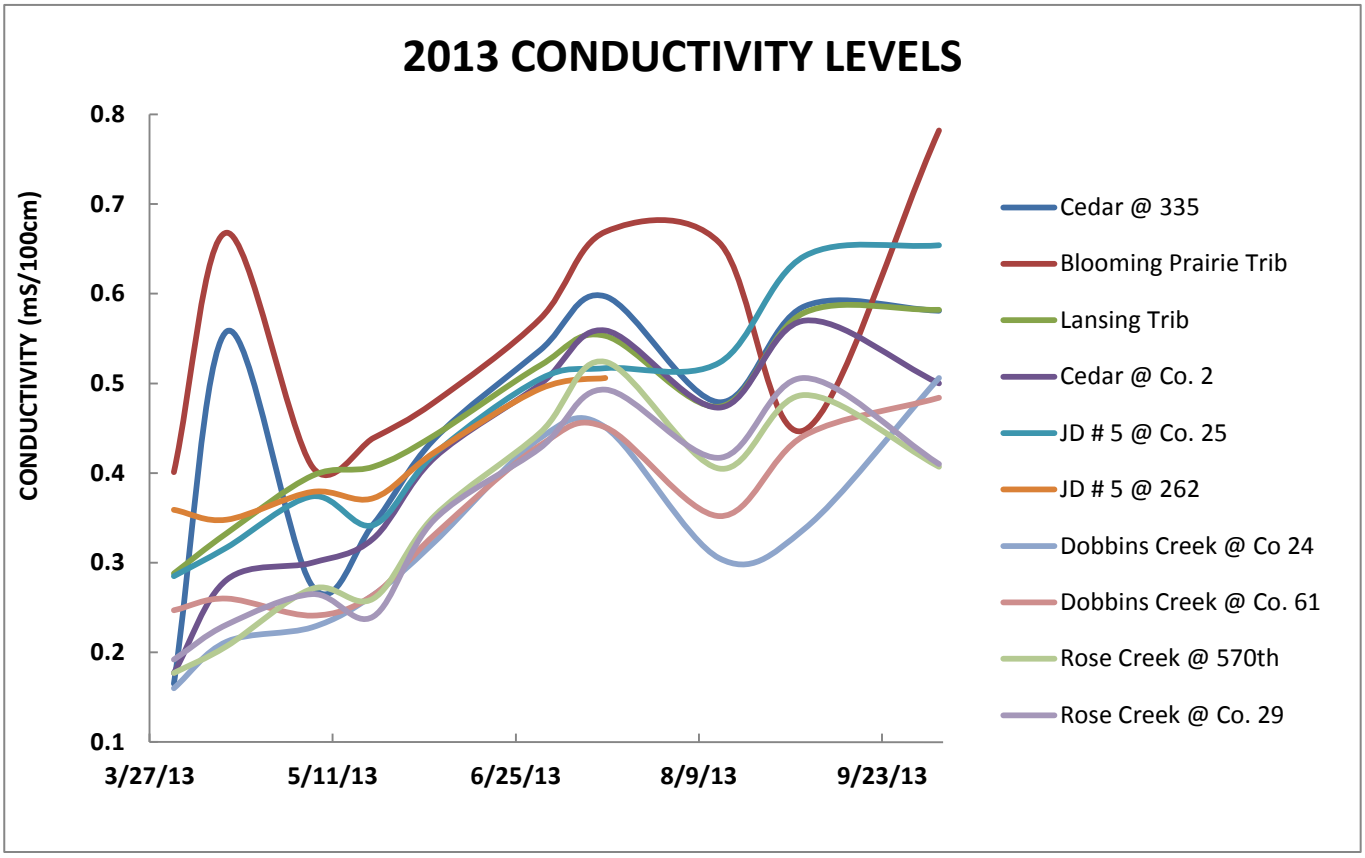

2013 Peak TSS (mg/L)
300
200
100
0
Rose @ Co. 29
Rose @ 570th Ave
JD #5 @ Co. 25
JD #5 @ 262nd St
Lansing Creek
Blooming Prairie Tributary
Cedar @ 355th St
Dobbins @ Co. 61
Dobbins @ Co. 24
Cedar @ Co 2

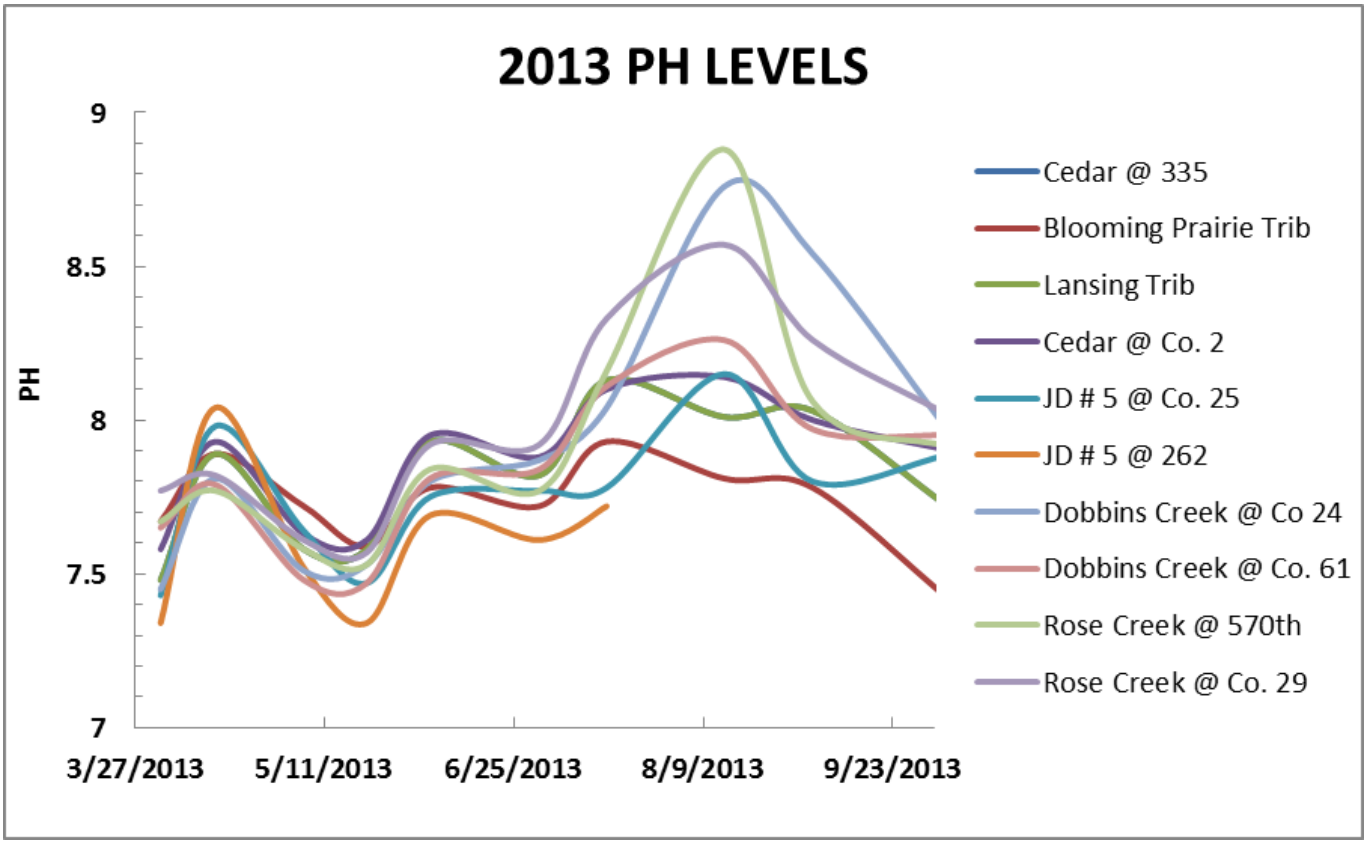

2013 Peak Nitrate (mg/L)
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Rose @ Co. 29
Rose @ 570th Ave
JD #5 @ Co. 25
JD #5 @ 262nd St
Lansing Creek
Blooming Prairie Tributary
Cedar @ 355th St
Dobbins @ Co. 61
Dobbins @ Co. 24
Cedar @ Co 2

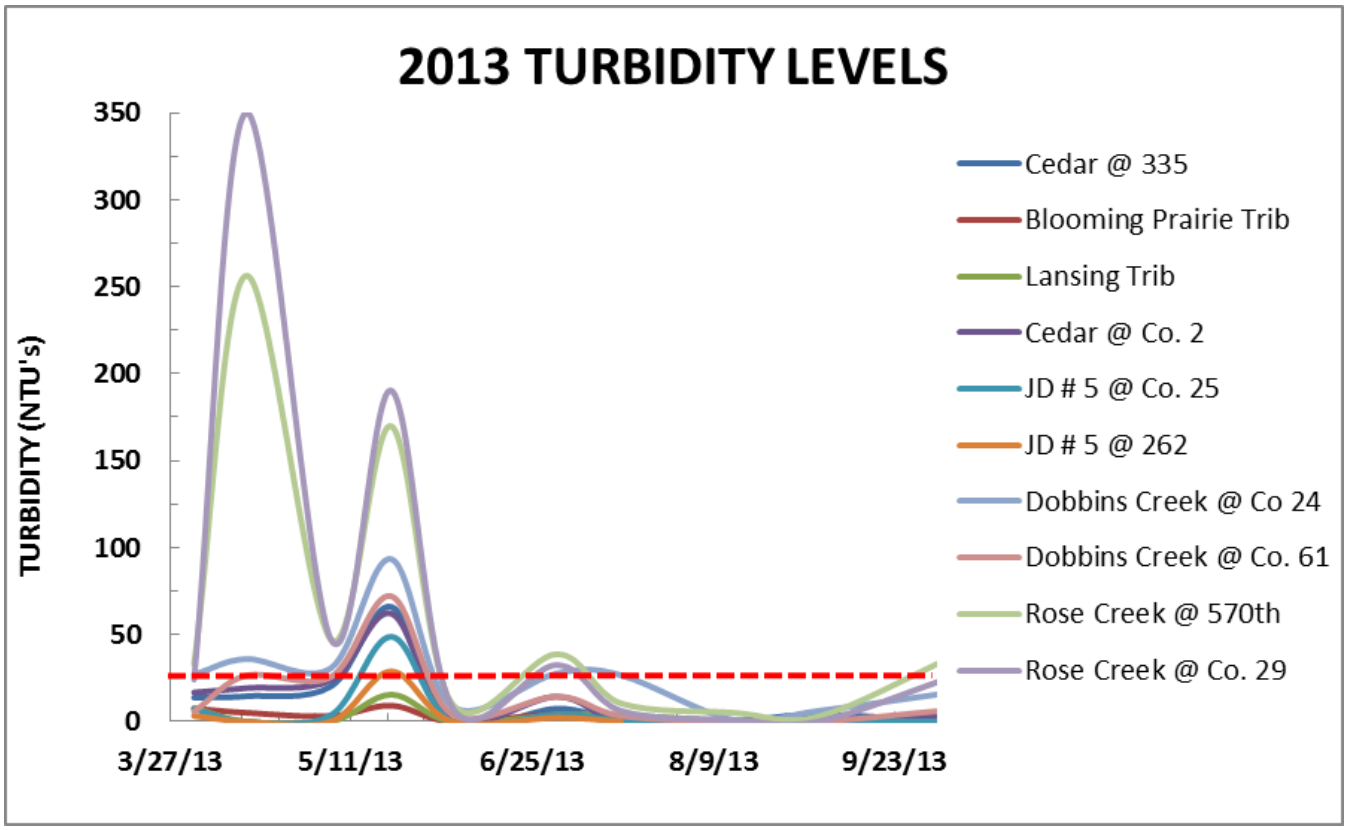

2013 Peak Turbidity (NTU's)
400
300
200
100
0
Rose @ Co. 29
Rose @ 570th Ave
JD #5 @ Co. 25
JD #5 @ 262nd St
Lansing Creek
Blooming Prairie Tributary
Cedar @ 355th St
Dobbins @ Co. 61
Dobbins @ Co. 24
Cedar @ Co 2

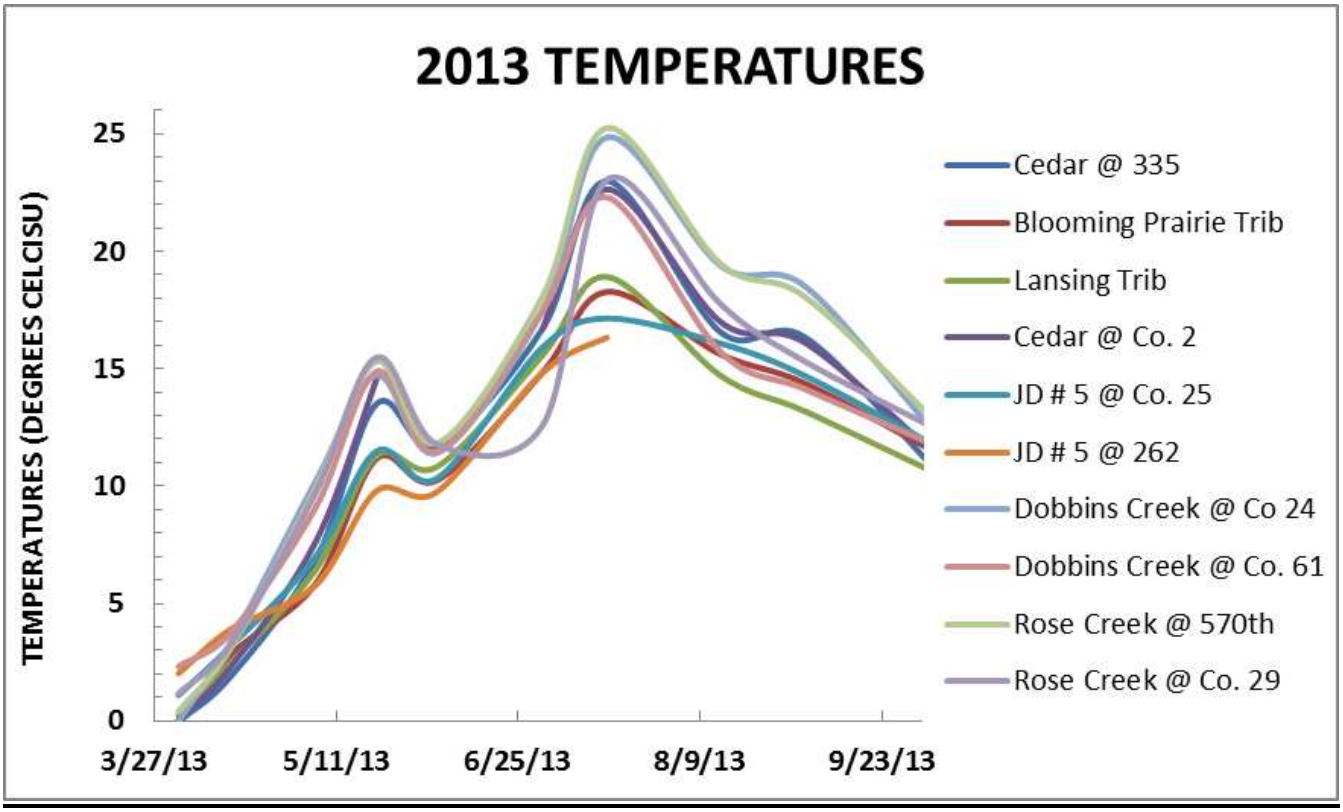

2013 TURBIDITY TUBE READINGS
T-TUBE (cm)
70
60
50
40
30
20
10
0
3/17/13
5/1/13
6/15/13
7/30/13
9/13/13
Cedar @ 335
Blooming Prairie Trib
Lansing Trib
Cedar @ Co. 2
JD # 5 @ Co. 25
JD # 5 @ 262
Dobbins Creek @ Co 24
Dobbins Creek @ Co. 61
Rose Creek @ 570th
Rose Creek @ Co. 29

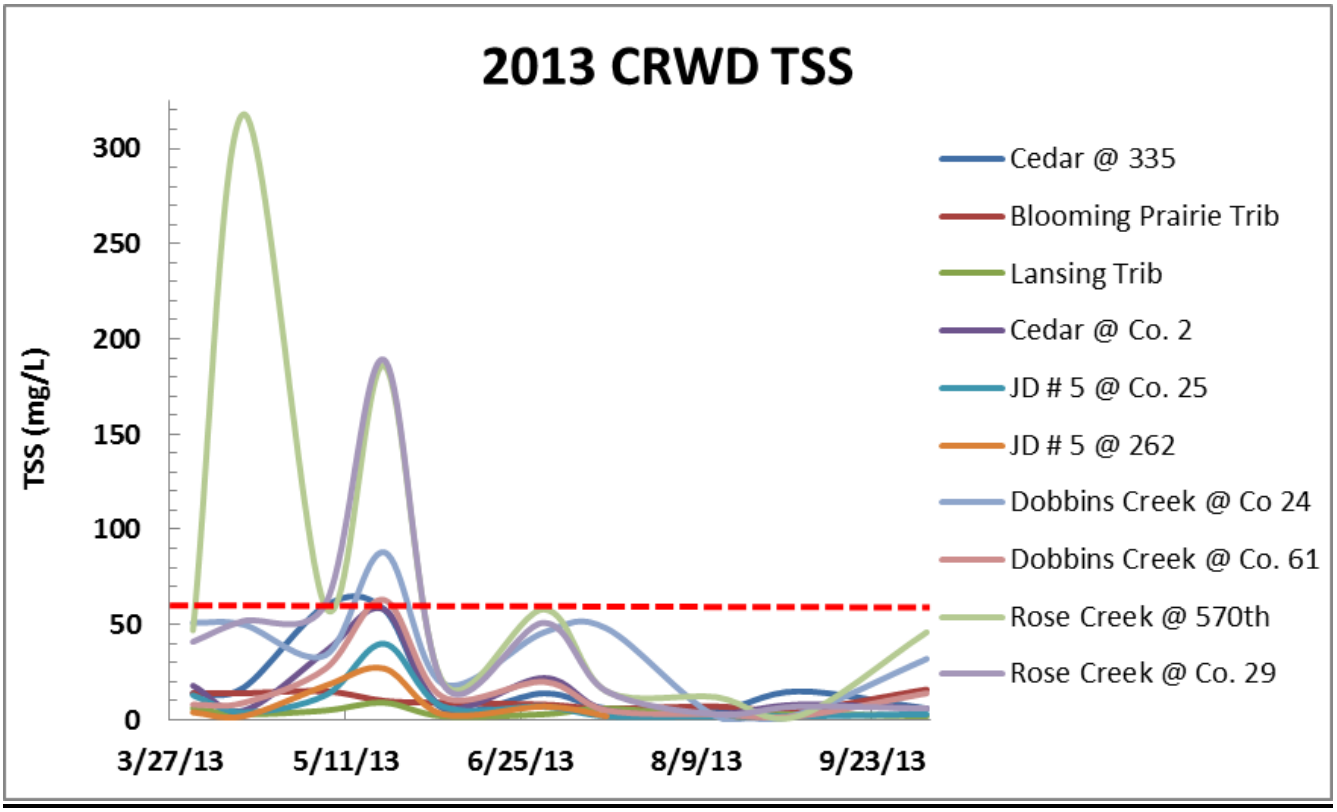

2013 DISSOVED OXYGEN LEVELS
DO (mg/L)
14
13
12
11
10
9
8
7
6
5
3/27/13
5/11/13
6/25/13
8/9/13
9/23/13
Cedar @ 335
Blooming Prairie Trib
Lansing Trib
Cedar @ Co. 2
JD # 5 @ Co. 25
JD # 5 @ 262
Dobbins Creek @ Co 24
Dobbins Creek @ Co. 61
Rose Creek @ 570th
Rose Creek @ Co. 29

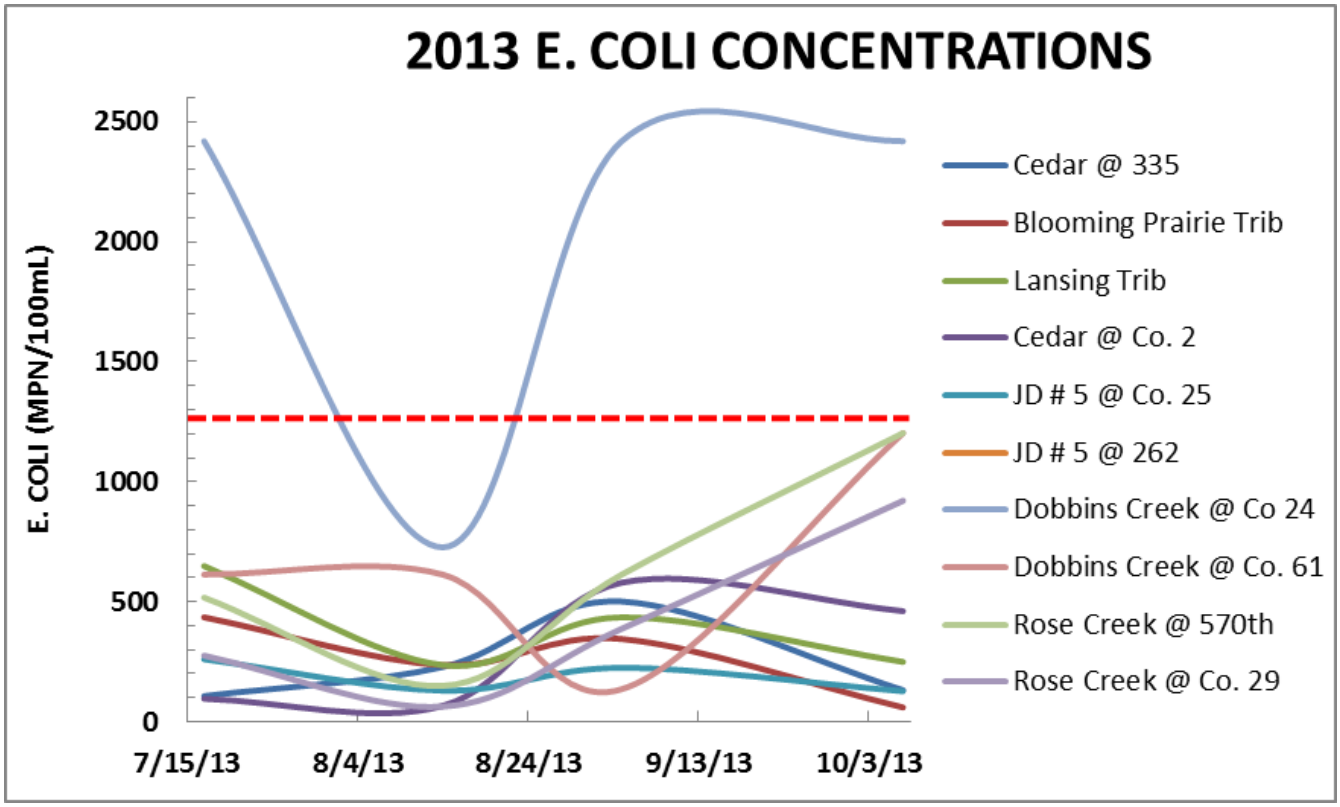

2013 CONDUCTIVITY LEVELS
CONDUCTIVITY (mS/100cm)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
3/27/13
5/11/13
6/25/13
8/9/13
9/23/13
Cedar @ 335
Blooming Prairie Trib
Lansing Trib
Cedar @ Co. 2
JD # 5 @ Co. 25
JD # 5 @ 262
Dobbins Creek @ Co 24
Dobbins Creek @ Co. 61
Rose Creek @ 570th
Rose Creek @ Co. 29

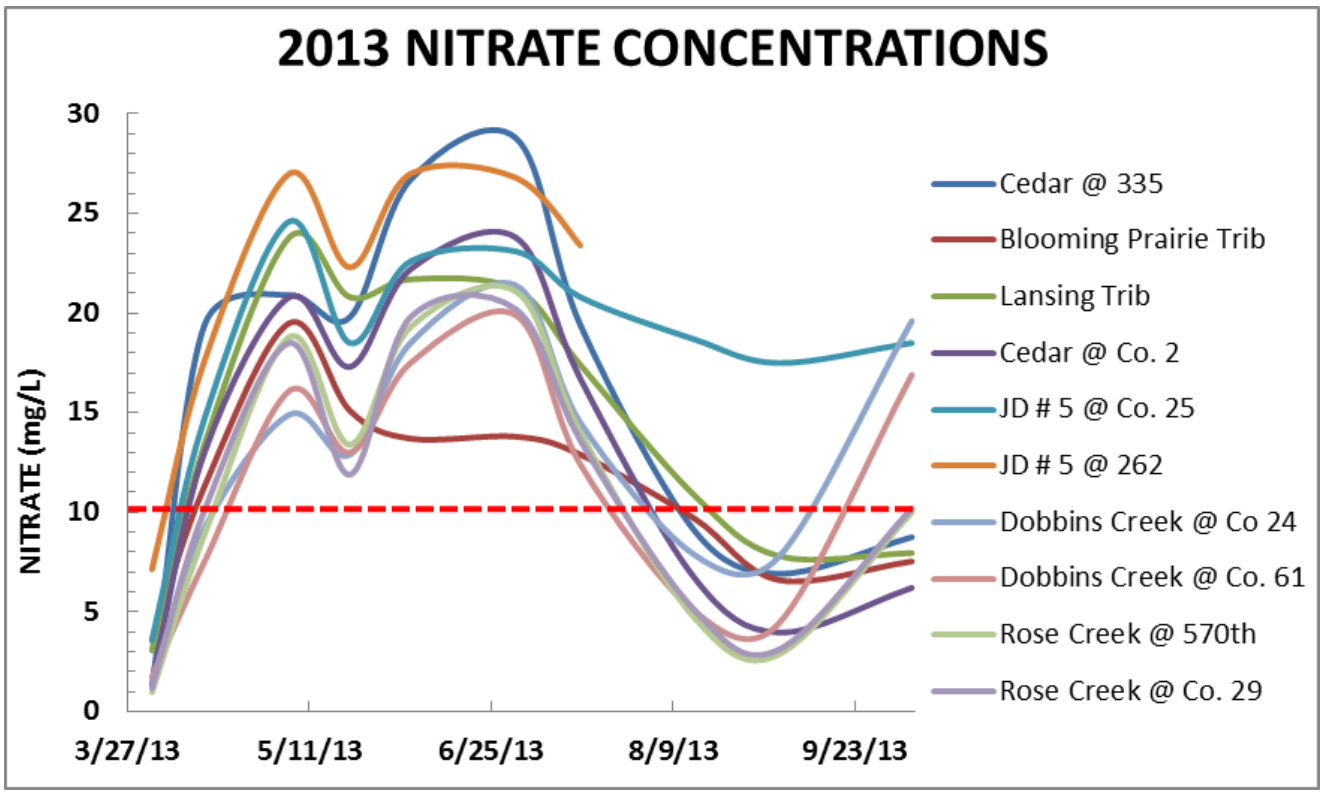

2013 PH LEVELS
PH
9
8.5
8
7.5
7
3/27/2013
5/11/2013
6/25/2013
8/9/2013
9/23/2013
Cedar @ 335
Blooming Prairie Trib
Lansing Trib
Cedar @ Co. 2
JD # 5 @ Co. 25
JD # 5 @ 262
Dobbins Creek @ Co 24
Dobbins Creek @ Co. 61
Rose Creek @ 570th
Rose Creek @ Co. 29

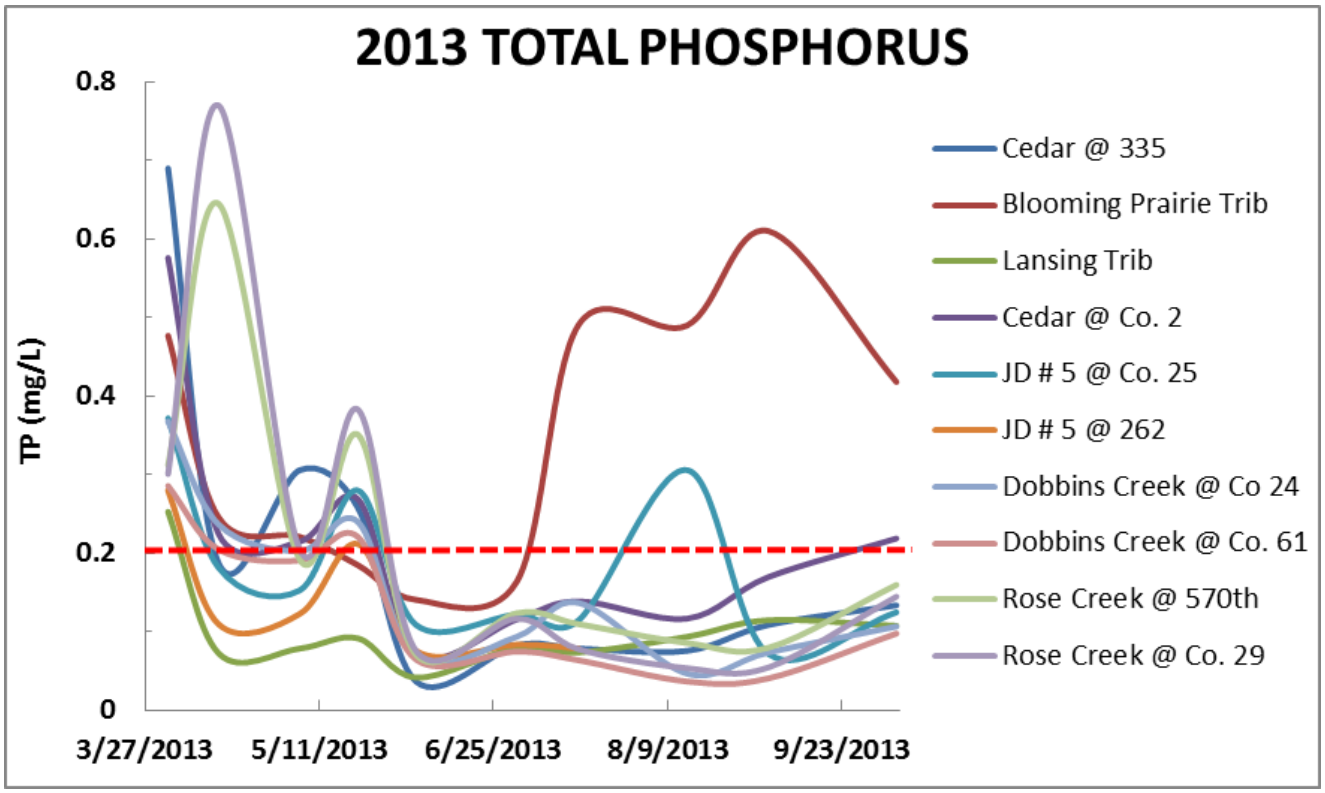

2013 TURBIDITY LEVELS
TURBIDITY (NTU's)
350
300
250
200
150
100
50
0
3/27/13
5/11/13
6/25/13
8/9/13
9/23/13
Cedar @ 335
Blooming Prairie Trib
Lansing Trib
Cedar @ Co. 2
JD # 5 @ Co. 25
JD # 5 @ 262
Dobbins Creek @ Co 24
Dobbins Creek @ Co. 61
Rose Creek @ 570th
Rose Creek @ Co. 29

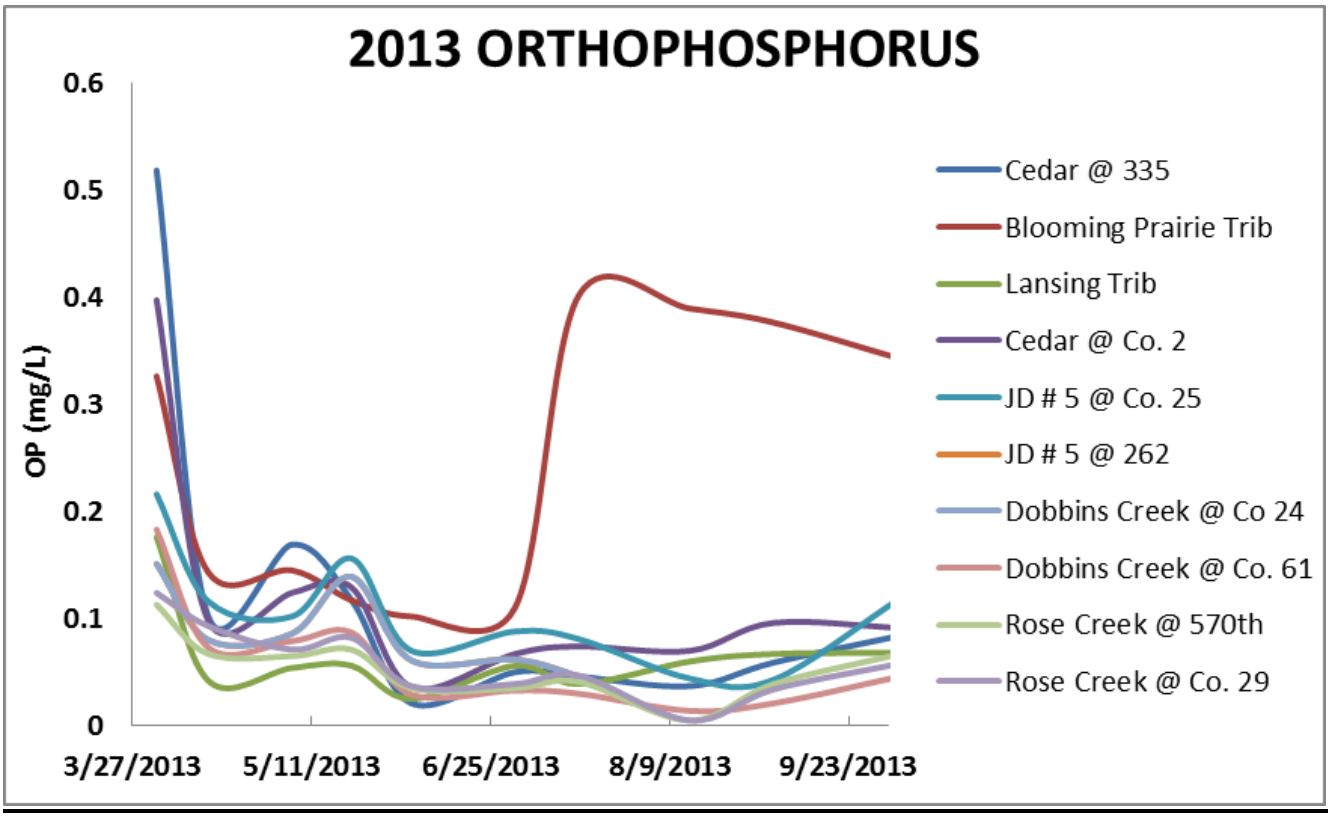

2013 TEMPERATURES
TEMPERATURES (DEGREES CELCISU)
25
20
15
10
5
0
3/27/13
5/11/13
6/25/13
8/9/13
9/23/13
Cedar @ 335
Blooming Prairie Trib
Lansing Trib
Cedar @ Co. 2
JD # 5 @ Co. 25
JD # 5 @ 262
Dobbins Creek @ Co 24
Dobbins Creek @ Co. 61
Rose Creek @ 570th
Rose Creek @ Co. 29


2013 CRWD TSS
TSS (mg/L)
300
250
200
150
100
50
0
3/27/13
5/11/13
6/25/13
8/9/13
9/23/13
Cedar @ 335
Blooming Prairie Trib
Lansing Trib
Cedar @ Co. 2
JD # 5 @ Co. 25
JD # 5 @ 262
Dobbins Creek @ Co 24
Dobbins Creek @ Co. 61
Rose Creek @ 570th
Rose Creek @ Co. 29


2013 E. COLI CONCENTRATIONS
E. COLI (MPN/100mL)
2500
2000
1500
1000
500
0
7/15/13
8/4/13
8/24/13
9/13/13
10/3/13
Cedar @ 335
Blooming Prairie Trib
Lansing Trib
Cedar @ Co. 2
JD # 5 @ Co. 25
JD # 5 @ 262
Dobbins Creek @ Co 24
Dobbins Creek @ Co. 61
Rose Creek @ 570th
Rose Creek @ Co. 29


2013 NITRATE CONCENTRATIONS
NITRATE (mg/L)
30
25
20
15
10
5
0
3/27/13
5/11/13
6/25/13
8/9/13
9/23/13
Cedar @ 335
Blooming Prairie Trib
Lansing Trib
Cedar @ Co. 2
JD # 5 @ Co. 25
JD # 5 @ 262
Dobbins Creek @ Co 24
Dobbins Creek @ Co. 61
Rose Creek @ 570th
Rose Creek @ Co. 29


2013 TOTAL PHOSPHORUS
TP (mg/L)
0.8
0.6
0.4
0.2
0
3/27/2013
5/11/2013
6/25/2013
8/9/2013
9/23/2013
Cedar @ 335
Blooming Prairie Trib
Lansing Trib
Cedar @ Co. 2
JD # 5 @ Co. 25
JD # 5 @ 262
Dobbins Creek @ Co 24
Dobbins Creek @ Co. 61
Rose Creek @ 570th
Rose Creek @ Co. 29



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