

# Cedar River Watershed 2008

## *Surface Water Monitoring Report*



## **1. Executive Summary**

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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 2008, the Watershed District received a Clean Water Legacy: Surface Water Assessment Grant from the state of Minnesota. The grant allowed for staff and volunteers to monitor stream sites and will run for one more monitoring season. The following sites were covered by this grant and sampled by the Mower SWCD:

- Blooming Prairie tributary at Mower Co. 1
- Cedar River at 335<sup>th</sup> St
- East Fork of the Cedar River at Dodge Co. 2
- JD #5 at Mower Co. 25
- Lansing Tributary at Mower Co. 2
- Murphy Creek at Taylor Ave Crossing
- Orchard Creek at Minnesota HWY 105
- Rose Creek at Mower Co. 29
- Roberts Creek at 550<sup>th</sup> Ave
- Wolf Creek at Mower Co. 16
- Woodbury Creek at Mower Co. 6

These sites were sampled by volunteers:

- Cedar River South of I-90
- North Branch of Dobbins Creek at Hormel Nature Center
- Orchard Creek at Minnesota HWY 105

The Cedar River basin also began baseline sampling for the turbidity TMDL (Total Maximum Daily Load). This began at the end of July and will run for 2 more monitoring seasons. In addition to adding the 6 sites below, continuous stage monitors were added to 11 of the Clean Water Legacy sites through the TMDL. The following sites were covered through the TMDL monitoring:

- Cedar River at Mower Co. 2
- Cedar River at Mower Co. 28
- Dobbins at Mower Co. 19
- Dobbins Creek at Mower Co. 61
- Middle Fork of the Little Cedar River at Minnesota HWY 30
- Rose Creek at 570<sup>th</sup> Ave

**2008 Highlights:**

- Total precipitation was 29.62 inches with the normal average precipitation for this area of 31.97 inches.
- A major flood occurred in June
  - Dobbins Creek crested at 18.95 feet, the 2<sup>nd</sup> highest recorded, over seven feet over flood stage (11.5)
  - Cedar River at County 28 crested at 21.4 feet, the 3<sup>rd</sup> highest recorded, 10 feet over flood stage (11.0)
  - Cedar River at the Waste Water Treatment Plant crested at 22.4 feet, the 3<sup>rd</sup> highest recorded, over 7 feet over flood stage (15.0)
  - Cedar River at Mower County 2 crested at 20.5 feet, the 4<sup>th</sup> highest recorded, 3.5 feet over flood stage (18.0)
- Total suspended solids concentrations ranged from <2 mg/L to 720 mg/L compared to the state guideline of 60 mg/L
- E. Coli concentrations ranged from 58 mpn/100mL to 2,419 mpn/100mL compared to the state guideline that is one sample over 1260 mpn/100mL

## **2. Monitoring Program**

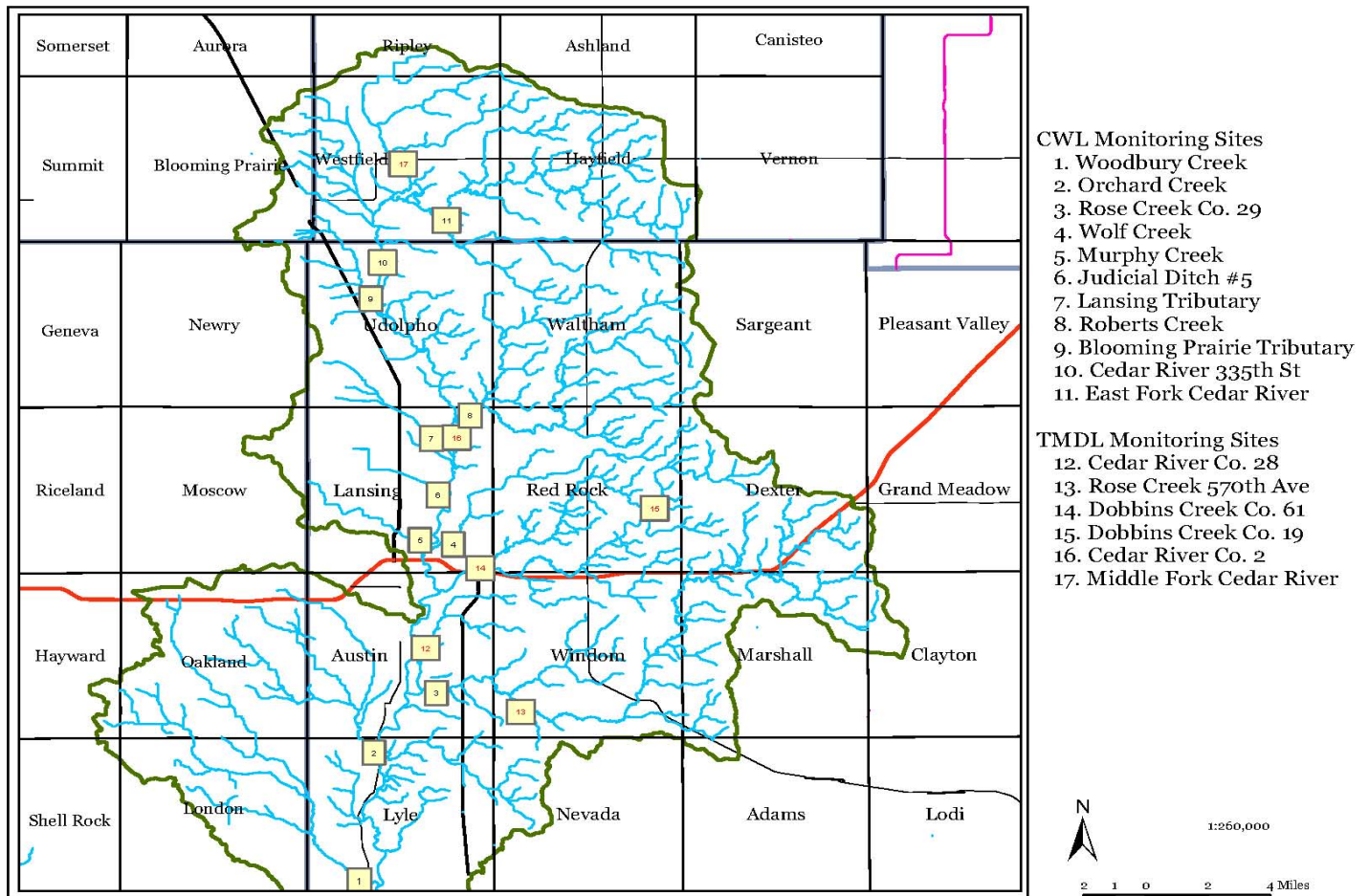
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This is the first year of the Cedar River Watershed District and represents the first year on its monitoring efforts. The purpose of the Clean Water Legacy: Surface Water Assessment Grant is to insure that all of Minnesota's lakes, streams, and wetlands have water quality conditions that are acceptable for the various ways in which we use these waters. 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, E. coli, sulfate, chloride, ammonia, total phosphorus, ortho phosphorus and total kjeldahl nitrogen. Volunteers monitor sites for transparency, stage, color, suitability, and rainfall.

The purpose of the TMDL initial monitoring phase is to gather information on streams that have already been assessed and declared impaired. When the TMDL is written a quantitative plan and an analysis for attaining and maintaining water quality standards for a specific water body and pollutant will be obtained. The TMDL in the Cedar River basin is for turbidity. There is also a TMDL for all of Southeastern Minnesota for fecal coli form bacteria. The TMDL sites are monitored on site for stage, transparency, dissolved oxygen, conductivity, pH, turbidity, temperature, flow, suitability and color. Samples are taken to Minnesota Department of Health (MDH) for turbidity, pH, total suspended solids, volatile suspended solids, total phosphorus, ortho phosphorus and total kjeldahl nitrogen.

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

#### Chloride:

Chlorides are salts that form from the combination of chlorine gas and various metal ions. Chlorine commonly combines with sodium to form what is commonly used as table salt. Small amounts of chloride are essential for cell functions, however too much chloride can be detrimental to fish and other aquatic life. Normal to moderate levels of chloride is commonly caused by road salt and is why chloride levels tend to spike during winter months. The Minnesota Pollution Control Agency has a set chronic standard above 230 mg/L standard and above 100 mg/L average standard that is put on industrial outputs. The chronic sample levels are set because of road salting. Chloride levels generally become lower during flood or high water events due to dilution.

### 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 macroinvertebrates. Conductivity levels tend to be lower during high water or flood events.

### 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 it was determined 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 bacterial contamination are sewage treatment plants, individual septic systems, domestic and wildlife manure, and storm runoff. The 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 first series of E. coli samples ever taken on the Cedar River. Past samples taken were fecal coli form. MPCA approved the E. coli as the new standard for bacteria in March of 2008 and EPA approved it in May of 2008.

#### 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. Nitrate-nitrite levels are generally lower during the flood events because dilution. The MPCA standard has a chronic exposure to un-ionized ammonia and is set at 0.016 mg/L of nitrogen from un-ionized ammonia. Total Kjeldahl Nitrogen (TKN) is the sum of all organic nitrogen.

#### 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.

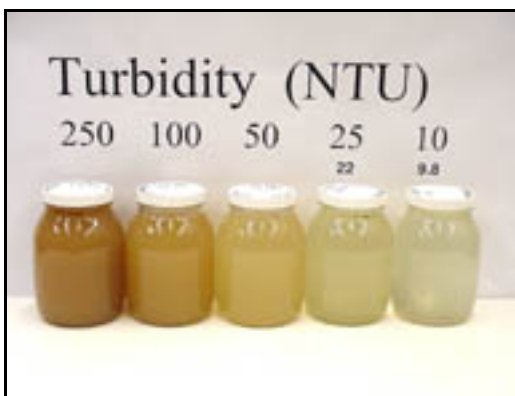
### Phosphorous:

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. Phosphorous levels generally are higher during flood and high water events.

### Sulfate:

Sulfur is an essential nutrient to plant growth. High levels of sulfate also produce the rotten egg smell, which makes the water unappetizing for both humans and animals. These high of levels sulfate can be toxic to both humans and animals. Sulfates can enter the streams through agricultural, municipal or industrial wastes or can be naturally occurring.

### 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:



*Gerald Erickson taking a  
Transparency Tube reading*

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 buffer 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.

<b>Blooming Prairie Tributary Watershed Land Use</b>	
<b><u>Types</u></b>	<b><u>Percent</u></b>
<b>Barren</b>	<b>0.01%</b>
<b>Row Crops</b>	<b>72.14%</b>
<b>Forested</b>	<b>1.72%</b>
<b>Developed</b>	<b>14.74%</b>
<b>Grassland/Pasture/Hay</b>	<b>11.04%</b>
<b>Wetland</b>	<b>0.30%</b>
<b>Open Water</b>	<b>0.04%</b>



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

## Monitoring Results

### **Chloride**

**High: 47.8 mg/L**

**Low: 25.9 mg/L**

**Ave: 35.3 mg/L**

Blooming Prairie Tributary had the highest average levels of chloride during the 2008 sampling season. The high was 47.8 mg/L, the low was 25.9 mg/L with an average of 35.3 mg/L. . The other sampling sites ranged from 16.1 mg/L to 25.4 mg/L. All samples at this site stayed well below the 230 mg/L chronic standard.

### **Conductivity**

**High: .835mS/cm**

**Low: .208 mS/cm**

**Ave: .637 mS/cm**

Blooming Prairie Tributary had the highest average of conductivity. This is expected because of the close correlation with chlorides. The lowest reading occurred on the day of flood sampling June 12<sup>th</sup>. 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.

### **Dissolved Oxygen**

**High: 15.2 mg/L**

**Low: 6.82 mg/L**

**Ave: 10.26 mg/L**

The high occurred during the beginning of the year and low occurred during the flood event on June 12<sup>th</sup>. The average DO measurement was one of the higher sites sampled.

### **E. Coli**

**High: 2419.6 mpn/100mL Low: 186 mpn/100mL Ave: 1410 mpn/100mL**

The high sample for the Blooming Prairie Tributary was tied for the highest sampled in 2008. The average was also the highest of this sampling set in 2008. Similar samples were taken in the past for Fecal Coli form averaging in 547 mpn/100mL (2000) and 1052 mpn/100mL (2001).



## **Sulfate**

**High: 76.2mg/L**

**Low: 26.2 mg/L**

**Ave: 55.1 mg/L**

Sulfate levels had the highest average, low and high of the sampling sites less the 2 sampling anomalies. All samples at the Blooming Prairie Tributary were below the MPCA standard (1000 mg/L).

## **Total Suspended Solids**

**High: 27mg/L**

**Low: 2 mg/L**

**Ave: 9.7 mg/L**

All samples were below the MPCA standard. The average samples were on the high side of the watersheds Clean Water Legacy samples for 2008. The low was the minimum that the lab could sample for.

## **Transparency**

**High: 60 cm**

**Low: 4 cm**

**Ave: 53.2 cm**

Only one sample was below the MPCA standard (20 cm). There were 11 of the 17 samples that were at the highest we could sample at 60 cm. The average was the highest of this sampling set.

## **Turbidity**

**High: 260 FNU**

**Low: .1 FNU**

**Ave: 19.7 FNU**

Excluding the June 12<sup>th</sup> flood data the average falls to 4.7 FNU and is one of the lowest among this sampling set. The high is the lowest of the 2008 sampling set with our without the flood data. Only the flood data was above the estimated 25 FNU standard.

## **Cedar River at 335<sup>th</sup> St:**

### Overview

This site is sampled on 335<sup>th</sup> 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. A beaver dam developed late in the sampling season that may have skewed some of the data. Land use in this watershed is similar to the site on the Middle Fork of the Cedar River.

<b>Cedar River at 335th Watershed</b>	
<b>Land Use</b>	
<b>Types</b>	<b>Percent</b>
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%



*Looking South down the Cedar River from the bridge on 335<sup>th</sup> St during the June 2008 flood event*

### Monitoring Results

#### **Chloride**

**High: 22.3 mg/L**

**Low: 12.7 mg/L**

**Ave: 19.6 mg/L**

The sample average was in the middle of this sampling set. All samples were well below the MPCA standard (230 mg/L). The low sample was taken during the June 12<sup>th</sup> Flood event.

#### **Conductivity**

**High: .575 mS/cm**

**Low: .124 mS/cm**

**Ave: .475 mS/cm**

The average sample ranked in the middle of our sampling set. The low was sampled during the June 12<sup>th</sup> flood event. The average is on the high end of the range for a good mixed fishery (.150-500 mS/cm).

### **Dissolved Oxygen**

**High: 12.47 mg/L                      Low: 6.65 mg/L                      Ave: 9.36 mg/L**

The average ranks in the middle of this sampling set, while the high is the lowest high of all the samples. All samples are above 5mg/L that is the minimum to support healthy aquatic life.

### **E. Coli**

**High: 2419.6 mpn/100mL    Low: 178.5 mpn/100mL    Ave: 1230.3 mpn/100mL**

The high sample tied highest sampled in 2008. The average was the second highest of this sampling set in 2008. Similar samples were taken in the past for Fecal Coli form averaging in 379.7 mpn/100mL (2000) and 486.2 mpn/100mL (2001).

### **Nitrogen**

**Nitrate- Nitrite High: 16.3 mg/L    Low: 3.74 mg/L                      Ave: 7.17 mg/L**

**Ammonia                      High: .59 mg/L                      Low: <.16 mg/L                      Ave: unknown**

**TKN                              High: 5.4 mg/L                      Low: .9mg/L                              Ave: 1.51 mg/L**

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 4 of the 14 samples at this site. The average was in the higher range for this year sample set. The high for nitrate-nitrite was the lowest of the 2008 sample set.

Most of Ammonia levels were below the .16 mg/L which is the lowest level that the lab sampled. There was only 1 sample outside of this range and it was .59 mg/L.

TKN levels averaged on the higher end of sampling set. The highest was taken during the flood and tied for the highest sample of this years sampling set.

### **pH**

**High: 8.57                              Low: 7.72                              Ave: 8.19**

The average pH was in the eco-region average of 8-8.2. The average, high and low were also in the middle range of this sampling set.

## Phosphorus

**Total High: 1.19 mg/L      Low: .019 mg/L      Ave: .172 mg/L**

**Ortho High: .958mg/L      Low: .005 mg/L      Ave: .120 mg/L**

Total phosphorous averages were above the MPCA state standard (.2mg/L). A total of 2 of the 14 samples tested at this site exceeded the MPCA standard for total phosphorous. One of the samples also fell higher than the eco-region normal (.16-.33 mg/L). The highest sample was the highest of this sample set and was one of the limited samples that were taken on the June 12<sup>th</sup> flood event.

Ortho Phosphorous levels were the highest during the June 12<sup>th</sup> flood event. Without the flood event sample averages ranked in the middle in this sample set. Both phosphorous results closely mirror that of results found at the East Fork of the Cedar River sampling site.

## Sulfate

**High: 54.8 mg/L      Low: 17.5 mg/L      Ave: 32.1 mg/L**

Sulfate levels had a higher average than most in this sampling set. All samples were below the MPCA standard (1000 mg/L). The highest sample was taken during the June 12<sup>th</sup> flood event.

## Total Suspended Solids

**High: 760mg/L      Low: 2 mg/L      Ave: 64.3 mg/L**

The average samples were the highest for this sample set even without the June 12<sup>th</sup> flood data. Only 1 sample exceeded the MPCA standard (60mg/L) and eco-region normal levels. The low was the minimum that the lab could sample for.

## Transparency

**High: 60 cm      Low: 2 cm      Ave: 40.75 cm**

Only one sample was below the MPCA standard (20 cm). There were 3 of the 16 samples that were at the highest we could sample at 60 cm. The average was the lowest of this sampling set. Samples were clearer in 2000 (51.3cm) and in 2001 (49.3

cm). The beaver dam seemed to cause the readings to remain lower, later in the year while others in the sample set cleared up.

**Turbidity**

**High: 735.2 FNU                      Low: .1 FNU                      Ave: 51.1 FNU**

Excluding the June 12<sup>th</sup> flood data the average falls to 8.38 FNU and is one of the higher among this sampling set. Three of the 17 samples were above the estimated 25 FNU standard.

**East Fork of the Cedar River:**

Overview

East Fork of the Cedar River is sampled at the crossing at Dodge County Road 2. There is a about a 31,000 acre watershed above the sampling site. Sampling is done about .5 miles downstream of the junction between of the East fork of the Cedar River and an unnamed tributary. Upstream from the sampling site the stream has mostly a wooded buffer. Land use of this site is similar to that of the Cedar River at 335<sup>th</sup> St. site.

<b>East Fork of Cedar River Watershed Land Use</b>	
<u>Types</u>	<u>Percent</u>
<b>Barren</b>	<b>0.00%</b>
<b>Row Crops</b>	<b>78.42%</b>
<b>Forested</b>	<b>1.66%</b>
<b>Developed</b>	<b>10.18%</b>
<b>Grassland/Pasture/Hay</b>	<b>9.48%</b>
<b>Wetland</b>	<b>0.25%</b>
<b>Open Water</b>	<b>0.02%</b>



*East Fork of the Cedar River at Dodge County 2 during the June 2008 flood event*

## Monitoring Results

### **Chloride**

**High: 34mg/L                      Low: 12.7 mg/L                      Ave: 25.4mg/L**

All samples were well below the MPCA standard (230 mg/L). The average was the second highest in the sampling set. The low occurred during the June 12<sup>th</sup> flood.

### **Conductivity**

**High: .560mS/cm                      Low: .119mS/cm                      Ave: .445mS/cm**

The results are fairly average at this sampling site compared to the sampling set. The high occurred on June 3<sup>rd</sup> which is right in line with most of the other samples in this set. The average is within the range for a good mixed fishery (.150-500 mS/cm).

### **Dissolved Oxygen**

**High: 12.72 mg/L                      Low: 5.0 mg/L                      Ave: 8.79 mg/L**

One sample was at 5mg/L which is the minimum to support healthy aquatic life. That was one of the lowest samples taken in this sample set. The DO average was also the lowest of this sample set. DO readings dropped at the end of the year corresponding to the limited rain events and flow at this monitoring site.

### **E. Coli**

**High: 1986.3 mpn/100mL    Low: 101.7 mpn/100mL    Ave: 627.5 mpn/100mL**

Samples were relatively low compared to the sample set. However the average was well above the 126 CFU/100 mL average standards that the MPCA has proposed and the high sample exceeded the MPCA maximum threshold of 1260 CFU/100 mL

### **Nitrogen**

<b>Nitrate- Nitrite</b>	<b>High: 15.9 mg/L</b>	<b>Low: &lt;.2 mg/L</b>	<b>Ave: unknown</b>
<b>Ammonia</b>	<b>High: .59 mg/L</b>	<b>Low: &lt;.16 mg/L</b>	<b>Ave: unknown</b>
<b>TKN</b>	<b>High: 5.4 mg/L</b>	<b>Low: .6mg/L</b>	<b>Ave: 1.39 mg/L</b>

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 4 of the 14 samples at this site. The estimated average was in the



### **Total Suspended Solids**

**High: 520 mg/L                      Low: 2 mg/L                      Ave: 46.8 mg/L**

Only one sample exceeded the 60 mg/L MPCA standard and that was during the June 12<sup>th</sup> flood event. The average is in the higher end of the sample set.

### **Transparency**

**High: 60cm                              Low: 1 cm                              Ave: 44.5cm**

Only one sample fell below the 20 cm estimated standard. The low was during the June 12<sup>th</sup> flood event. Five samples were 60 cm or clearer.

### **Turbidity**

**High: 569.9 FNU                      Low: .6 FNU                      Ave: 39.7 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) only once in 17 samples. The high sample was taken during the June 12<sup>th</sup> flood event. Two of the 17 samples fell above the eco-region normal range (5.2-22NTU).

## **Judicial Ditch #5:**

### Overview

Judicial 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 570<sup>th</sup> Ave.

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



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

### Monitoring Results

#### **Chloride**

**High: 17.7 mg/L                      Low: 14.7 mg/L                      Ave: 16.4 mg/L**

All samples were well below the MPCA standard (230 mg/L). Chloride levels were very stable; there was not a lot of variation throughout the sampling season.

Chloride levels were on the low end of the sampling set

#### **Conductivity**

**High: .591 mS/cm                      Low: .106 mS/cm                      Ave: .487 mS/cm**

The low sample was taken during the June 12<sup>th</sup> flood and besides that sample; conductivity levels were very stable. This is expected with the correlation between chloride levels and conductivity. The average is high but within the range for a good mixed fishery (.150-500 mS/cm).

### **Dissolved Oxygen**

**High: 15.3 mg/L                      Low: 7.43 mg/L                      Ave: 10.38 mg/L**

All samples are above 5 mg/L that is the minimum to support healthy aquatic life. The average sample was the highest average of this sample set. The low sample was taken during the June 12<sup>th</sup> flood event.

### **E. Coli**

**High: 2419.6 MPN/100mL   Low: 325.5 MPN/100mL   Ave: 1132 MPN/100mL**

One sample exceeded the estimated MPCA threshold standard (1260CFU/100mL). The average also exceeded the estimated MPCA average standard (126CFU/100mL).

### **Nitrogen**

**Nitrate- Nitrite High: 11.9 mg/L   Low: 6.32 mg/L   Ave: 9.1 mg/L**

**Ammonia                      High: <.16 mg/L   Low: <.16 mg/L   Ave: <.16mg/L**

**TKN                              High: 1.5 mg/L   Low: .6mg/L   Ave: 1.5 mg/L**

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 6 of the 13 samples at this site. The average was highest for the 2008 sample set. Samples were very consistent compared to the sampling set.

All of the ammonia levels were below the .16 mg/L which is the lowest level that the lab sampled.

TKN levels averaged on the higher end of sampling set. The highest was taken on June 26<sup>th</sup>. There was no sample taken during the flood which probably would have been the high sample.

### **pH**

**High: 8.6                              Low: 7.64                              Ave: 8.16**

The average is with in the eco-region normal range (8-8.2). The average falls slightly on the high side of the sampling set.

### **Phosphorus**

**Total High: .182 mg/L      Low: .041 mg/L      Ave: .085 mg/L**

**Ortho High: .111 mg/L      Low: .030 mg/L      Ave: .060 mg/L**

Total phosphorous averages were below the MPCA state standard (.2mg/L).  
None of the 13 samples fell higher than the eco-region normal (.16-.33 mg/L).

Ortho Phosphorous levels were on the high end compared to the rest of the sampling set.

### **Sulfate**

**High: 38.7 mg/L      Low: 18.3 mg/L      Ave: 27.5 mg/L**

Sulfate levels were in the middle of this sampling set and all samples were below the MPCA standard (1000 mg/L).

### **Total Suspended Solids**

**High: 520 mg/L      Low: 2 mg/L      Ave: 46.8 mg/L**

Only one sample exceeded the 60 mg/L MPCA standard and that was during the June 12<sup>th</sup> flood event. The average is on the higher end of the sample set.

### **Transparency**

**High: 60cm      Low: 3cm      Ave: 47.6cm**

Only one sample fell below the 20 cm estimated standard. The low was during the June 12<sup>th</sup> flood event. Ten samples were 60 cm or clearer.

### **Turbidity**

**High: 409.6 FNU      Low: .1 FNU      Ave: 30.1 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) twice in 17 samples. The high sample was taken during the June 12<sup>th</sup> flood event. Two of the 17 samples fell above the eco-region normal range (5.2-22NTU).

## **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.

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



Monitoring Results

**Chloride**

**High: 49.9 mg/L                      Low: 15.7 mg/L                      Ave: 19.7 mg/L**

All samples were well below the MPCA standard (230 mg/L). Chloride levels were very stable; except for the high sample taken on November 6<sup>th</sup>. Chloride levels were on the low end of the sampling set

**Conductivity**

**High: .584 mS/cm                      Low: .14 mS/cm                      Ave: .487 mS/cm**

The low sample was taken during the June 12<sup>th</sup> flood event, with the average is in the middle of this sampling set. The average is high but within the range for a good mixed fishery (.150-500 mS/cm).

**Dissolved Oxygen**

**High: 13.45 mg/L                      Low: 7.1 mg/L                      Ave: 9.31 mg/L**

All samples are above 5 mg/L minimum to support healthy aquatic life. The average sample was very average compared to this sampling set. The low sample was taken during the June 12<sup>th</sup> flood event.

**E. Coli**

**High: 2419.6 MPN/100mL    Low: 387.3 MPN/100mL    Ave: 1170.4 MPN/100mL**

Two samples exceeded the estimated MPCA threshold standard (1260CFU/100mL). The average also exceeded the estimated MPCA average standard (126CFU/100mL). The four samples taken got progressively lower as the year went on. This trend is similar to what was seen during the 2001 fecal coli form testing.

**Nitrogen**

**Nitrate- Nitrite High: 13 mg/L                      Low: 5.43 mg/L                      Ave: 8.40 mg/L**

**Ammonia                      High: <.16 mg/L                      Low: <.16 mg/L                      Ave: <.16mg/L**

**TKN                      High: 2.3 mg/L                      Low: .6mg/L                      Ave: 1.34 mg/L**

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water in 4 of the 13 samples at this site. The average was on the high for the 2008 sample set.

All of the ammonia levels were below the .16 mg/L which is the lowest level that the lab sampled.

TKN levels averaged in the middle of the sampling set with the highest taken on September 11<sup>th</sup>. There was no sample taken during the flood which probably would have been the high sample.

### **pH**

**High: 8.46**                      **Low: 7.6**                      **Ave: 8.11**

The average is within the eco-region normal range (8-8.2) and falls in the middle of the sampling set.

### **Phosphorus**

**Total High: .33 mg/L**              **Low: .018 mg/L**              **Ave: .09 mg/L**  
**Ortho High: .164 mg/L**              **Low: .005 mg/L**              **Ave: .064 mg/L**

Total phosphorous averages were below the MPCA state standard (.2mg/L). One of the sample was above the MPCA standard and was higher than the eco-region normal (.16-.33 mg/L).

Ortho Phosphorous levels were on the high end compared to the rest of the sampling set.

### **Sulfate**

**High: 3690 mg/L**                      **Low: 17.4 mg/L**                      **Ave: 308.2 mg/L**

The high sample was an extreme and was above the MPCA standard (1000 mg/L). When you throw out the anomaly the average falls to 26.4 mg/L which is in the middle of this sampling set.

### **Total Suspended Solids**

**High: 68 mg/L                      Low: 2 mg/L                      Ave: 9.2 mg/L**

Only one sample exceeded the 60 mg/L MPCA standard and that was on July 17<sup>th</sup>. The average is in the middle of the sample set. The results are very similar to data collected in 2001 with an average of 8.99 mg/L.

### **Transparency**

**High: 60cm                      Low: 3cm                      Ave: 47.6cm**

Twice the sample fell below the 20 cm estimated standard. The low was during the June 12<sup>th</sup> flood event. Twelve of 16 samples were 60 cm or clearer. In 2001 the average transparency tube reading was higher at 58 cm.

### **Turbidity**

**High: 304.2 FNU                      Low: .1 FNU                      Ave: 21.6 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) twice in 17 samples with the high sample was taken during the June 12<sup>th</sup> flood event. Two of the 17 samples fell above the eco-region normal range (5.2-22NTU).

## **Murphy Creek:**

### Overview

Murphy Creek is sampled at Taylor Avenue in Maplevue less than 700 feet from its junction with the Cedar River. Above this point Murphy Creek has a 4250 acre watershed. This creek is used as a drainage ditch and flows mainly through row cropped farmland. The last 1.3 miles above the sample site runs through an industrial park, new housing development and on the edge of the city of Maplevue. This watershed has the highest percentage of grassland/pasture/hay and wetlands compared to the other monitoring sites. This watershed also has the lowest percentage of row crops when compared to the other watersheds. There are a lot of conservation programs a long the creek corridor and lowlands.

<b>Murphy Creek Watershed Land Use</b>	
<u>Types</u>	<u>Percent</u>
Barren	0.02%
Row Crops	51.39%
Forested	2.15%
Developed	13.11%
Grassland/Pasture/Hay	31.65%
Wetland	1.59%
Open Water	0.09%



*Murphy Creek at the Taylor Ave during the June 2008 flood*

Monitoring Results

**Chloride**

**High: 51.4 mg/L                      Low: 10.0 mg/L                      Ave: 18.1 mg/L**

All samples were well below the MPCA standard (230 mg/L). The high sample 51.4 mg/L was the highest of this sample set and the lowest sample was taken during the June 12<sup>th</sup> flood. Chloride levels were on the lower end of the sampling set

**Conductivity**

**High: .598 mS/cm                      Low: .005 mS/cm                      Ave: .409 mS/cm**

The low sample was taken on the September 24<sup>th</sup> and was much lower than any other sample. The average is in the lower end of this sampling and the average is within the range for a good mixed fishery (.150-500 mS/cm).

**Dissolved Oxygen**

**High: 12.88 mg/L                      Low: 6.62 mg/L                      Ave: 9.21 mg/L**

All samples are above 5mg/L that is the minimum to support healthy aquatic life. The average sample was on the lower end of this sampling set.



Ortho Phosphorous levels were on the high end compared to the rest of the sampling set. The high sample was taken on August 27<sup>th</sup>.

### **Sulfate**

**High: 46.8 mg/L**                      **Low: 17.5 mg/L**                      **Ave: 37.5 mg/L**

None of the samples taken were above the MPCA standard (1000 mg/L). The average sample was in the higher end of this sampling set.

### **Total Suspended Solids**

**High: 520 mg/L**                      **Low: 2 mg/L**                      **Ave: 55.6 mg/L**

Two samples exceeded the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L) on June 12<sup>th</sup> and on July 17<sup>th</sup>. The average was on the higher end of this sampling set.

### **Transparency**

**High: 60cm**                      **Low: 2cm**                      **Ave: 38.8cm**

Three times the sample fell below the 20 cm estimated standard. The lowest was during the June 12<sup>th</sup> flood event. Six of 16 samples were 60 cm or clearer. The average is the lowest of this sampling set.

### **Turbidity**

**High: 572.2 FNU**                      **Low: .1 FNU**                      **Ave: 49.3 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) three times in 17 samples. The high sample was taken during the June 12<sup>th</sup> flood event. Four of the 17 samples fell above the eco-region normal range (5.2-22NTU).

## **Orchard Creek:**

### Overview

Orchard Creek is sampled at the Minnesota State Highway 105 crossing about 150 feet before it enters the Cedar River. There is about a 20,410 acre watershed above the site. The lower 2.75 miles of the creek has a wooded buffer with the upper portions

of the creek having little to no buffer and have been ditched. This watershed includes the far Southwest part of the city of Austin. This site was sampled by a volunteer as well as staff.

Orchard Creek Watershed Land Use	
Types	Percent
Barren	0.01%
Row Crops	81.03%
Forested	1.30%
Developed	10.46%
Grassland/Pasture/Hay	6.65%
Wetland	0.55%
Open Water	0.01%



*Orchard Creek at the Minnesota Highway 105 crossing looking West during the June 2008 flood*

Monitoring Results

**Chloride**

**High: 21.1 mg/L                      Low: 10.4 mg/L                      Ave: 16.4 mg/L**

All samples were well below the MPCA standard (230 mg/L). The average was one of the lowest of the sample set and the highest sample of 21.1 mg/L was one of the lowest of this sample set. Chloride levels were on the lower end of the sampling set

**Conductivity**

**High: .575 mS/cm                      Low: .138 mS/cm                      Ave: .477 mS/cm**

The average is in the middle of this sampling set. The high sample was taken on June 3<sup>rd</sup>. The average is high but within the range for a good mixed fishery (.150-500 mS/cm).

## Dissolved Oxygen

**High: 15.89 mg/L                      Low: 7.19 mg/L                      Ave: 9.78 mg/L**

All samples are above 5 mg/L that is the minimum to support healthy aquatic life. The average sample was in the middle of this sampling set, and the high sample was the highest sample taken in this sampling set.

## E. Coli

**High: 816.4 MPN/100mL   Low: 209.8 MPN/100mL   Ave: 525.1 MPN/100mL**

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

## Nitrogen

**Nitrate- Nitrite High: 12.3 mg/L   Low: 2.34 mg/L   Ave: 5.92 mg/L**

**Ammonia                      High: <.16 mg/L   Low: <.16 mg/L   Ave: <.16mg/L**

**TKN                              High: 4 mg/L                      Low: .7 mg/L                      Ave: 1.5 mg/L**

Nitrate-Nitrite levels did exceed the federal nitrogen standard of 10 mg/L for drinking water at this site in 3 of the 14 samples. The average was on the high end of this years sample set.

All of the ammonia levels were below the .16 mg/L which is the lowest level that the lab sampled.

TKN levels were slightly above the average of this sampling set. The 4 mg/L sample on October 29<sup>th</sup> was the highest non-flood sample.

## pH

**High: 8.67                              Low: 7.8                              Ave: 8.16**

The average is within the eco-region normal range (8-8.2). The average is also slightly above the sample set average.

## Phosphorus

**Total High: .095 mg/L                      Low: .022 mg/L                      Ave: .060 mg/L**

**Ortho High: .063 mg/L      Low: .005 mg/L      Ave: .037 mg/L**

Total phosphorous averages were below the MPCA state standard (.2mg/L). There were no samples above the MPCA standard. All of 13 samples fell below the eco-region normal (.16-.33 mg/L). The average was the lowest of the sampling set.

Ortho Phosphorous levels were on the low end compared to the rest of the sampling set. The high sample was taken on July 31<sup>st</sup>.

### **Sulfate**

**High: 4170 mg/L                      Low: 17.5 mg/L                      Ave: 339.7 mg/L**

The high sample was an extreme and that sample was above the MPCA standard (1000 mg/L). It was the highest of this year's sample set. When you throw out the anomaly the average falls to 20.5 mg/L which is in the lower end of this sampling set

### **Total Suspended Solids**

**High: 13 mg/L                      Low: 2 mg/L                      Ave: 6.2 mg/L**

None of the samples exceeded the 60 mg/L MPCA standard or the eco-region normal range (10-61 mg/L). There was not a sample taken during the July 12<sup>th</sup> flood event. The average was one of the lowest of the 2008 sample set. The results are lower than previous testing in 2000 (11.2 mg/L) and 2001 (30.5 mg/L). Excluding a high sample in 2001 the average was 15.3 mg/L.

### **Transparency**

**Staff High: 60 cm                      Low: 2 cm                      Ave: 47cm**

**Volunteer High: 44.5 cm                      Low: 5 cm                      Ave: 27.5 cm**

Twice the samples fell below the 20 cm estimated standard. The low was during the June 12<sup>th</sup> flood event. Thirteen of 16 samples were 60 cm or clearer. The average was on the higher end of this sampling set. Results are similar to previous results where a majority of the results are 60cm. The average has been on a slight downward turn since 2000 (53.8cm) and 2001 (51.9cm).

The volunteer sampling had much lower results and average. The data collected by the volunteer captured the early spring rains when the water level was high. This

sample set includes the heavy rain event on May 30<sup>th</sup> and after the flood on June 15<sup>th</sup>. Two of the 5 samples were below 20 cm estimated standard.

**Turbidity**

**High: 536.5 FNU                      Low: .1 FNU                      Ave: 36.8 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) twice in 17 samples and the eco-region normal range (5.2-22 NTU). The high sample was taken during the June 12<sup>th</sup> flood event. The average was slightly below the average for the sampling set.

**Roberts Creek:**

Overview

Roberts Creek is sampled at the crossing of 550<sup>th</sup> Ave Northeast of Lansing. There is about a 24,850 acre watershed above the sampling site which is located about 1/3 mile before it enters the Cedar River. The watershed includes portions of Brownsdale, Sargeant, and Waltham. The main branch corridor is mostly wooded and runs through agricultural areas. This sampling site has the highest percentage of forested lands in the watershed compared to the other sampling sites. The land use of this sampling site is similar to that of Rose Creek at 570<sup>th</sup> Ave and Judicial Ditch #5 sites.

<b>Roberts Creek Watershed Land Use</b>	
<u>Types</u>	<u>Percent</u>
Barren	0.00%
Row Crops	73.13%
Forested	3.18%
Developed	9.35%
Grassland/Pasture/Hay	13.74%
Wetland	0.51%
Open Water	0.10%



*Sampling on Roberts Creek at the bridge crossing on 550<sup>th</sup> Ave during the June 2008 flood event*

## Monitoring Results

### **Chloride**

**High: 21.3 mg/L                      Low: 12.4 mg/L                      Ave: 16.0 mg/L**

All samples were well below the MPCA standard (230 mg/L). The average sample was the lowest of this sample set.

### **Conductivity**

**High: .557 mS/cm                      Low: .113 mS/cm                      Ave: .417 mS/cm**

The low sample was taken during the June 12<sup>th</sup> flood event. The average is on the lower end of this sampling set. The average is high but within the range for a good mixed fishery (.150-500 mS/cm).

### **Dissolved Oxygen**

**High: 13.76 mg/L                      Low: 7.38 mg/L                      Ave: 9.60mg/L**

All samples are above 5 mg/L that is the minimum to support healthy aquatic life. The average sample was on the lower end of this sampling set. In 1989, DO samples were taken twice at two spots on Roberts Creek with an average of 8.94 mg/L.

### **E. Coli**

**High: 2419.6 MPN/100mL    Low: 387.3 MPN/100mL    Ave: 1076.8 MPN/100mL**

One of the four samples exceeded the estimated MPCA threshold standard (1260CFU/100mL). The average also exceeded the estimated MPCA average standard (126CFU/100mL). The four samples got progressively lower as the year went on, but the average was also in the higher end of this sample set. E. coli monitoring was done twice in 1989 with an average of 1205 MPN/mL.

### **Nitrogen**

**Nitrate- Nitrite High: 13.5 mg/L    Low: .85 mg/L                      Ave: 4.84 mg/L**

**Ammonia                      High: <.16 mg/L    Low: <.16 mg/L                      Ave: <.16mg/L**

**TKN                              High: 1.8mg/L                      Low: .3 mg/L                      Ave: 0.91 mg/L**



### **Total Suspended Solids**

**High: 38 mg/L**

**Low: 2 mg/L**

**Ave: 7.8 mg/L**

None of the 13 samples exceeded the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). The average was on the lower end of this sampling set. Upstream of this sampling site Roberts Creek was tested in 2000 and 2001. In 2001 there was one sample (126.3 mg/L on July 23<sup>rd</sup>, 2001) that exceeded the MPCA. The average of the samples was 10.8mg/L (2000), 19.5 mg/L (2001 including the high sample) and 13.3 mg/L (2001 without the high sample).

### **Transparency**

**High: 60cm**

**Low: 1cm**

**Ave: 48.8cm**

Two of 17 samples fell below the 20 cm estimated standard. The low was during the June 12<sup>th</sup> flood event. Eleven of 17 samples were 60 cm or clearer. The average is on the higher end of this sampling set. The average is very close to what was sampled in 2000 (51.9 cm) and in 2001(49.4 cm) on an upstream site. In both 2000 and 2001 there was also one sample that was below the 20 cm.

### **Turbidity**

**High: 888.1 FNU**

**Low: .1 FNU**

**Ave: 58.4 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) twice in 17 samples. The high sample was taken during the June 12<sup>th</sup> flood event. Two of the 17 samples fell above the eco-region normal range (5.2-22NTU). Without the flood sample the average falls to 6.6 FNU. In 1989 there were 2 turbidity samples taken at this site (4.5NTU and 3.8NTU).

## **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.

<b>Rose Creek at Mower County Road 29 Watershed Land Use</b>	
<u>Types</u>	<u>Percent</u>
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%



*Water rising during the June 2008 flood on  
Rose Creek at Mower County 29*

### Monitoring Results

#### **Chloride**

**High: 37.5 mg/L                      Low: 9.8 mg/L                      Ave: 20.0 mg/L**

All samples were well below the MPCA standard (230 mg/L). The average sample was on the higher end of this sample set.

#### **Conductivity**

**High: .576 mS/cm                      Low: .106 mS/cm                      Ave: .423 mS/cm**

The low sample was taken during the June 12<sup>th</sup> flood event. The average is in the lower end of this sampling set. The average is high but within the range for a good mixed fishery (.150-500 mS/cm).

#### **Dissolved Oxygen**

**High: 17.51 mg/L                      Low: 7.76 mg/L                      Ave: 10.06 mg/L**

All samples are above 5mg/L that is the minimum to support healthy aquatic life. The average sample was on the higher end of this sampling set. The highest DO of the

entire sampling set was collected on May 20<sup>th</sup>. In 1973 there was one DO sample taken with 10.5 mg/L.

### **E. Coli**

**High: 517.2 MPN/100mL Low: 238.2 MPN/100mL Ave: 345.3 MPN/100mL**

None of the four samples exceeded the estimated MPCA threshold standard (1260CFU/100mL). The average also exceeded the estimated MPCA average standard (126CFU/100mL). The average was in the lower end of this sample set. Fecal coli form was tested in 1973, 2000, and 2001 with averages of 310 MPN/100mL, 540.4 MPN/100mL, and 824.5 MPN/100mL respectively.

### **Nitrogen**

**Nitrate- Nitrite High: 15.0 mg/L Low: 1.88 mg/L Ave: 5.68 mg/L**

**Ammonia High: <.16 mg/L Low: <.16 mg/L Ave: <.16 mg/L**

**TKN High: 3.9 mg/L Low: .6 mg/L Ave: 1.27 mg/L**

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water at this site in 2 of the 13 samples. The average for this site was about the average for the 2008 sample set.

All of the ammonia levels were below the .16 mg/L which is the lowest level that the lab sampled.

Average TKN levels were slightly below the average of this sampling set. TKN was sampled in 1973 with a result of .77mg/L.

### **pH**

**High: 9.09 Low: 7.5 Ave: 8.28**

The average was above the eco-region normal range (8-8.2). The average was the highest of the sampling set. The high sample was also the highest of the sampling set. Ten of the 16 samples were above 8.2 and 2 of the samples were below 8.0.

## Phosphorus

**Total High: .841 mg/L      Low: .022 mg/L      Ave: .113 mg/L**

**Ortho High: .755 mg/L      Low: .005 mg/L      Ave: .097 mg/L**

Total phosphorous averages were below the MPCA state standard (.2mg/L). Only 1 of the 14 samples was above the MPCA standard, that sample was taken during the June 12<sup>th</sup> flood event. The average without the flood sample was the lowest of the sampling set (.057 mg/L). There was one sample taken in 1973 with a result of .09 mg/L.

Ortho Phosphorous levels were on the lower end compared to the rest of the sampling set.

## Sulfate

**High: 44.3 mg/L      Low: 16.3 mg/L      Ave: 24.7 mg/L**

None of the samples were above the MPCA standard (1000 mg/L). The high sample was taken during the June 12<sup>th</sup> flood event. The average sample was in the middle to lower end of this sampling set.

## Total Suspended Solids

**High: 496 mg/L      Low: 2 mg/L      Ave: 40.6 mg/L**

One of the 14 samples exceeded the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). That sample was taken during the June 12<sup>th</sup> flood event. The average was on the lower end of this sampling set. In 2001 there were two samples that exceeded the MPCA standard. The average of the samples in 2001 was 44.5 mg/L and in 2000 was 12.1 mg/L. The 3 sample years are similar in the fact that a majority of the samples are very low with rain events causing some high results.

## Transparency

**High: 60cm      Low: 2cm      Ave: 49.8cm**

Two of 16 samples fell below the 20 cm estimated standard. The low was during the June 12<sup>th</sup> flood event. Eleven of 17 samples were 60 cm or clearer. The average is on the higher end of this sampling set. In 2000, 1 of 10 samples was below 20 cm, and 2001, 5 of 21 were below 20 cm. The average in 2000 was 51.5 cm and 39.2 cm in 2001.

## **Turbidity**

**High: 909 FNU**

**Low: .1 FNU**

**Ave: 72.5 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) three times in 17 samples. The high sample was taken during the June 12<sup>th</sup> flood event. Three of the 17 samples fell above the eco-region normal range (5.2-22NTU). The average is the highest of the sampling set. The stream has a tendency to show extreme highs and lows in turbidity. Most of the time the turbidity was very low and one of the lowest of the sampling set.

## **Wolf Creek:**

### Overview

Wolf Creek is sampled at the crossing at Mower County Road 16 about 2.25 miles before it enters the Cedar River. There is a 5650 acre watershed above the sampling site. The Creek is fairly-well buffered as it runs through cropped ground and it also runs on the south side of Brownsdale.

<b>Wolf Creek Watershed Land Use</b>	
<b><u>Types</u></b>	<b><u>Percent</u></b>
<b>Barren</b>	<b>0.01%</b>
<b>Row Crops</b>	<b>75.88%</b>
<b>Forested</b>	<b>1.89%</b>
<b>Developed</b>	<b>9.45%</b>
<b>Grassland/Pasture/Hay</b>	<b>12.10%</b>
<b>Wetland</b>	<b>0.57%</b>
<b>Open Water</b>	<b>0.10%</b>



Photo courtesy of Thomas Oots

*Wolf Creek looking North from the  
Mower County 16 Crossing*

## Monitoring Results

### **Chloride**

**High: 24.9 mg/L                      Low: 16.4 mg/L                      Ave: 21.5 mg/L**

All samples were well below the MPCA standard (230 mg/L). The average sample was in the middle of this sample set. Samples were very consistent; the last 2 samples of the season were the high and low.

### **Conductivity**

**High: .470 mS/cm                      Low: .082 mS/cm                      Ave: .385 mS/cm**

The low sample was taken during the June 12<sup>th</sup> flood event. The average is the lowest of this sampling set. The average is high but within the range for a good mixed fishery (.150-500 mS/cm).

### **Dissolved Oxygen**

**High: 14.93 mg/L                      Low: 4.86 mg/L                      Ave: 9.00 mg/L**

One sample was below 5mg/L that is the minimum to support healthy aquatic life. The average sample was on the lower end of this sampling set. Samples got lower later in the year when the creek was drying up and the flow stopped.

### **E. Coli**

**High: 365.4 MPN/100mL    Low: 40.4 MPN/100mL    Ave: 136.8 MPN/100mL**

None of the four samples exceeded the estimated MPCA threshold standard (1260CFU/100mL). The average exceeded the estimated MPCA average standard (126CFU/100mL). The average was in the lowest of this sample set. Fecal coli form was tested in 2000 and 2001 with averages of 370 MPN/100mL and 635 MPN/100mL respectively.

### **Nitrogen**

<b>Nitrate- Nitrite</b>	<b>High: 10.6 mg/L</b>	<b>Low: .2 mg/L</b>	<b>Ave: 2.91 mg/L</b>
<b>Ammonia</b>	<b>High: .86 mg/L</b>	<b>Low: &lt;.16 mg/L</b>	<b>Ave: Unknown</b>
<b>TKN</b>	<b>High: 3.3 mg/L</b>	<b>Low: .6 mg/L</b>	<b>Ave: 1.41 mg/L</b>

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water at this site in only 1 of the 13 samples. The average was for this site was in the lower end for sample set.

Eleven of the 13 samples of the ammonia levels were below the .16 mg/L which is the lowest level that the lab sampled. The other 2 samples were .57 mg/L (August 12<sup>th</sup>) and .86 mg/L (October 29<sup>th</sup>).

Average TKN levels were slightly above the average of this sampling set.

## **pH**

**High: 8.79**                      **Low: 7.47**                      **Ave: 8.11**

The average was in the eco-region normal range (8-8.2). The average was in the middle of the sampling set. Six of the 17 samples were above 8.2 and six of the samples were below 8.0. The pH values went up towards the end of the year.

## **Phosphorus**

**Total High: .259 mg/L**      **Low: .025 mg/L**      **Ave: .098 mg/L**  
**Ortho High: .062 mg/L**      **Low: .005 mg/L**      **Ave: .030 mg/L**

Total phosphorous averages were below the MPCA state standard (.2mg/L). Only 1 of the 14 samples was above the MPCA standard, that sample was taken on August 27<sup>th</sup>. The average was the slightly below average of the sampling set.

Ortho Phosphorous levels were the lowest of the sampling set.

## **Sulfate**

**High: 23.1 mg/L**                      **Low: 14.0 mg/L**                      **Ave: 18.9 mg/L**

None of the samples were above the MPCA standard (1000 mg/L). The results had a very consistent range. The average sample was the lowest of this sampling set.

## **Total Suspended Solids**

**High: 20 mg/L**                      **Low: 2 mg/L**                      **Ave: 9.23 mg/L**

None of the 14 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 the 2008 sampling set. In

2001 there were two samples that exceeded the MPCA standard. The average of the samples in 2001 was 12.7 mg/L and in 2000 was 6.0 mg/L. Not one sample in 2000 or 2001 exceeded the MPCA standard.

### **Transparency**

**High: 60cm**

**Low: 1cm**

**Ave: 43.8cm**

Two of 17 samples fell below the 20 cm estimated standard. The low was during the June 12<sup>th</sup> flood event. Six of 17 samples were 60 cm or clearer. The average is on the lower end of this sampling set. In 2000, none of 9 samples was below 20 cm, and in 2001, 1 of 21 were below 20 cm. The average in 2000 was 59 cm and 53.6 cm in 2001. The trend tends to be moving in a negative direction.

### **Turbidity**

**High: 1064.8 FNU**

**Low: .1 FNU**

**Ave: 71.2 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) three times in 17 samples. The high sample was taken during the June 12<sup>th</sup> flood event. Three of the 17 samples fell above the eco-region normal range (5.2-22NTU). The average is one of the highest of the sampling set.

## **Woodbury Creek:**

### Overview

Woodbury Creek is sampled at the Mower County Road 6 crossing about 1 mile before the junction with the Cedar River. There is about a 25,430 acre watershed above the sampling site. The lower 3.75 miles of the creek channel has a wooded buffer, beyond that the channel is mainly ditched with a very small average buffer.

<b>Woodbury Creek Watershed Land Use</b>	
<u>Types</u>	<u>Percent</u>
Barren	0.00%
Row Crops	77.43%
Forested	2.33%
Developed	9.28%
Grassland/Pasture/Hay	10.48%
Wetland	0.45%
Open Water	0.02%



*Rushing water during the June flood event on Woodbury Creek at Mower County 6*

### Monitoring Results

#### **Chloride**

**High: 18.7 mg/L                      Low: 14.7 mg/L                      Ave: 16.2 mg/L**

All samples were well below the MPCA standard (230 mg/L). The average sample was the lowest of this sample set. Samples were very consistent with very little variation.

#### **Conductivity**

**High: .633 mS/cm                      Low: .152 mS/cm                      Ave: .505 mS/cm**

The low sample was taken during the June 12<sup>th</sup> flood event. The average was slightly above the average of this sampling set. The average is slightly higher than the range for a good mixed fishery (.150-500 mS/cm).

#### **Dissolved Oxygen**

**High: 15.73 mg/L                      Low: 6.6 mg/L                      Ave: 9.44 mg/L**

None of the 17 samples were below 5mg/L that is the minimum to support healthy aquatic life. The average sample was slightly below the average of sampling set. Samples were higher in the earlier part of the year.

**E. Coli**

**High: 1732.9 MPN/100mL Low: 579.4 MPN/100mL Ave: 927.0 MPN/100mL**

One of the four samples exceeded the estimated MPCA threshold standard (1260CFU/100mL). The average exceeded the estimated MPCA average standard (126CFU/100mL). The average was slightly above the average of this sample set. Fecal coli form was tested in 1973, 2000 and 2001 with averages of 790 MPN/100mL, 769 MPN/100mL and 1303.6 MPN/100mL respectively.

**Nitrogen**

**Nitrate- Nitrite High: 10.9 mg/L Low: 3.74 mg/L Ave: 6.17 mg/L**

**Ammonia High: <.16 mg/L Low: <.16 mg/L Ave: <.16**

**TKN High: 2 mg/L Low: .9 mg/L Ave: 1.21 mg/L**

Nitrate-Nitrite levels exceeded the federal nitrogen standard of 10 mg/L for drinking water at this site in only 1 of the 13 samples. The average for this site was slightly above the average of the sampling set.

All of the 13 samples of the ammonia levels were below the .16 mg/L which is the lowest level that the lab sampled.

Average TKN levels were slightly below the average of this sampling set.

**pH**

**High: 8.68 Low: 7.73 Ave: 8.18**

The average was in the eco-region normal range (8-8.2). The average was in the middle of the sampling set. Nine of the 17 samples were above 8.2 and 3 of the samples were below 8.0.

**Phosphorus**

**Total High: .117 mg/L Low: .016 mg/L Ave: .075 mg/L**

**Ortho High: .4 mg/L Low: .005 mg/L Ave: .085 mg/L**

Total phosphorous averages were below the MPCA state standard (.2mg/L). None of the 13 samples were above the MPCA standard. The average was the slightly below average of the sampling set.

Ortho Phosphorous levels were slightly below the average of the sampling set.

### **Sulfate**

**High: 43.6 mg/L**                      **Low: 20.4 mg/L**                      **Ave: 32.5 mg/L**

None of the samples were above the MPCA standard (1000 mg/L). The results showed a steady rise throughout the year. The average sample was slightly above the average of the sampling set.

### **Total Suspended Solids**

**High: 19 mg/L**                      **Low: 2 mg/L**                      **Ave: 8.62 mg/L**

None of the 14 samples exceeded the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). The average was slightly below the middle of this sampling set. In 2001 there were two samples that exceeded the MPCA standard. The average of the samples in 2001 was 18.59 mg/L and in 2000 was 10.49 mg/L. Not one sample in 2000 or 2001 exceeded the MPCA standard.

### **Transparency**

**High: 60cm**                      **Low: 1.5cm**                      **Ave: 48.6cm**

Two of 17 samples fell below the 20 cm estimated standard. The low was during the June 12<sup>th</sup> flood event. Eight of 17 samples were 60 cm or clearer. The average is slightly above the average of this sampling set. In 2000, none of 9 samples was below 20 cm, and in 2001, 1 of 21 were below 20 cm. The average in 2000 was 52.4 cm and 42.7 cm in 2001. This years sample splits the deference of the prior.

### **Turbidity**

**High: 580 FNU**                      **Low: .1 FNU**                      **Ave: 42.6 FNU**

The samples at this site exceeded the estimated MPCA standard (25 NTU) two times in 17 samples. The high sample was taken during the June 12<sup>th</sup> flood event. Two of the 17 samples fell above the eco-region normal range (5.2-22NTU). The average is slightly above the average of the sampling set.

## **Cedar River South of Interstate 90:**

### **Transparency**

**Volunteer High: 57 cm**

**Low: 14 cm**

**Ave: 37.5 cm**

The data collected by the volunteer captured data from July 12<sup>th</sup> to November 10<sup>th</sup>. Eight of the 52 samples were below 20 cm estimated standard. The sampler listed most of the samples as muddy with high sediment.

## **North Branch of Dobbins Creek in Nature Center:**



### **Transparency**

**Volunteer High: 60 cm**

**Low: 5.8 cm**

**Ave: 45.9 cm**

The data collected by the volunteer captured the early spring rains when the water level was high. This sample set includes the early season rain events that were not captured at either of the Dobbins Creek TMDL sites. Four of the 18 samples were below 20 cm estimated standard.

## TMDL

### 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.



*Cedar River at Mower County 2 during the June 2008 flood event*

<b>Cedar River at Mower County Road 2 Watershed Land Use</b>	
<u>Types</u>	<u>Percent</u>
<b>Barren</b>	<b>0.04%</b>
<b>Row Crops</b>	<b>75.21%</b>
<b>Forested</b>	<b>2.53%</b>
<b>Developed</b>	<b>10.29%</b>
<b>Grassland/Pasture/Hay</b>	<b>11.06%</b>
<b>Wetland</b>	<b>0.82%</b>
<b>Open Water</b>	<b>0.05%</b>

#### Monitoring Results

##### **Conductivity**

**High: .594 mS/cm**

**Low: .387 mS/L**

**Ave: .497 mS/L**

The low sample was taken during October 8th. The average was slightly above the average of this sampling set. The average is high but within the range for a good mixed fishery (.150-500 mS/cm).

### **Dissolved Oxygen**

**High: 9.84 mg/L                      Low: 7.81 mg/L                      Ave: 8.64 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 over that same span was 10.75 mg/L.

### **Nitrate-Nitrite**

**High: 7.7 mg/L                      Low: 1.7 mg/L                      Ave: 3.9 mg/L**

All 3 samples were below the 10mg/L federal drinking water standard. The 7.7 mg/L was the highest sample taken during the sample set. From 1980 to 2008 samples have exceeded the MPCA standard in 25 of the 207 samples. The average over that same time frame 6.13 mg/L.

### **pH**

**High: 8.41                      Low: 8.02                      Ave: 8.24**

The average was slightly above the eco-region normal range (8-8.2). The average was in the middle of the sampling set. Five of the 7 samples were above 8.2.

The average of over 300 samples from 1967 to 2008 was 7.96. The average was 7.83 from in 95 samples from 1967 to 1976.

### **Phosphorus**

**Total High: .501 mg/L                      Low: .111 mg/L                      Ave: .249 mg/L**

**Ortho High: .497mg/L                      Low: .07 mg/L                      Ave: .219 mg/L**

Total phosphorous averages were above the MPCA state standard (.2mg/L). Two of the 3 samples were above the MPCA standard. The average was the on the high end of the sampling set. The average was .210 mg/L over 265 samples from 1967-2008.

The high ortho-phosphorous sample was the highest of this sample set. The average was highest of this sample set.

### **Suspended Solids**

**Total High: 4.4 mg/L                      Low: 1 mg/L                      Ave: 2.87 mg/L**

**Volatile High: 1.6 mg/L      Low: 1 mg/L      Ave: 1.27 mg/L**

None of the 3 total suspended solid samples exceeded the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). The average was on the lower end of this sampling set. The average was 28.6 mg/L of 261 samples taken from 1967 to 2008. The prior average may be higher than this year because of the small late season sampling set.

The volatile suspended solids average was on the lower end of this sampling set. The average was 5.85 mg/L in 61 samples from 1967 to 2008. The prior average may be higher than this year because of the small late season sampling set.

### **Transparency**

**High: 60 cm                      Low: 60 cm                      Ave: 60 cm**

All seven of the samples were 60 cm. There were 47 samples taken from 1997 to 2008 with an average of 50.1 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.

### **Turbidity**

**Field High: 8.4 FNU                      Low: .1 FNU                      Ave: 1.99 FNU**  
**Lab High: 3.5 NTU                      Low: 2.4 NTU                      Ave: 2.8 NTU**

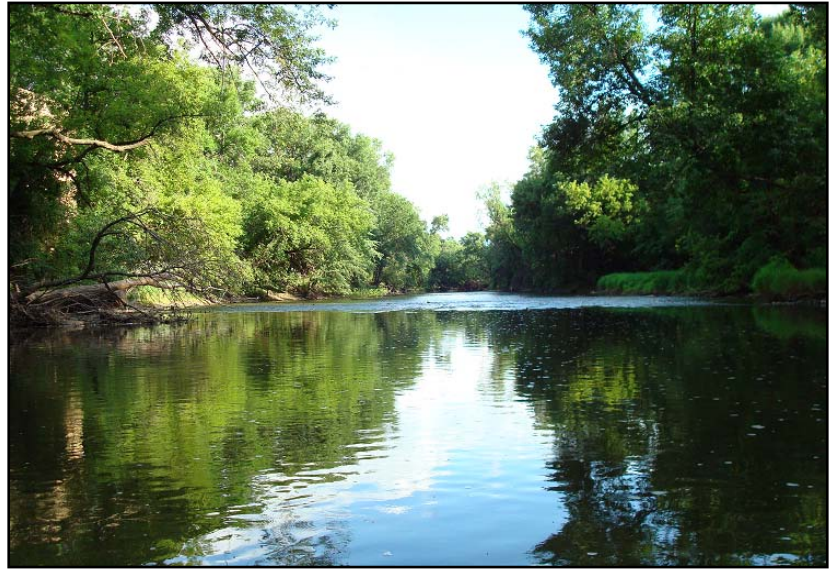
The samples at this site never exceeded the estimated MPCA standard (25 NTU) in the 7 field samples or 3 lab samples. None of the samples fell above the eco-region normal range (5.2-22NTU).

## **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.

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



*Cedar River South of Mower County Road 28*

### Monitoring Results

#### **Conductivity**

**High: .654 mS/cm                      Low: .421 mS/cm                      Ave: .555 mS/cm**

The average is high but within the range for a good mixed fishery (.150-.500 mS/cm). This was the highest of this sampling set. There was sampling done in 2007 and 2008 with an average of .538 mS/cm.

#### **Dissolved Oxygen**

**High: 11.42 mg/L                      Low: 7.21 mg/L                      Ave: 9.27 mg/L**

All samples are above 5mg/L that is the minimum to support healthy aquatic life. This was the highest 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. It appears that trend is moving towards high levels of dissolved oxygen at this site.

### **Nitrate-Nitrite**

**High: 4.2 mg/L**

**Low: 2.2 mg/L**

**Ave: 3.5mg/L**

All samples were below the 10 mg/L Federal drinking water standard. The average was for this site was about the average of sample set. There were 71 samples collected from 2007 to 2008 with an average of 8.3 mg/L.

### **pH**

**High: 8.74**

**Low: 7.99**

**Ave: 8.32**

The average was above the eco-region normal range (8-8.2). The average was in the middle of the sampling set. Six of the 7 samples were above 8.2. The average was the highest 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.

### **Phosphorus**

**Total High: .349 mg/L**

**Low: .131 mg/L**

**Ave: .259 mg/L**

**Ortho High: .255mg/L**

**Low: .093 mg/L**

**Ave: .194 mg/L**

Total phosphorous averages were above the MPCA state standard (.2mg/L). Two of the 3 samples were above the MPCA standard. The average was the on the highest of the sampling set. There were 71 samples taken from 2007 to 2008 with an average of .303 mg/L.

The high orthophosphate sample was the second highest of this sample set. The average was the second highest of this sample set as well. There were 69 samples taken from 2007 and 2008 with an average of .220 mg/L.

### **Suspended Solids**

**Total High: 15 mg/L**

**Low: 5.6 mg/L**

**Ave: 9.13 mg/L**

**Volatile High: 3.6 mg/L**

**Low: 3.6 mg/L**

**Ave: 2.8 mg/L**

None of the 3 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 end of this sampling set. The average was 28.6 mg/L of 271 samples taken from 1967 to

2008. The prior average may be higher than this year because of the small late season sampling set.

The volatile suspended solids average was in the middle end of this sampling set. The average might be a little lower because of the late season sampling set.

### **Transparency**

**High: 60 cm                      Low: 54 cm                      Ave: 58.6 cm**

All but 2 of the 7 of the samples were 60 cm. There were 45 samples taken from 1997 to 2008 with an average of 49.2 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 those 45 samples were below the 20 cm estimated standard.

### **Turbidity**

**Field High: 11.5 FNU                      Low: -.7 FNU                      Ave: 5.1 FNU**

**Lab High: 14 NTU                      Low: 4 NTU                      Ave: 7.5 NTU**

The samples at this site never exceeded the estimated MPCA standard (25 NTU) in 7 field samples and 3 lab samples. None of the samples fell above the eco-region normal range (5.2-22NTU). The average is was the highest of the 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.

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

### Monitoring Results

#### **Conductivity**

**High: .473 mS/cm                      Low: .284 mS/cm                      Ave: .385 mS/cm**

The average is within the range for a good mixed fishery (.150-500 mS/cm). This was the second lowest of this sample set with the other Dobbins Creek site being the lowest.

#### **Dissolved Oxygen**

**High: 11.13 mg/L                      Low: 7.88 mg/L                      Ave: 8.86 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.

#### **Nitrate-Nitrite**

**High: 4.6 mg/L                      Low: 3.5 mg/L                      Ave: 4.1 mg/L**

All 3 samples were below the 10 mg/L federal drinking water standard. Samples remained fairly consistent. The average was the highest of this sample set.

#### **pH**

**High: 8.3                      Low: 7.88                      Ave: 8.14**

The average was within the eco-region normal range (8-8.2). Two of the 6 samples were above the normal eco-region range. It is also on the middle of this sampling set.

### **Phosphorus**

**Total High: .122 mg/L      Low: .040 mg/L      Ave: .076 mg/L**

**Ortho High: .076 mg/L      Low: .024 mg/L      Ave: .045 mg/L**

Total phosphorous averages were below the MPCA state standard (.2mg/L). All 3 samples were above the MPCA standard. The average was the lowest of the sampling set.

The low sample was the second lowest of this sample set. The average was the second lowest of this sample set as well.

### **Suspended Solids**

**Total High: 5.6 mg/L      Low: 1 mg/L      Ave: 2.6 mg/L**

**Volatile High: 1 mg/L      Low: 1 mg/L      Ave: 1 mg/L**

None of the 3 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 end of this sampling set. The average was 18.6 mg/L of 35 samples taken from 2000 to 2008.

The volatile suspended solids average was in the lowest of this sampling set. The average might be a little lower because of the late season sampling set.

### **Transparency**

**High: 60 cm      Low: 51 cm      Ave: 58.7 cm**

None of the 7 samples fell below the 20 cm estimated standard. Six of the 7 samples were 60 cm or clearer. The average was the second highest of the sample set. From 1987 to 2008 there were 78 samples taken with an average of 38.6 cm. Nineteen of those samples were below the 20 cm estimated standard.

### **Turbidity**

**Field High: 7.2 FNU      Low: -1.4 FNU      Ave: 2.6 FNU**

**Lab High: 7.2 NTU      Low: 1.9 NTU      Ave: 4.1 NTU**

The samples at this site never exceeded the estimated MPCA standard (25 NTU) in 7 field samples and 3 lab samples. None of the samples fell above the eco-region normal range (5.2-22NTU). The average is was the second lowest of the sampling set.

**Dobbins Creek at Mower County Road 19:**

Overview

This sampling site is located on the bridge on Mower County Road 19. There are about 6400 acres about the sampling site. This stretch runs through farmland and has a decent buffer. This site has the least percentage of development compared to the other sampling sites.

<b>Dobbins Creek at Mower County Road 19 Watershed Land Use</b>	
<u>Types</u>	<u>Percent</u>
<b>Barren</b>	<b>0.00%</b>
<b>Row Crops</b>	<b>79.79%</b>
<b>Forested</b>	<b>1.24%</b>
<b>Developed</b>	<b>8.12%</b>
<b>Grassland/Pasture/Hay</b>	<b>10.84%</b>
<b>Wetland</b>	<b>0.01%</b>
<b>Open Water</b>	<b>0.00%</b>

Monitoring Results

**Conductivity**

**High: .457 mS/cm                      Low: .294 mS/L                      Ave: .375 mS/cm**

The average is high but within the range for a good mixed fishery (.150-500 mS/cm).

**Dissolved Oxygen**

**High: 9.02 mg/L                      Low: 4.39 mg/L                      Ave: 6.92 mg/L**

One of the 7 samples was below 5mg/L that is the minimum to support healthy aquatic life. The average was the lowest of this sampling set. The lack of water flow at this site may have impacted the dissolved oxygen levels.

**Nitrate-Nitrite**

**High: 6.1 mg/L                      Low: 1.9 mg/L                      Ave: 3.6mg/L**

All 3 samples were below the 10 mg/L federal drinking water standard. The average was in the middle of this sample set.

**pH**

**High: 8.33                              Low: 7.62                              Ave: 8.06**

The average was within the eco-region normal range (8-8.2). Two of the 7 samples were above the normal eco-region range. The average is the lowest of this sampling set.

**Phosphorus**

**Total High: .151 mg/L              Low: .057 mg/L              Ave: .095 mg/L**  
**Ortho High: .080 mg/L              Low: .022 mg/L              Ave: .047 mg/L**

Total phosphorous averages were below the MPCA state standard (.2mg/L) and all 3 samples were above the MPCA standard. The average was the on the low end of the sampling set.

The low orthophosphate sample was the lowest of this sample set. The average was very average for this sample set.

**Suspended Solids**

**Total High: 29 mg/L              Low: 8 mg/L              Ave: 18.3 mg/L**  
**Volatile High: 8.8 mg/L              Low: 1.2 mg/L              Ave: 4.5 mg/L**

All 3 of the total suspended solid samples were below the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). The average was on the highest of this sampling set.

The volatile suspended solids were on the highest of this sample set.

## Transparency

**High: 48 cm**

**Low: 28 cm**

**Ave: 38.2 cm**

None of the 7 samples fell below the 20 cm estimated standard. None of the 7 samples were 60 cm or clearer. The average was the lowest of the sample set.

## Turbidity

**Field High: 21.6 FNU**

**Low: 11.5 FNU**

**Ave: 14.8 FNU**

**Lab High: 13 NTU**

**Low: 7.5 NTU**

**Ave: 9.7 NTU**

The samples at this site did not exceed the estimated MPCA standard (25 NTU). All seven field samples were at or below the eco-region normal range (5.2-22 NTU). The field samples were the highest of this sample set and lab sample average was the second highest of this sample set.

## Middle Fork Of the Little Cedar River:

### Overview

The Middle Fork of the Little Cedar River is sampled at Minnesota State Highway 30, East of Blooming Prairie. There is a 12,000 acre watershed above the site. This watershed has the highest percentage of row crops of those sampled. The watershed also has the lowest percentage of forested lands and grassland/pasture/hay of those sampled.

<b>Middle Fork Cedar River Watershed Land Use</b>	
<u>Types</u>	<u>Percent</u>
<b>Barren</b>	<b>0.10%</b>
<b>Row Crops</b>	<b>84.26%</b>
<b>Forested</b>	<b>0.50%</b>
<b>Developed</b>	<b>8.32%</b>
<b>Grassland/Pasture/Hay</b>	<b>6.57%</b>
<b>Wetland</b>	<b>0.24%</b>
<b>Open Water</b>	<b>0.01%</b>

## Monitoring Results

### **Conductivity**

**High: .544 mS/cm                      Low: .341 mS/cm                      Ave: 431 mS/L**

The average was in the middle of this sampling set. This is toward the high end of the range for a good mixed fishery (.150-500 mS/cm).

### **Dissolved Oxygen**

**High: 9.48mg/L                      Low: 3.82 mg/L                      Ave: 7.18 mg/L**

One of the 6 samples was below the 5mg/L that is the minimum to support healthy aquatic life. The average was at the low end of this sample set along with Dobbins Creek at Mower County Road 19. Both of these sites had issues with flow late in the season when these samples were taken.

### **Nitrate-Nitrite**

**High: 1.4 mg/L                      Low: .63 mg/L                      Ave: 1.01 mg/L**

All 4 samples were below the 10 mg/L federal drinking water standard. The average was the lowest of this sample set. The low was also the lowest of this sample set.

### **pH**

**High: 8.34                      Low: 7.83                      Ave: 8.11**

The average was within the eco-region normal range (8-8.2). Two of the 6 samples were above the normal eco-region range. It is also on the middle of this sampling set.

### **Phosphorus**

**Total High: .176 mg/L                      Low: .075 mg/L                      Ave: .137 mg/L**

**Ortho High: .092 mg/L                      Low: .034 mg/L                      Ave: .071 mg/L**

Total phosphorous averages below the MPCA state standard (.2mg/L). All 4 samples were below the MPCA standard. The average was in the middle of the sampling set.

The orthophosphate sample average was near average for this sample set.

### **Suspended Solids**

**Total High: 25 mg/L      Low: 6 mg/L      Ave: 15.3 mg/L**

**Volatile High: 5.2 mg/L      Low: 2.8 mg/L      Ave: 4 mg/L**

All 4 of the total suspended solid samples were below the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). The average was on the high of this sampling set.

The volatile suspended solids were on the higher end of this sample set.

### **Transparency**

**High: 58 cm                      Low: 27 cm                      Ave: 44.7 cm**

None of the 7 samples fell below the 20 cm estimated standard. The low was sampled on November 6<sup>th</sup>. None of the 7 samples were 60 cm or clearer. The average was on the lower end of this sample set. The average was lower even with the lack of rain events late in the year when these samples were taken.

### **Turbidity**

**Field High: 12.5 FNU      Low: 3.0 FNU      Ave: 7.9 FNU**

**Lab High: 18 NTU      Low: 5.2 NTU      Ave: 11.25 NTU**

The samples at this site did not exceed the estimated MPCA standard (25 NTU). All seven field samples were at or below the eco-region normal range (5.2-22NTU). The average is slightly above the average of the sampling set.

## **Rose Creek at 570<sup>th</sup> Ave**

### Overview

This site is sampled at 570<sup>th</sup> 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.

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

### Monitoring Results

#### **Conductivity**

**High: .478 mS/cm                      Low: .317 mS/cm                      Ave: .407 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).

#### **Dissolved Oxygen**

**High: 10.06 mg/L                      Low: 7.3 mg/L                      Ave: 8.24 mg/L**

All samples are above 5mg/L that is the minimum to support healthy aquatic life. This sample set was in the middle of this sampling set.

#### **Nitrogen**

**High: 2.2 mg/L                      Low: .81 mg/L                      Ave: 1.43 mg/L**

All 4 samples were below the 10 mg/L federal drinking water standard. The average was on the lower end of this sample set.

#### **pH**

**High: 8.45                      Low: 8.04                      Ave: 8.30**

The average was above the eco-region normal range (8-8.2). Six of the 7 samples were above the normal eco-region range. It is also on the higher end of this sampling set.

### **Phosphorous**

**Total High: .200 mg/L      Low: .066 mg/L      Ave: .134 mg/L**

**Ortho High: .045mg/L      Low: .034 mg/L      Ave: .039 mg/L**

Total phosphorous averaged below the MPCA state standard (.2mg/L). One of the 4 samples was above the MPCA standard. The average was in the middle of the sampling set.

The orthophosphate sample average was the lowest of this sample set. All samples remained very consistent.

### **Suspended Solids**

**Total High: 15 mg      Low: 1.6 mg/L      Ave: 8.75 mg/L**

**Volatile High: 6.4 mg/L      Low: 1 mg/L      Ave: 3.65 mg/L**

All 3 of the total suspended solid samples were below the 60 mg/L MPCA standard and the eco-region normal range (10-61 mg/L). The average was about the average of this sampling set.

### **Transparency**

**High: 60 cm      Low: 52 cm      Ave: 58.4 cm**

None of the 7 samples fell below the 20 cm estimated standard. The low was sampled on November 6<sup>th</sup>. Five of the 7 samples were 60 cm or clearer. The average was one of the clearer of this sample set but we didn't really have any rain events late in the year when these samples were taken.

### **Turbidity**

**Field High: 9.1 FNU      Low: .1 FNU      Ave: 3.09 FNU**

**Lab High: 5.8 NTU      Low: 2.6 NTU      Ave: 4.4 NTU**

The samples at this site did not exceed the estimated MPCA standard (25 NTU). All seven field samples were at or below the eco-region normal range (5.2-22NTU). The average is slightly below the average of the sampling set.

## **5. Quick Monitoring Recap**

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### Chloride:

All samples stayed well below the 230 mg/L chronic standard and the 100 mg/L standard that is put on industrial outputs. Blooming Prairie Tributary had the highest average, 35.3 mg/L, over 10 mg/L higher than any other average.

### Conductivity:

Conductivity was a little high with 38 percent of sites were above .500 mS/cm, which is the high end for a good mixed fishery. Most high samples were fairly close to .500 mS/cm. Only 4 percent were below .150 mS/cm which is the low end for a good mixed fishery. The Blooming Prairie Tributary had the highest average at .632 mS/cm.

### Dissolved Oxygen:

Dissolved oxygen was generally good at all the sampling sites. The general range for fish is from 7-11 mg/L with levels below 2 mg/L causing fish to suffocate. All samples were above the 2 mg/L level. The averages range from 6.9 mg/L (Dobbins Creek at Mower County 19) to 10.4 mg/L (Judicial Ditch #5).

### E. Coli:

Of the 44 samples, 36 were over 200 colonies per 100 mL which is the MPCA standard. The Average was 900 colonies per 100 mL. Wolf Creek had the lowest average with 136 colonies per 100 mL. Blooming Prairie had the highest average with 1410 colonies per 100 mL.

### Nitrogen:

The nitrate-nitrite totals were high in spring and lower in the fall and that pattern is typical with past results. 27 of the 174 samples are over the 10 mg/L drinking water standard. Iowa has set their goal for the Cedar River at 9.5 mg/L. Middle Fork of the Little Cedar River was the lowest with an average of 1.01 mg/L. Lansing tributary was the highest with an average of 8.4 mg/L.

Ammonia did not show anything of great significance. Only 4 of the 154 samples were above the .16 mg/L laboratory detection limit.

Roberts Creek had the lowest average Total Kjeldahl Nitrogen at .9 mg/L and Murphy Creek had the highest average TKN at 1.9 mg/L.

#### pH:

The eco-region normal range is from 8.0 to 8.2. Samples from this year were slightly on the high end. The overall average is 8.2. The outliers were Murphy Creek with an average of 8.0 and Cedar River at County 28 with an average of 8.32.

#### Phosphorous:

Just over 10 percent of the total samples exceeded the MPCA state standard (.2mg/L). Of the 17 samples that exceeded the MPCA state standard, 10 were collected at the Blooming Prairie Tributary site. The Blooming Prairie Tributary had the highest average with .334 mg/L. The four samples taken during the June 12<sup>th</sup> flood event were the highest.

The orthophosphate samples were also the highest during the June 12<sup>th</sup> flood event. Blooming Prairie was also the highest with .277 mg/L.

#### Sulfate:

All samples were below the MPCA standard (1000 mg/L). The Blooming Prairie Tributary had the highest average of the sampling sites less the 2 sampling anomalies. Samples were only taken at the 11 Clean Water Legacy monitoring sites.

#### Transparency Tube:

During the June flood the transparency ranged from 1 to 4cm. Eighteen of the 229 total samples had a transparency below 20 cm, which is the estimated standard and 118 of the 229 total samples had a transparency of 60 cm or more. The Cedar River at Mower County Road 2 was the clearest with all 7 samples above 60 cm. Lack of rain events probably contributed to the higher transparency numbers.

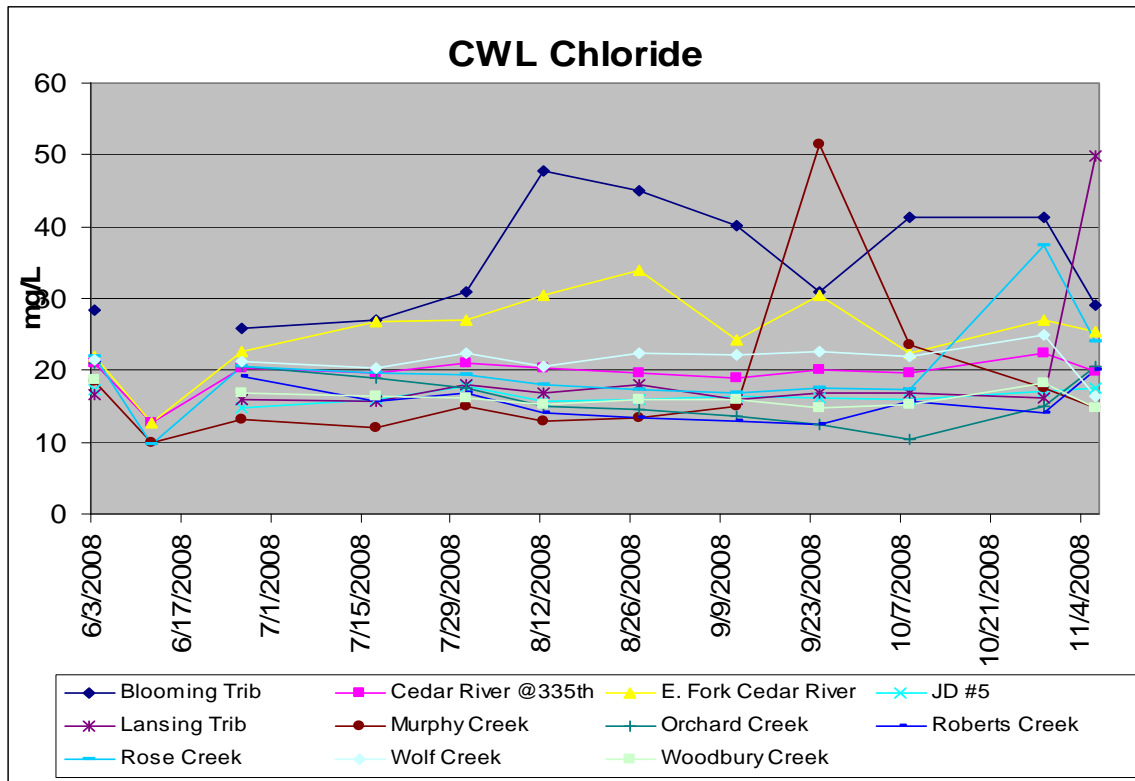
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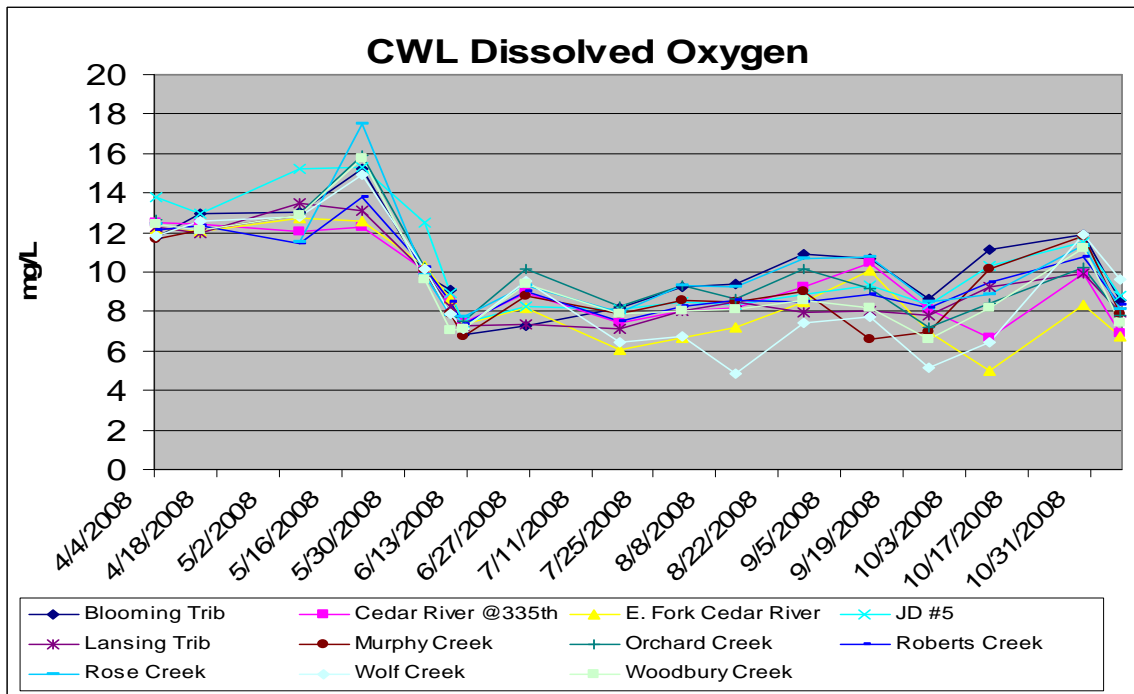
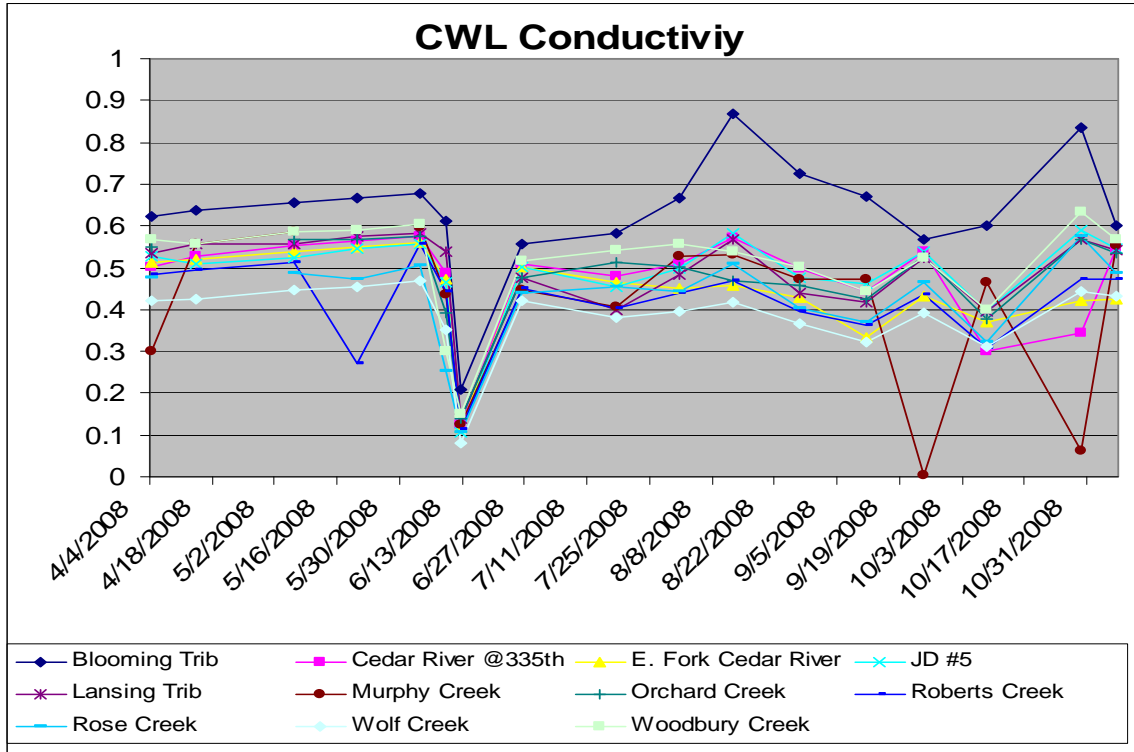
Six of the 164 samples exceeded the MPCA standard of 60mg/L. All 4 of the samples taken during the June 12<sup>th</sup> flood event exceeded the standard. Without the flood data Dobbins Creek at County 19 had the highest average with 18.3 mg/L.

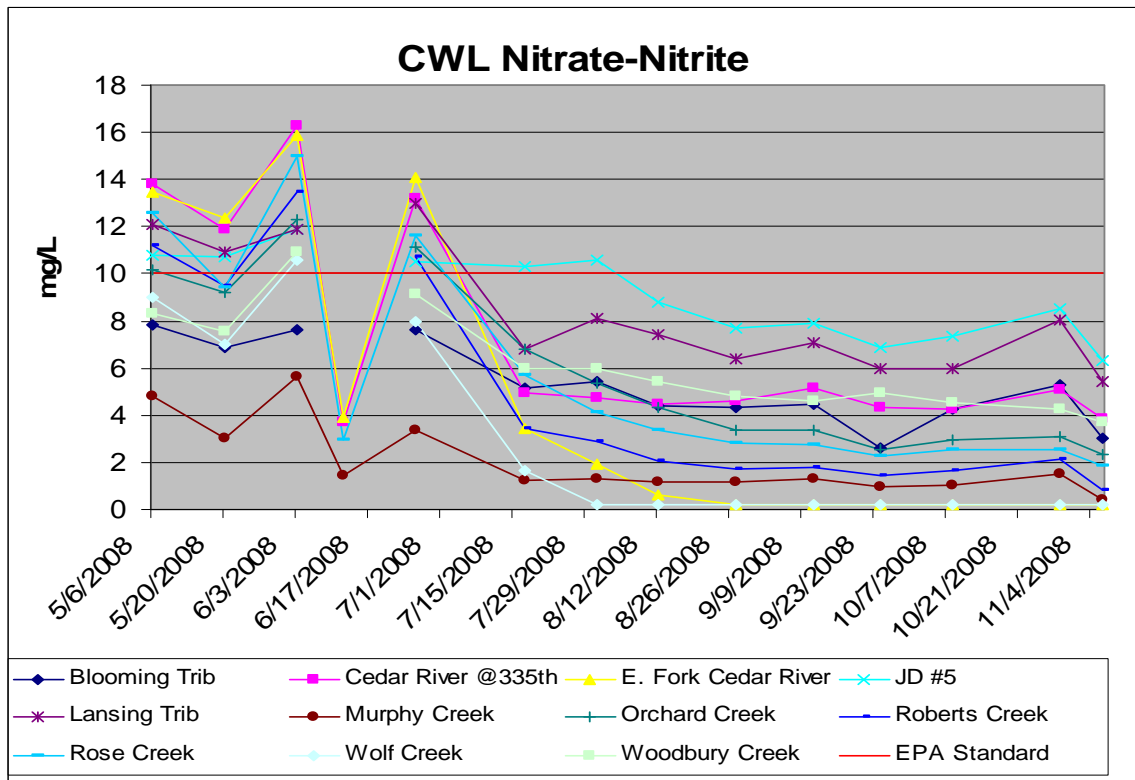
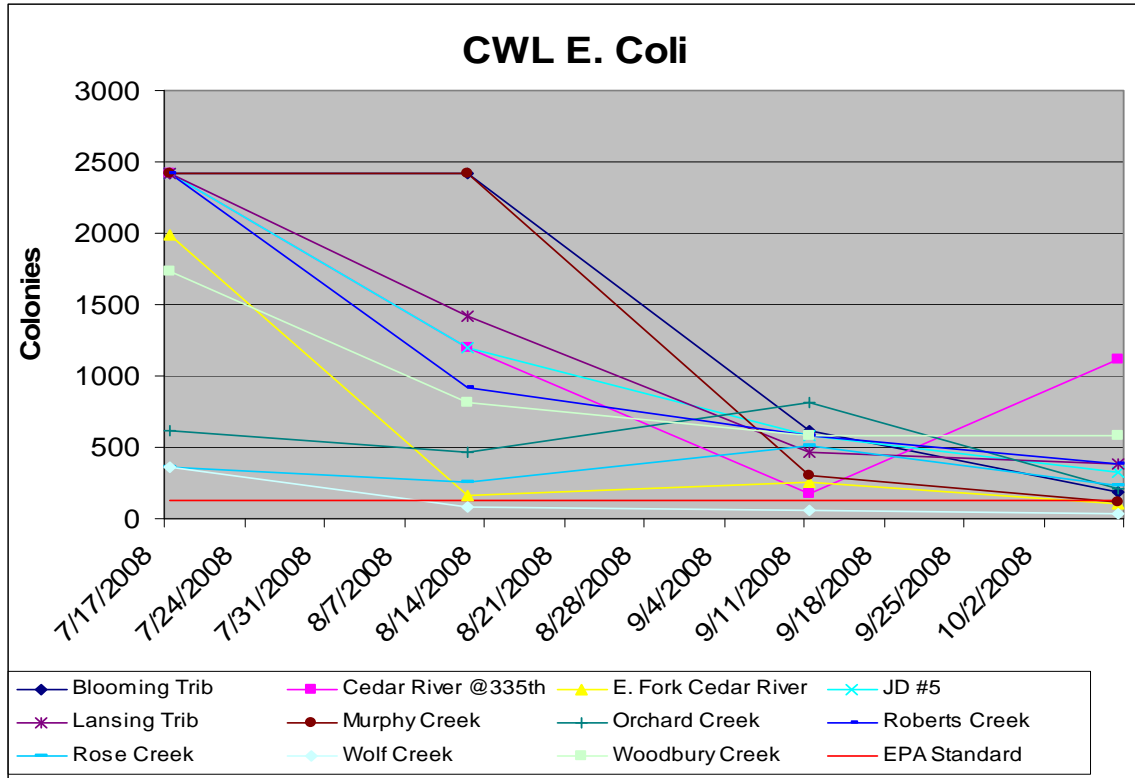
Turbidity:

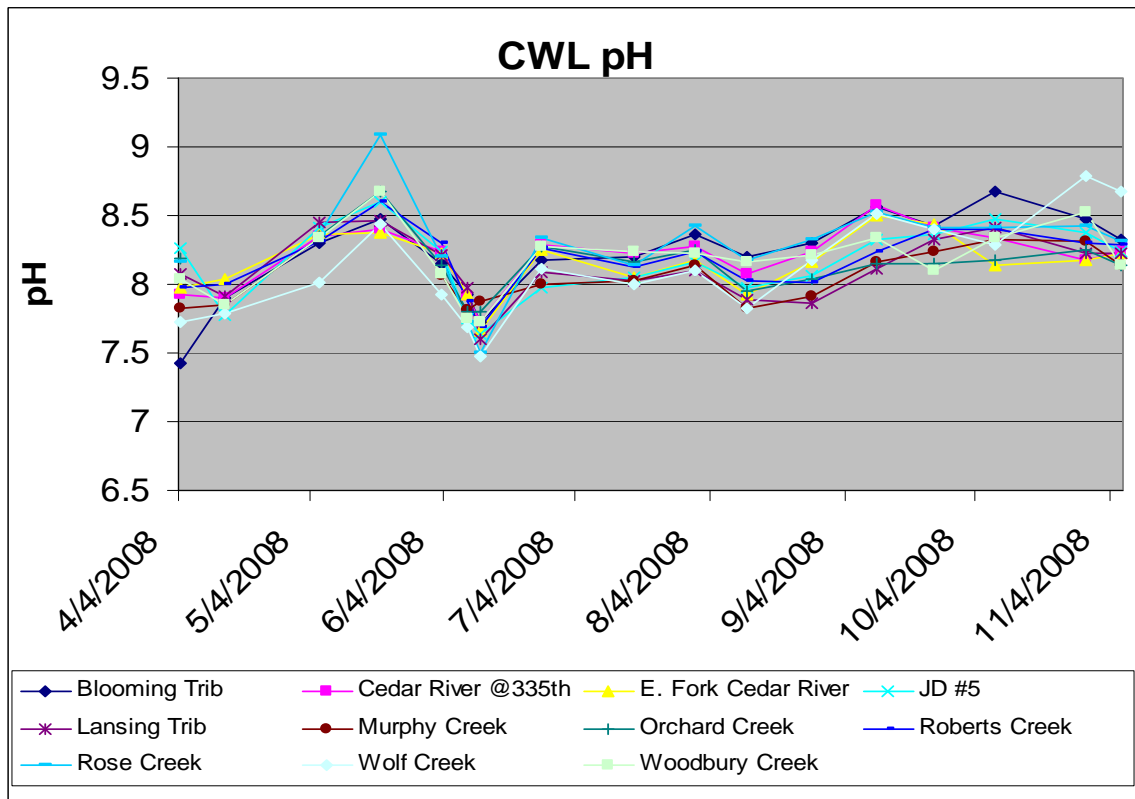
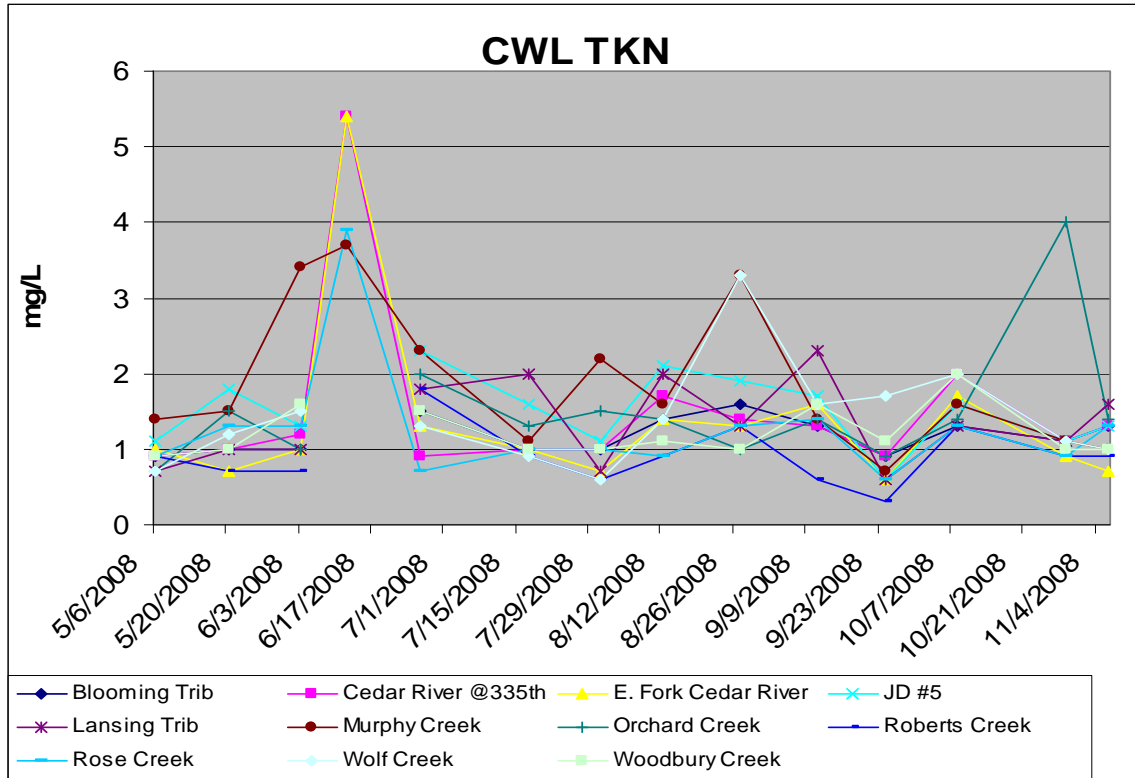
Flood and rain events showed the highest totals. The end of the sampling season showed the clearest results. 21 of the 229 samples were above the estimated 25 FNU standard. Murphy Creek had the highest average (16.6 FNU) without the flood data. Cedar River at County Road 2 had the lowest average (1.99 FNU). Lack of rain events probably contributed to the lower numbers in the TMDL samples.

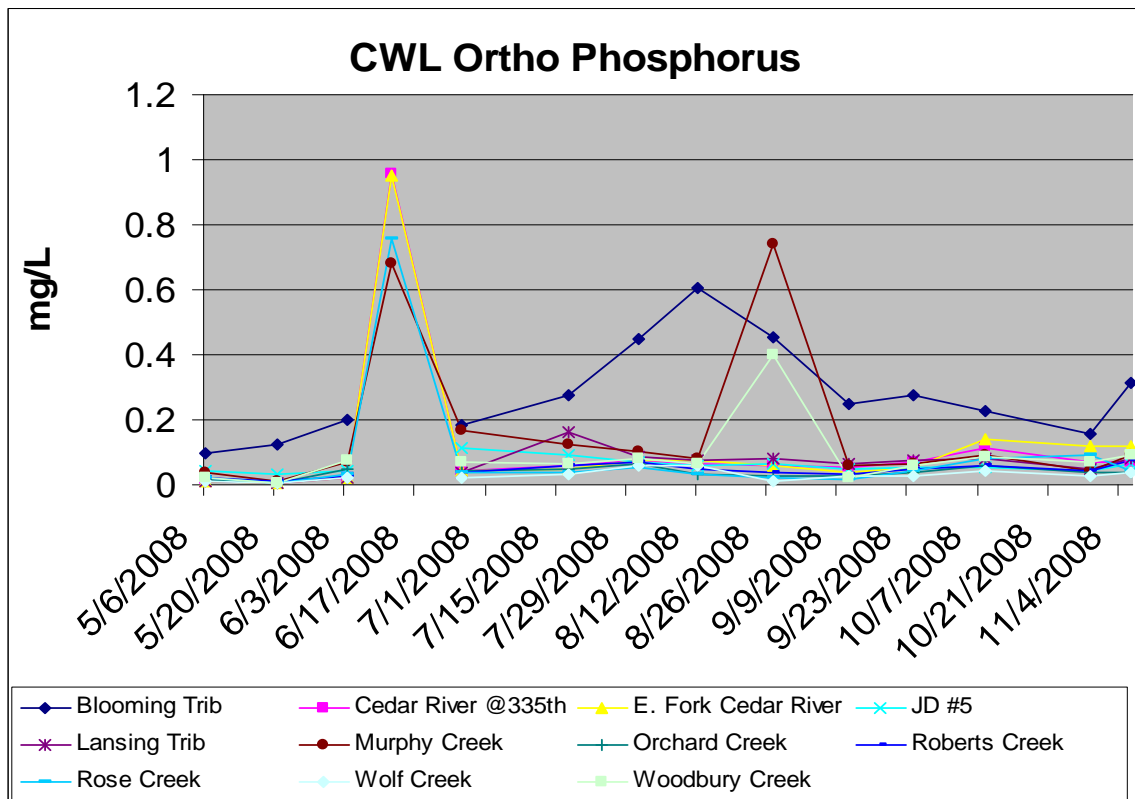
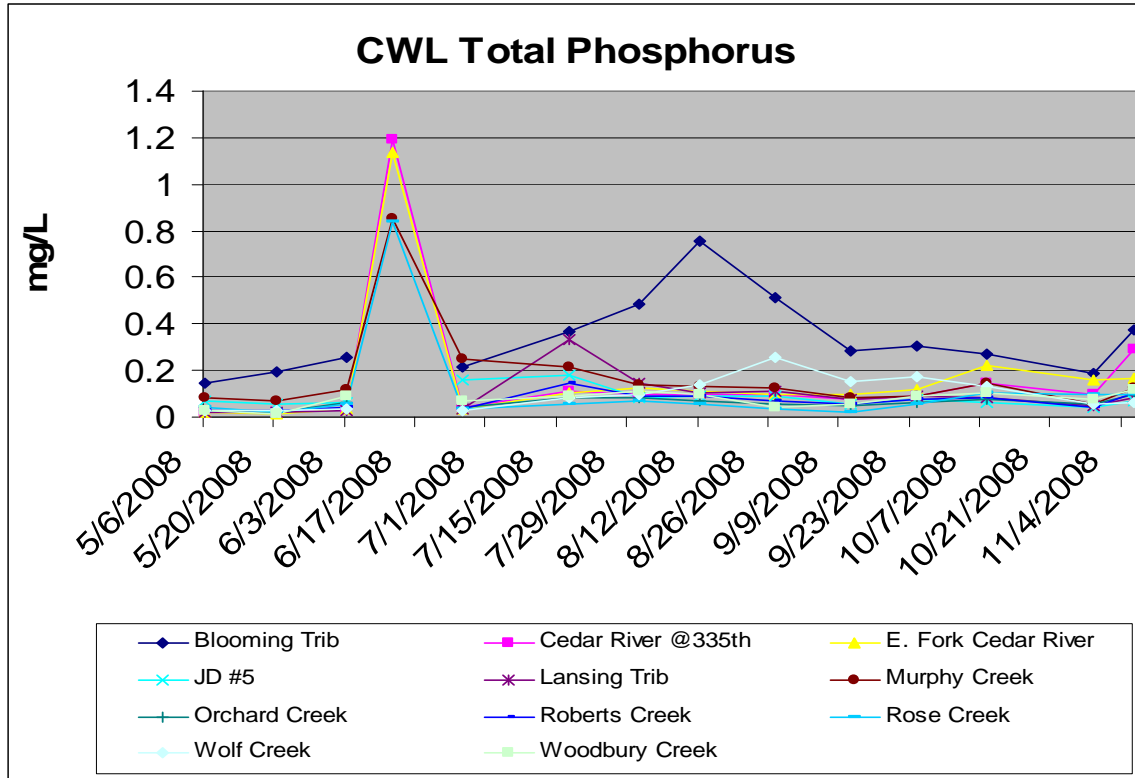
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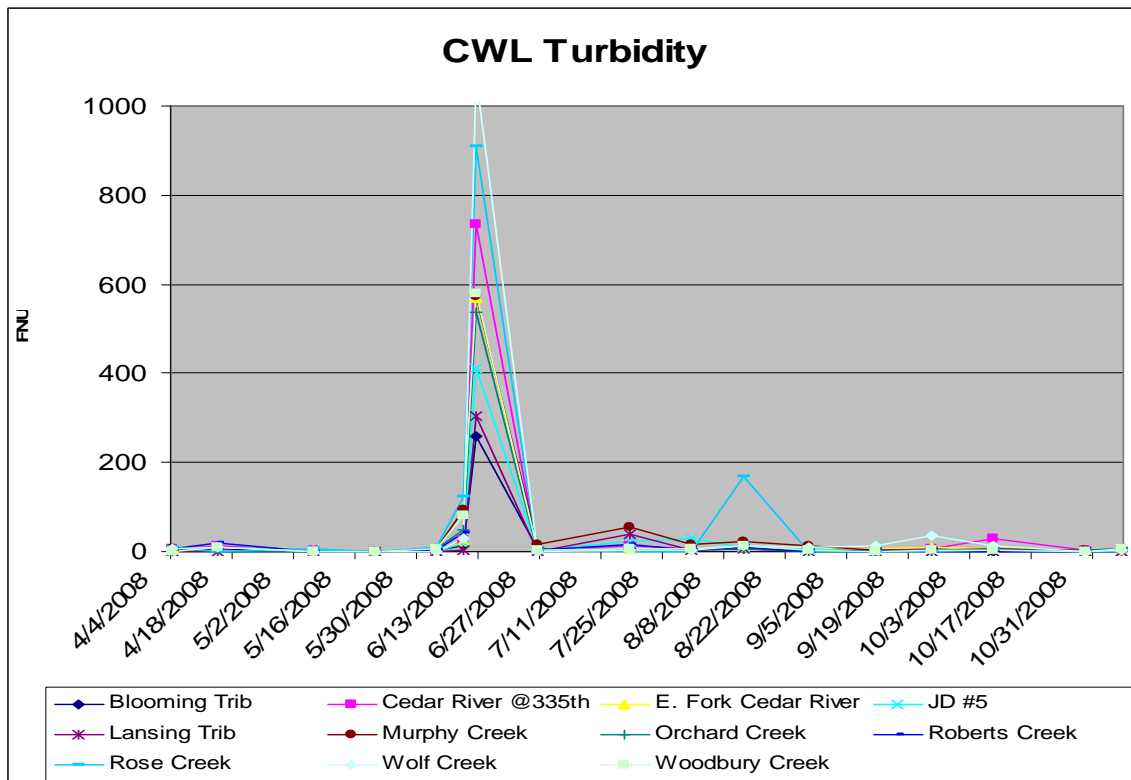
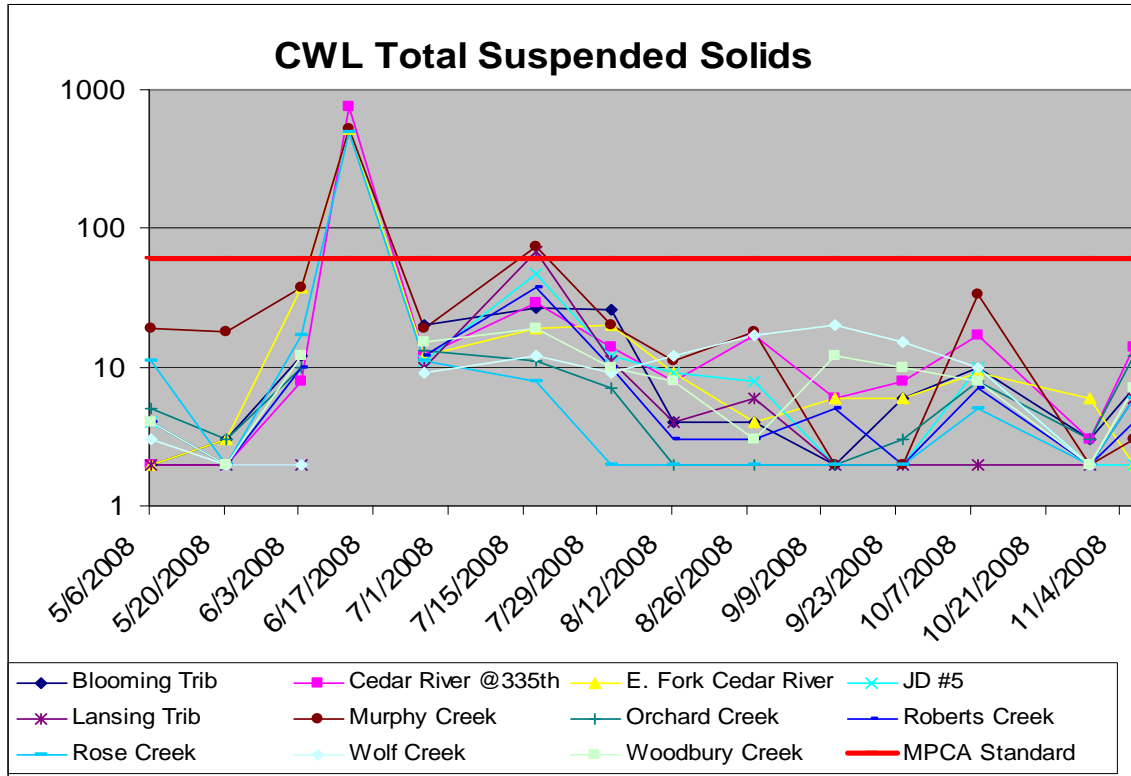


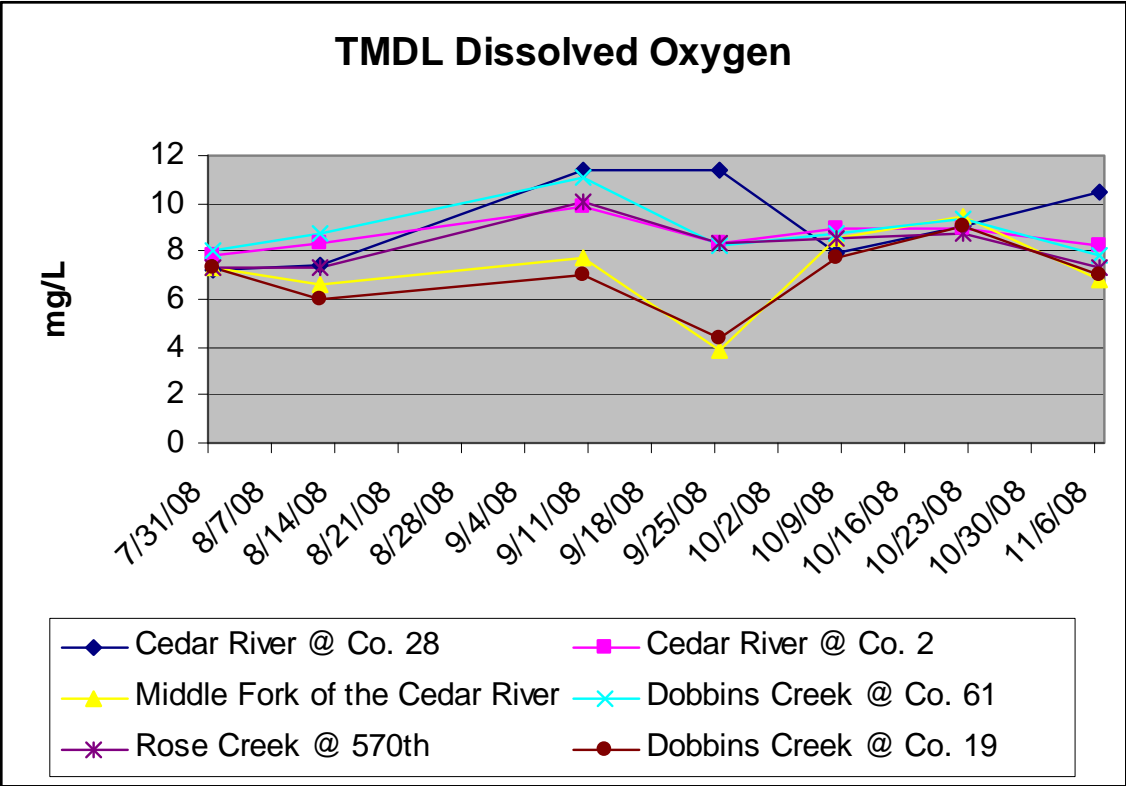
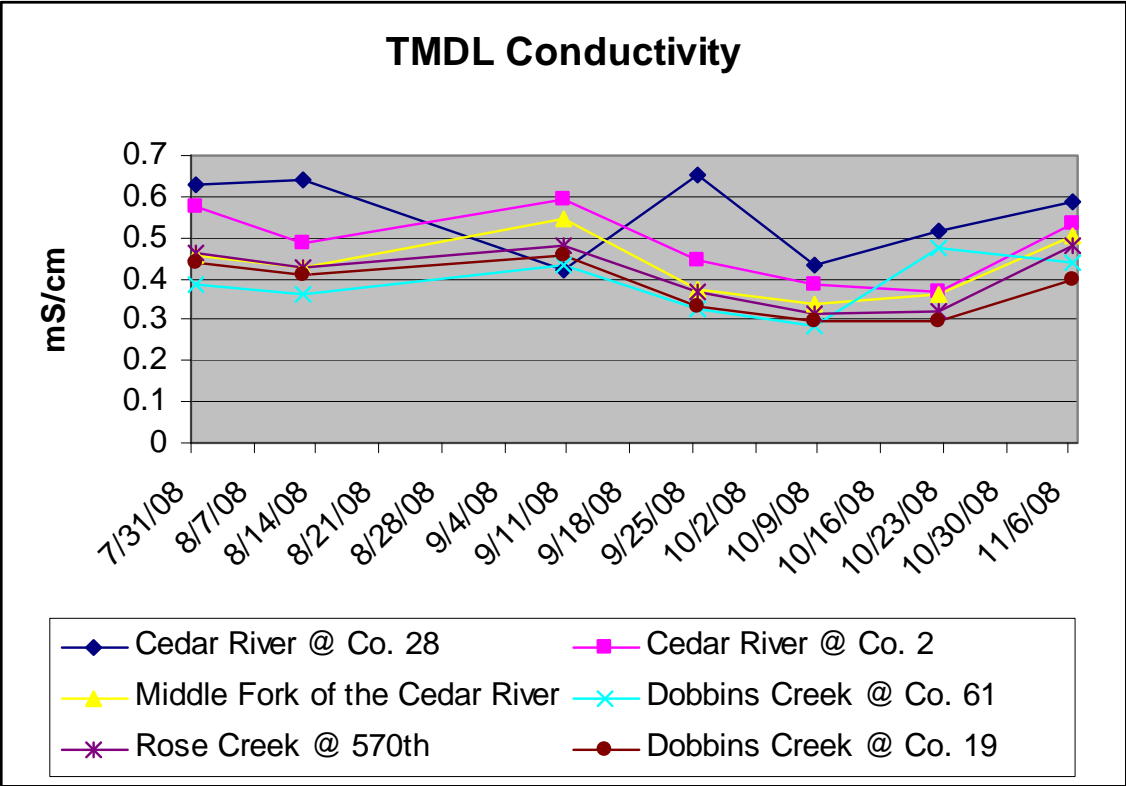


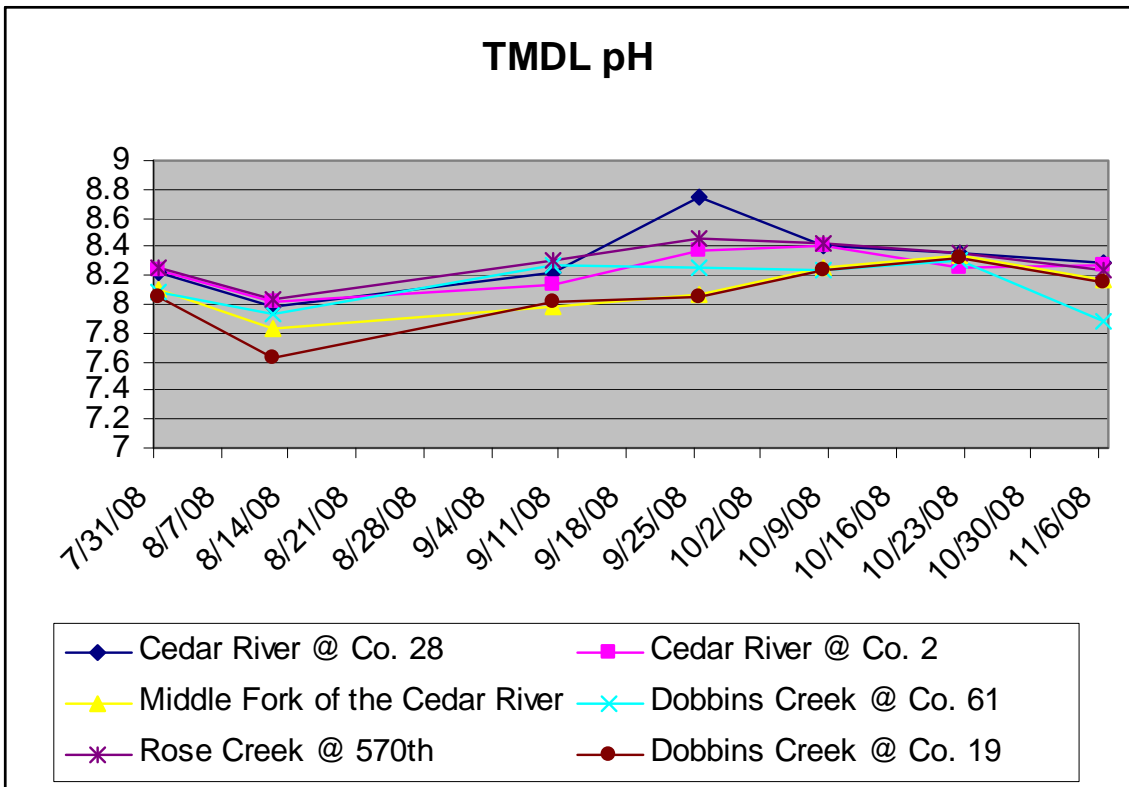
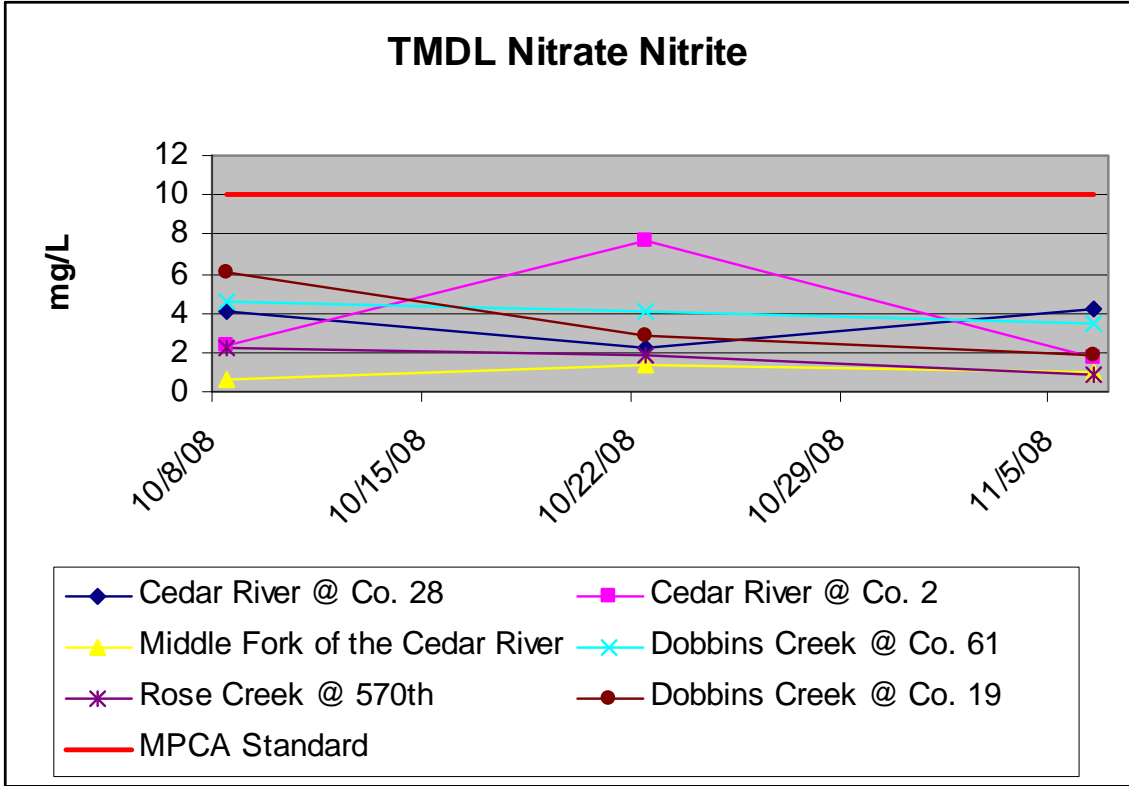


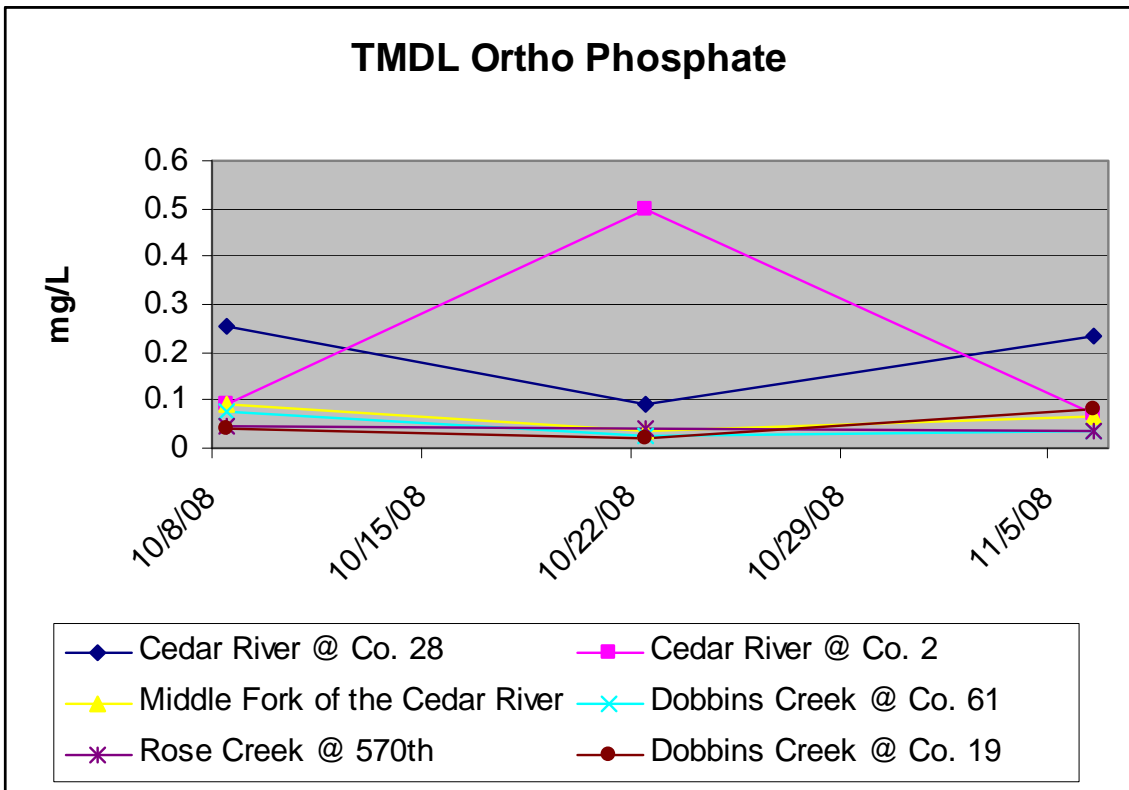
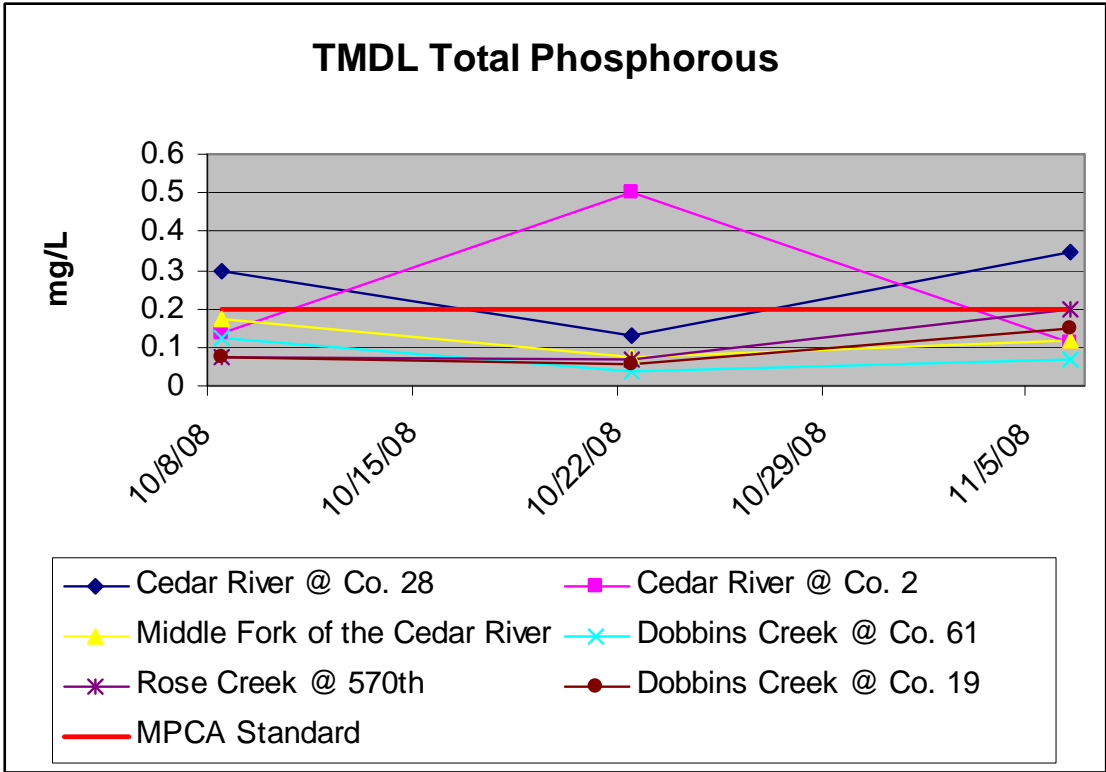


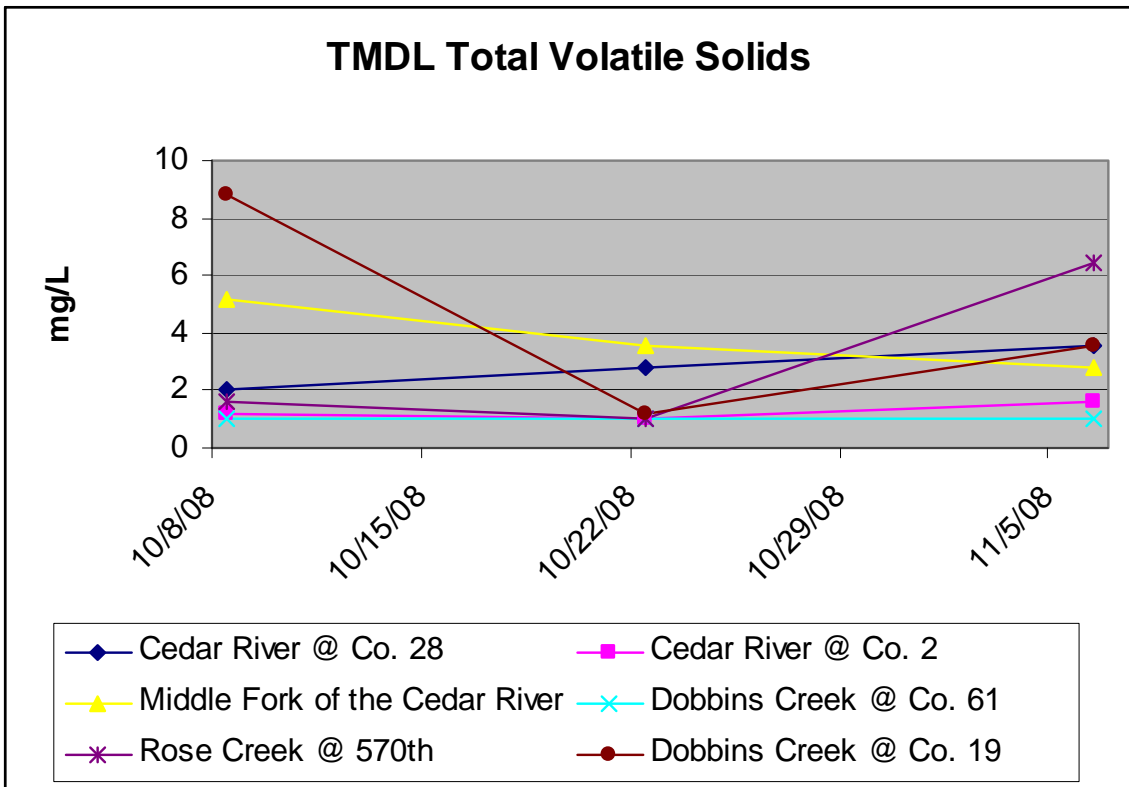
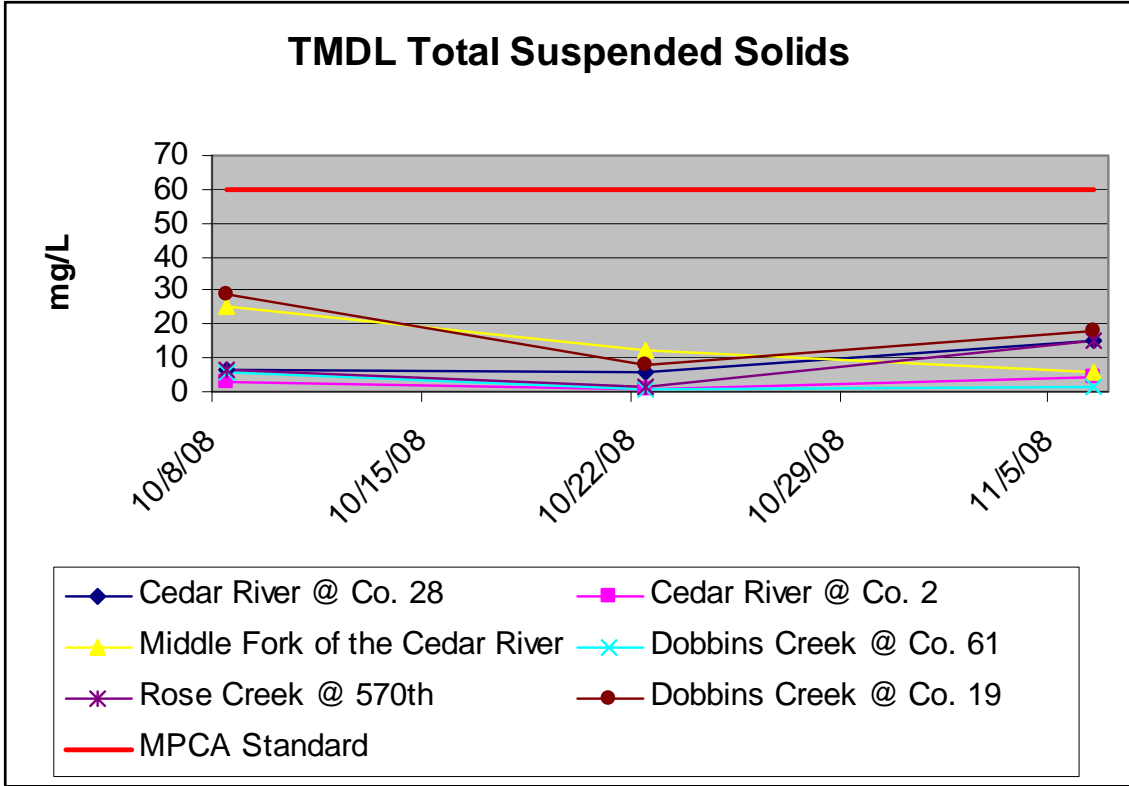




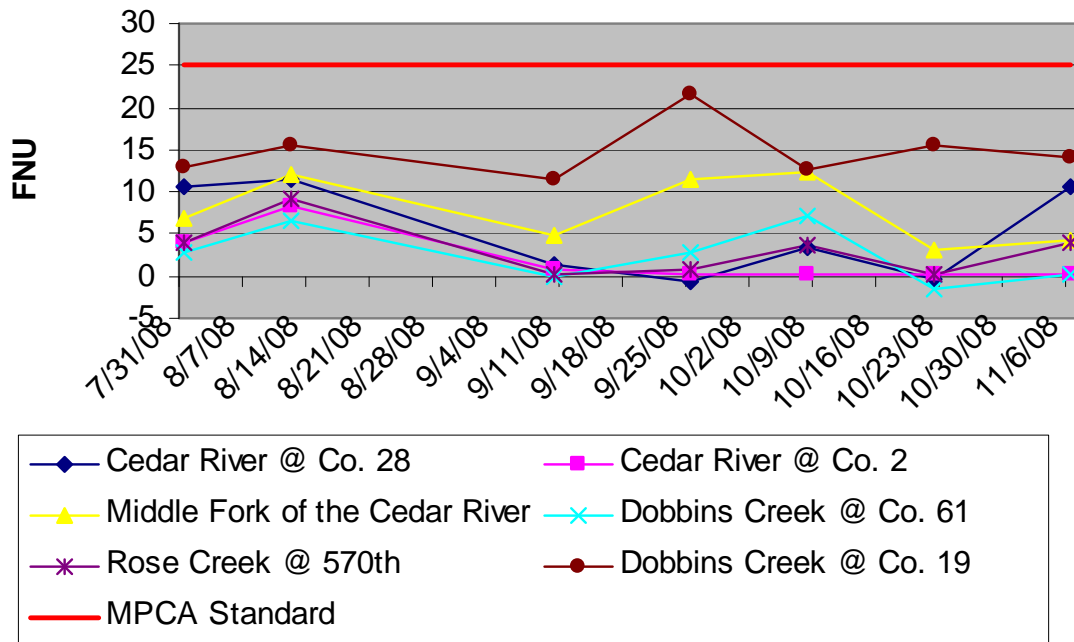




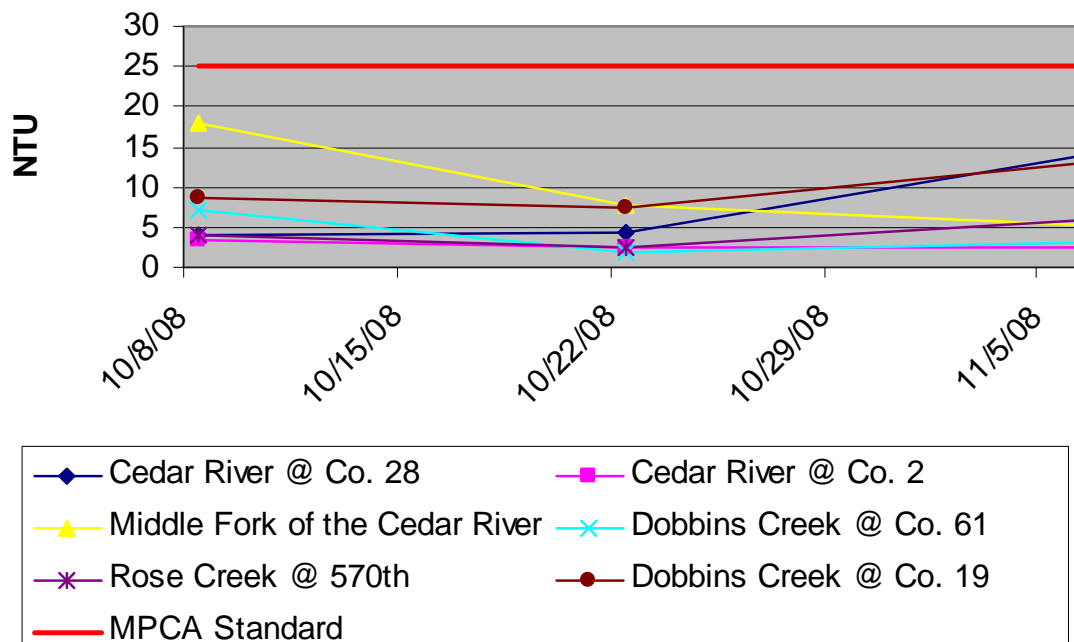




### TMDL Field Turbidity



### TMDL Lab Turbidity



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