Citizen Stream Monitoring

2005 Year in Review

Newsletter of the Faribault County Soil and Water Conservation District

CSMP Refresher...

The Citizen Stream Monitoring Program (CSMP) works to combine the technical expertise of the Minnesota Pollution Control Agency (MPCA) and local agencies such as the Soil and Water Conservation District (SWCD) with local knowledge of interested citizens to develop a statewide network for monitoring the state's 92,000 miles of streams. The network works to increase understanding of how human activities, such as land use, affect water quality.

The goal of the CSMP is to help determine the condition of Minnesota streams, provide the opportunity for anyone interested to participate, facilitate awareness and understanding of water quality issues, and promote shared responsibility for protection of our water resources.

During rainfall events, stream transparency can decrease as sediments are delivered to streams in runoff. In addition, sediments may carry other pollutants to streams. CSMP records of rainfall amount, stream stage estimates, and transparency readings can tell us where runoff may be contributing sediment and other pollutants to streams. Changes over time can also help to measure improvements or declines in water quality. Increased monitoring will help identify problems, develop strategies, prioritize activities for improving water quality, and track progress toward improvement.

The Year in Review...

This was the third year of stream monitoring in Faribault County. From the end of March through October, 6 volunteers monitored the water quality of 6 sites on 3 major rivers and streams. Sites were located on the Blue Earth River, East Branch Blue Earth River, and Judicial Ditch 13.

NAME	*LOCATION*	*RIVER/STREAM*
Kay Bogan	Blue Earth, Sec 16 on the East Street Bridge	East Branch BE River
Orville Goemann	Foster, Sec 8 on County Road 16	East Branch BE River
Robert Worner	Blue Earth, Sec 7 on County Road 16	Blue Earth River
Laurie Ristau	Blue Earth, Sec 20 near BE Swimming Pool	Blue Earth River
Barbara Baker	Rome, Sec 35 on County Road 17 near IA border	Judicial Ditch 13
Wilma Bittinger	Blue Earth, Sec 30 on River Road	Blue Earth River (stagnant stretch just off Main Stem)

Inside this issue:

Special thanks to all of the Citizen Stream Monitors who took the time to monitor the rivers and streams of Faribault County. Your dedication and persistence makes this report possible and has helped to shape the direction of work done by resource managers throughout Faribault County.

2005 Data Summary...

The mean stream transparency and total rainfall are listed in the table below for each site. The mean transparency from 2004 is listed in red.

The stream with the highest average transparency (33) was the **Blue Earth River** near the Blue Earth swimming pool. The next highest site was **Judicial Ditch 13** near the Iowa border with an average reading of 32. The site with the lowest mean transparency (16) reported was the **East Branch of the Blue Earth River** in Foster Township on County Road 16. *The site with an average transparency of 9 was located directly on the river (as opposed to a bridge) and ended up not being the main flowing channel.*

Citizen Monitor/ Monitored Water Body	*# of Samples*	*2005 Mean cm* *2004*	*Min cm*	*Max cm*	*# > 60*	*Total Rain Inches*	*Collection Dates*
Kay Bogan / **East Branch Blue Earth River**	30	22 16	5	60+	1	27.65"	4/1/05-10/31/05
Orville Goemann / **East Branch Blue Earth River**	30	16 25	4	41		31.70"	4/12/05-10/26/05
Robert Worner / **Blue Earth River**	43	26 27	5	48		28.25"	3/29/05-10/15/05
Laurie Ristau **Blue Earth River**	**77**	33 26	5	60+	9	23.38"	4/11/05-10/31/05
Barbara Baker **Judicial Ditch 13**	50	32 37	3	60		30.94"	3/28/05-10/31/05
Wilma Bittinger ***Blue Earth River (stagnant reach)***	*11*	*9*	*0*	*23*		*17.59"*	*5/28/05-10/19/05*

The Transparency Tube—Why Should I Use It???

Transparency Tube

- **Determination of how streams react to rain events:** Consistent use of the tube, coupled with precipitation records, can reveal how a given stream reacts to rain events. Immediate influxes of great amounts of sediment would likely result in a low transparency tube reading. This effect would be a direct reflection of the watershed's capacity for retaining and absorbing runoff, thus the information can determine which watersheds might require the most attention.

- **Baseline Data and Trend Analysis:** Many streams in the county have had little or no attention with respect to water quality assessment. Creating the initial record is very important, and the sooner this is done, the more valuable the information will be. Continued data collection will allow for trend analysis-evaluation of the health of the water body over time.

- **Once data set is established and understood, tube can act as an alarm:** After persistent monitoring and understanding of the data that has been collected, you will begin to expect specific tube readings according to corresponding circumstances. If you find a reading that disagrees with your expectation, you can interpret it as a potential alarm. For example you may find that after one week of no rain, your stream always exhibits a reading of 40 cm. With that in mind you discover that after nine days of dry weather, the transparency at your site is only 10 cm. You may assume that something other that typical run-off has suspended matter in the water.

- **Tube can be the first in a series of triggers:** Consistently poor transparency could lead to increased attention from local water related groups.

- **Upstream and Downstream Monitoring:** The transparency tube is a simple, inexpensive means of monitoring "above and below" a suspect site near a river or stream.

- **Puts you in the water:** The tube brings you to the water, where you interact first hand with a stream. Such a relationship is conducive to genuine, sound stewardship.

T-TUBE DATA: New Developments In How It Will Be Used

From the E-Stream Reader June 2005 Edition:

Last year this newsletter informed you of how a new use for CSMP data was in the works. At that time, MPCA was envisioning using this data to help determine surface water impairments. Transparency tube readings are good predictors of turbidity, or the murkiness of stream water.

Why turbidity? Minnesota generally has a water quality standard for turbidity. If a certain number of turbidity readings exceed this standard, the stream is listed as impaired.

Using both t-tube and turbidity data, we can determine if a river is impaired and needs to undergo improvement via land management changes such as buffer strips, upland erosion control, wetland restorations, or native plant restoration.

Transparency tube data WAS used for the first time this spring during the MPCA's stream assessments, and it's making a difference! The agency was able to assess a total of 88 stream segments because of the availability of t-tube data. Preliminary results suggest 55 new stream segments be listed as impaired for turbidity based, in part, on CSMP transparency readings.

So just what is the criteria for incorporating transparency tube readings into a turbidity assessment?

A waterbody is in ***violation*** of the turbidity standard if:

- A tranparency reading is less than 20 centimeters.

A waterbody is ***impaired*** if:

- There are at least 20 independent observations, from a minimum of 2 years, AND
- Observations are distributed across years and months so as to be representative of the open water season (April—Sept), AND
- At least 3 observations and 10% of observations are in violation of the standard, AND
- Volunteer collected observations are corroborated by the judgement of MPCA and local staff.

Minnesota has 92,000 river miles. Currently only 8 percent or about 7,000 miles have been assessed for water quality impairments. Using CSMP data in this way will greatly increase the percentage of river miles assessed for turbidity impairments in Minnesota.

What is an Impaired Water ? ... What does this all mean?

An ***impaired water*** body is any water body that is not meeting the water quality standards that have been established for that water. These water bodies are either partially supporting or not supporting designated beneficial uses such as fishing or swimming.

How are Impaired Waters Determined?

- Review Water Quality Standards
- Evaluate Monitoring Data
- Identify waters for Impaired Waters List 303(d)

The Clean Water Act requires states to publish an updated list of streams and lakes that are not meeting their designated uses because of excess pollutants every two years. The list, known as the 303(d) list, is based on violations of water quality

What are the Top 5 Impairments in Minnesota?

- Mercury in Fish (1,237)
- Excess Nutrients (153)
- Turbidity (118)
- Poor Aquatic Life Community (103)
- Fecal Coliform (89)

Whats Next? ... TMDL Study

An impaired listing triggers a regulatory response to address the causes and sources of impairments. This process is called a ***TMDL study***. TMDL stands for Total Maximum Daily Load. Essentially, a TMDL is the amount of pollution a body of water can handle and still meet water quality standards. A TMDL study identifies sources of pollution and reductions of the particular pollutant needed to attain water quality standards. Keep in mind that rivers and streams may have several TMDL's, each one determining the limit for a different pollutant.

Major Steps in a TMDL Study...

After a water body is listed, a TMDL study must be conducted to evaluate why impaired waters are not meeting standards and to set pollutant reduction goals that will eventually restore them to their designated uses. Major TMDL steps are: 1) Monitor water quality, 2) Determine load allocations, 3) Determine sources of pollutant, 4) Determine required reductions.

Implementation...

Upon completion of a study, a detailed implementation plan will be developed. During this phase, local elected officials and dedicated staff will work toward developing effective strategies. However, it is important to note that much work is already underway to reduce pollutants from reaching our surface waters. This work has been and will continue to progress as TMDL goal setting is completed.

Understanding the Transparency Reading…

The transparency tube has become a common tool used to understand and measure stream conditions. The greater the reading in centimeters, the greater the water clarity. A reading of less than 20 cm is poor transparency and often occurs in ditches and streams after rainfall events. If poor transparency is the norm rather than the exception, this may indicate a more serious, long term problem. Readings between 20 and 40 cm are considered moderate transparency and consistent readings of 40 cm and above during both high and low flow conditions indicate very good water quality.

Water transparency can be affected by a number of factors. For the majority of water bodies, the amount of suspended solids is the most important factor. In rivers and streams, soil particles are the primary sources of suspended solids. Transparency is a good indicator for some key water pollutants and a low transparency is generally the result of excessive sediment. Excessive soil material is a pollutant in itself as it can degrade the habitat of fish and other stream life and reduce light penetration necessary for aquatic life. In addition, soil particles may carry pollutants such as phosphorus attached to them. The pollutants may impact the flowing river or stream directly, but often times are carried downstream to a lake. Excess phosphorus is the trigger for large algae blooms.

2005 Rainfall Summary…

NAME	*Township*	*Sec.*	*April*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*TOTAL*	*% N*
Orville Goemann	Foster	10	**2.93**	5.99	2.90	5.05	3.30	9.69	**1.84**	**31.70**	134.0
Robert Worner	Blue Earth	7	3.07	6.14	3.95	2.64	4.05	7.46	0.53	27.84	117.7
Kay Bogan	Blue Earth	17	3.43	5.89	3.87	2.70	3.19	7.48	1.09	27.65	116.9
Laurie Ristau	Blue Earth	31	**2.44**	5.45	2.93	1.90	3.33	6.62	0.71	**23.38**	98.8
Wilma Bittinger	Blue Earth	30			2.95	4.02	2.92	6.81	**0.87**	**17.57**	74.3
Barbara Baker	Rome	35	3.69	6.10	4.21	4.72	4.72	5.43	1.52	30.39	128.4
	Monthly	**Ave**	3.40	5.91	3.47	3.51	3.59	7.25	0.96	28.63	121.0
NORMAL	***Faribault***	***Co***	***2.80***	***3.48***	***4.01***	***4.08***	***3.79***	***3.24***	***2.26***	***23.66***	

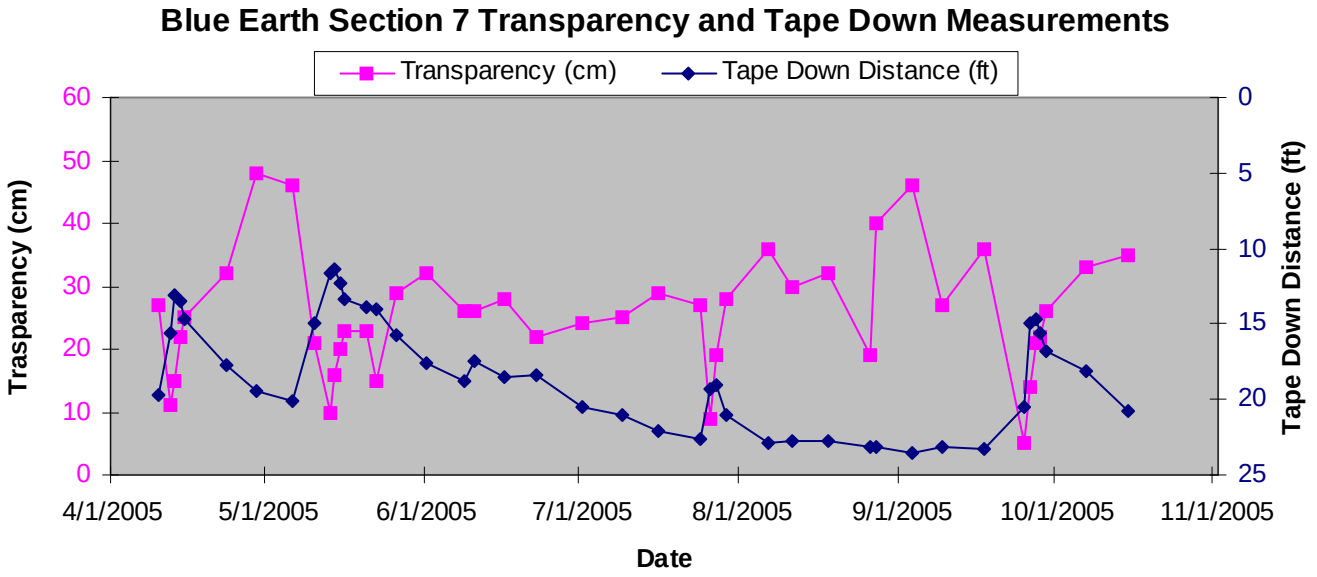
Note: Some monthly totals do not include the entire month (depending on start and end dates of monitoring). These totals are in bold.

Rainfall's Effect on Transparency…

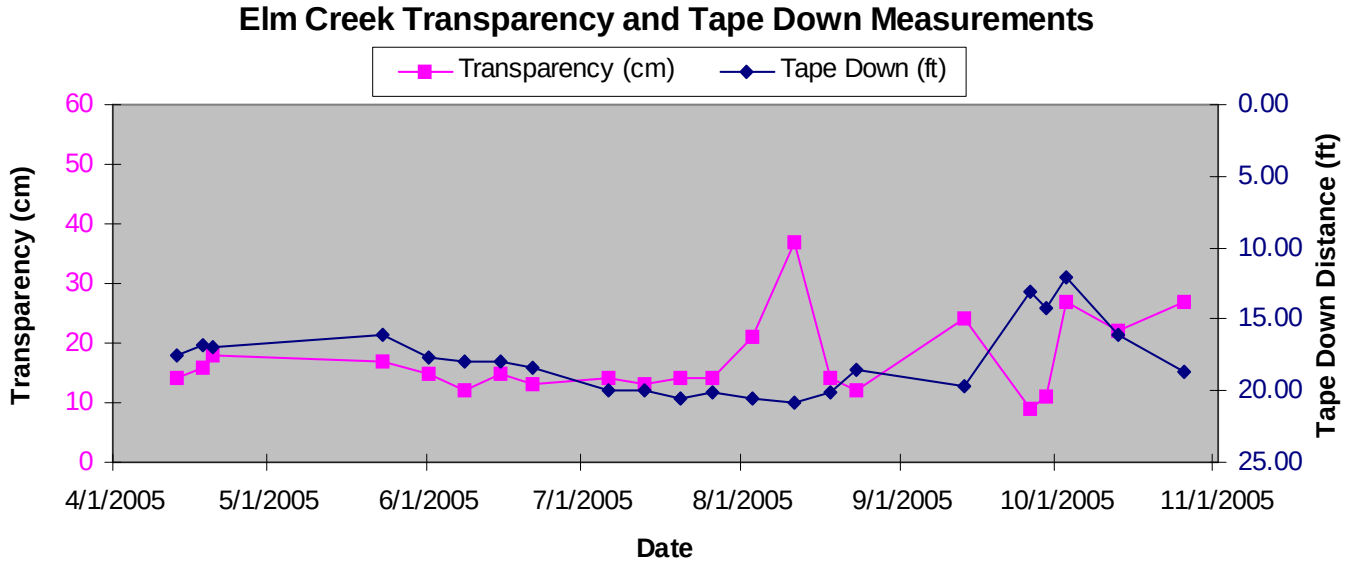
Transparency will vary over the length of the monitoring season for a variety of reasons, but often times this change is the result of precipitation. To get a better understanding of this relationship, transparency readings must be looked at together with rainfall amounts. Often when this data is looked at together, a decline in transparency after a rainfall event can be observed. The graphs starting on page 8 help to show this relationship between precipitation and transparency. When a peak in rainfall is observed, a fall is transparency is often also observed. This appears truer during the spring of the year until mid summer. Rainfall tends to produce more runoff during this time because there is less ground cover (crops, grass). During later summer and into fall, there tends to be more ground cover and crop canopy that slows and filters rainfall, producing less rapid runoff and therefore less noticeable transparency changes. Although generalizations can be made, site specific conditions also largely contribute to transparency tube readings.

Transparency and Steam Depth

Sites may also show a correlation between transparency and stream depth. First of all an increase in water level is normally the result of rainfall. In an area where erosion is likely there will be a drop in transparency. In areas where erosion is not likely, the rainwater that enters the stream could actually dilute the pollutants and cause transparency to improve. However, local relationships can be complicated and may take observation over several years to understand the data at any one site. We reside in an agricultural area where erosion is likely during rain events, so our charts generally show a decrease in transparency as water levels rise from rain events.



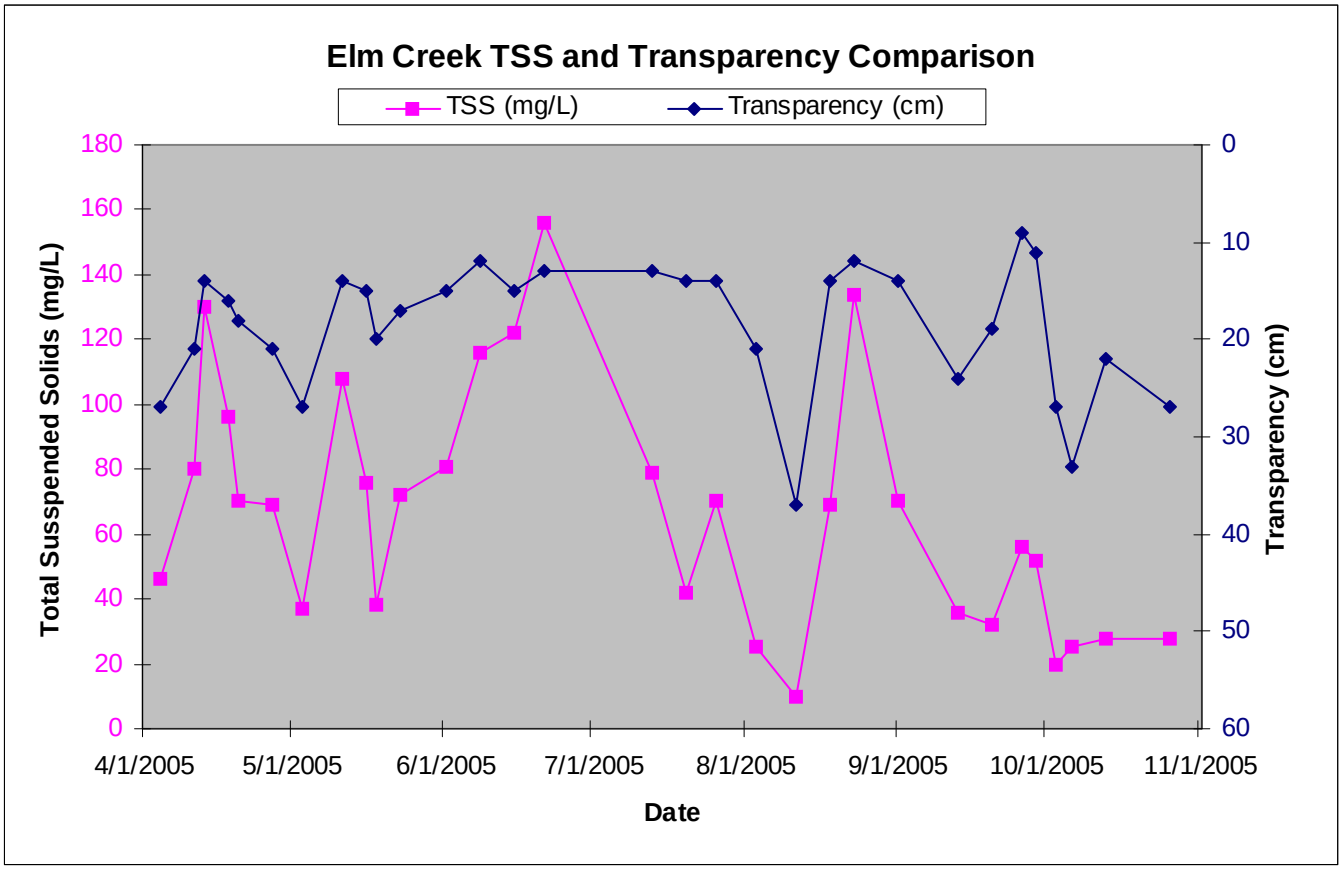
This chart shows how the transparency increases as the stream becomes shallow. Notice how the lines mirror each other and move in opposite directions.



This chart shows how the transparency increases as the stream becomes shallow. Although not as drastic as the chart above the lines are moving in opposite directions.

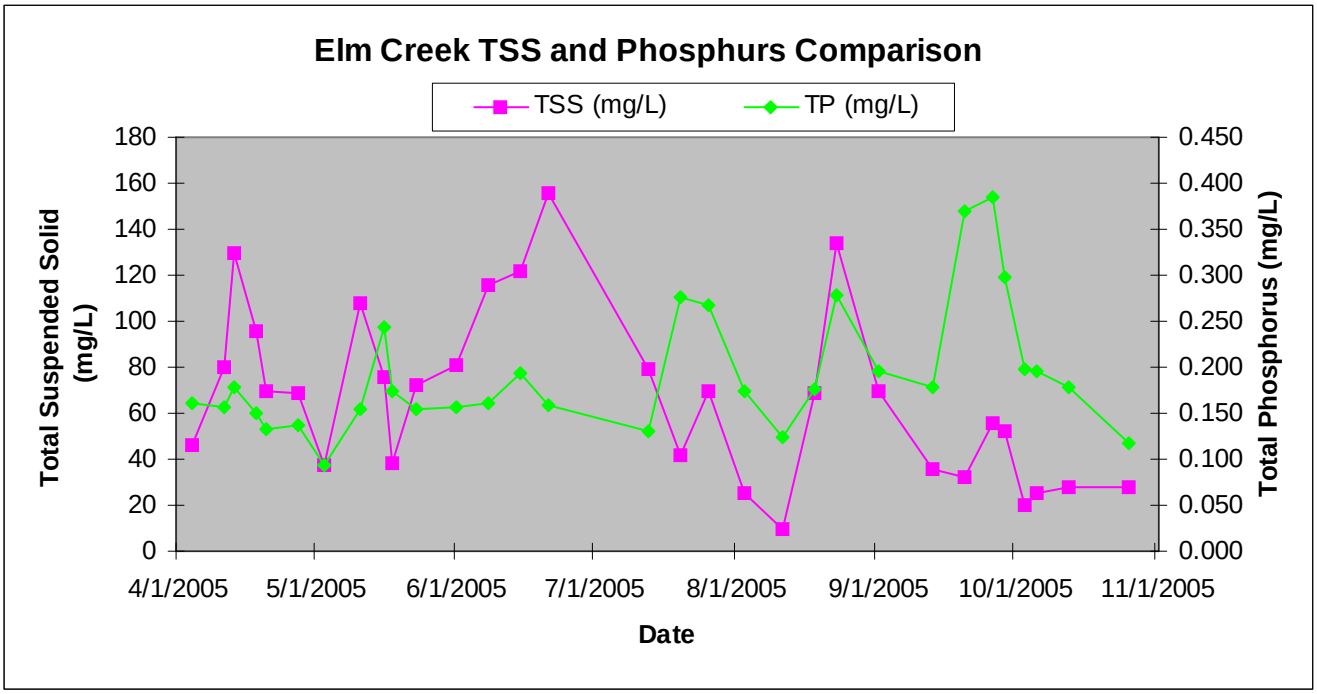
You've been consistently going out to your monitoring sites and making these transparency tube readings. Other than the fact that the water is difficult to see through at times, what do all of your measurements mean? The simple answer: A low transparency reading means more pollution in the stream that you are watching so closely. So, how do we come to that conclusion?

The Minnesota Pollution Control Agency has studied a connection between transparency tube readings and the amount of total suspended solids (TSS) in the waters being sampled. Basically, a low transparency reading is going to mean a high level of TSS. This can be confirmed with samples collected by a Clean Water Partnership monitoring station on Elm Creek. Elm Creek is branch of the Blue Earth River that has a watershed in Martin and Faribault Counties. A transparency tube reading is taken every time samples are pulled from the creek, which allows for a comparison of the lab results from sampled pollutants and the transparency readings. The chart below shows a strong connection of TSS increasing as the transparency is decreasing.

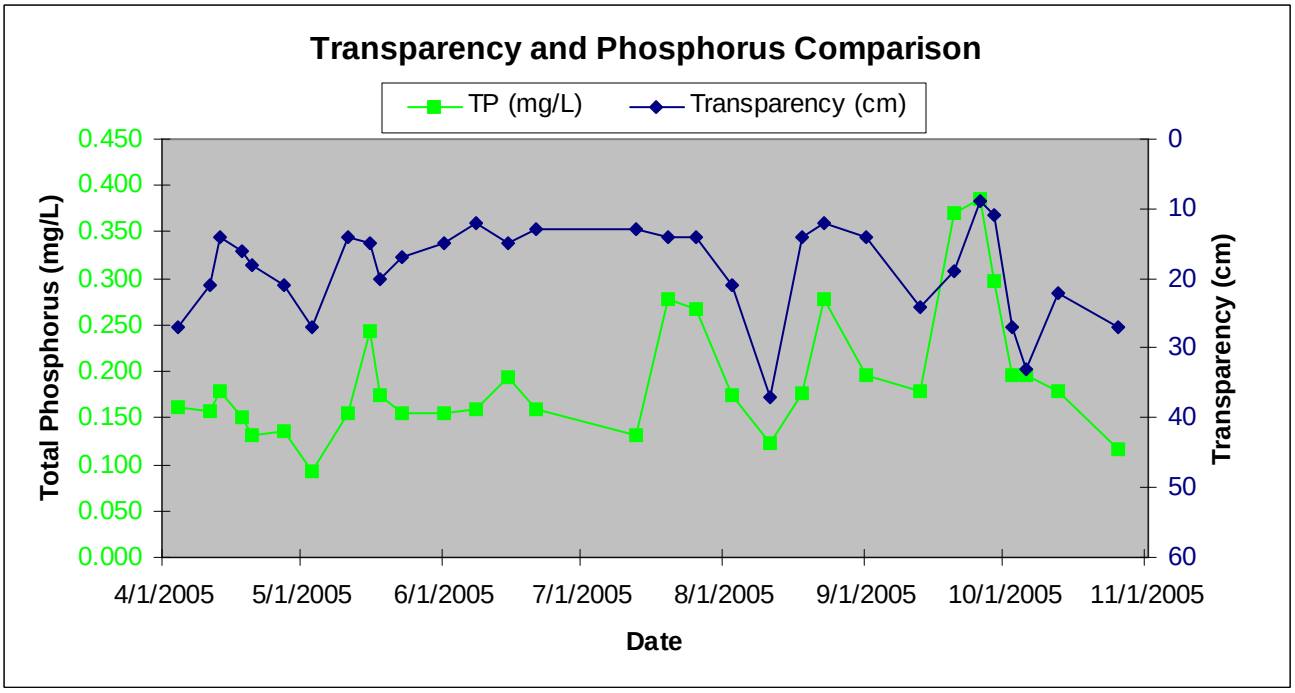


Notice how the peeks and valleys of the lines rise and fall at similar times. The lines might not fit together like a perfect puzzle piece, but they do follow a similar pattern.

The correlation between TSS and transparency is strong which tells us that there is pollution in the water because sediment, a contributor to TSS, is considered a pollutant on its own. Is there pollution in addition to the sediment? Chemical pollutants are also associated with TSS because they are attached to sediment or other particles. When soil is eroded during a rain event the soil brings attached pollutants. The following charts show the connection between TSS levels and lab results of Phosphorus levels. Phosphorus is a pollutant associated with soil erosion because it is attached to soil particles. The other chart proves again that the transparency can also be used to assess the presence of certain chemical pollutants.



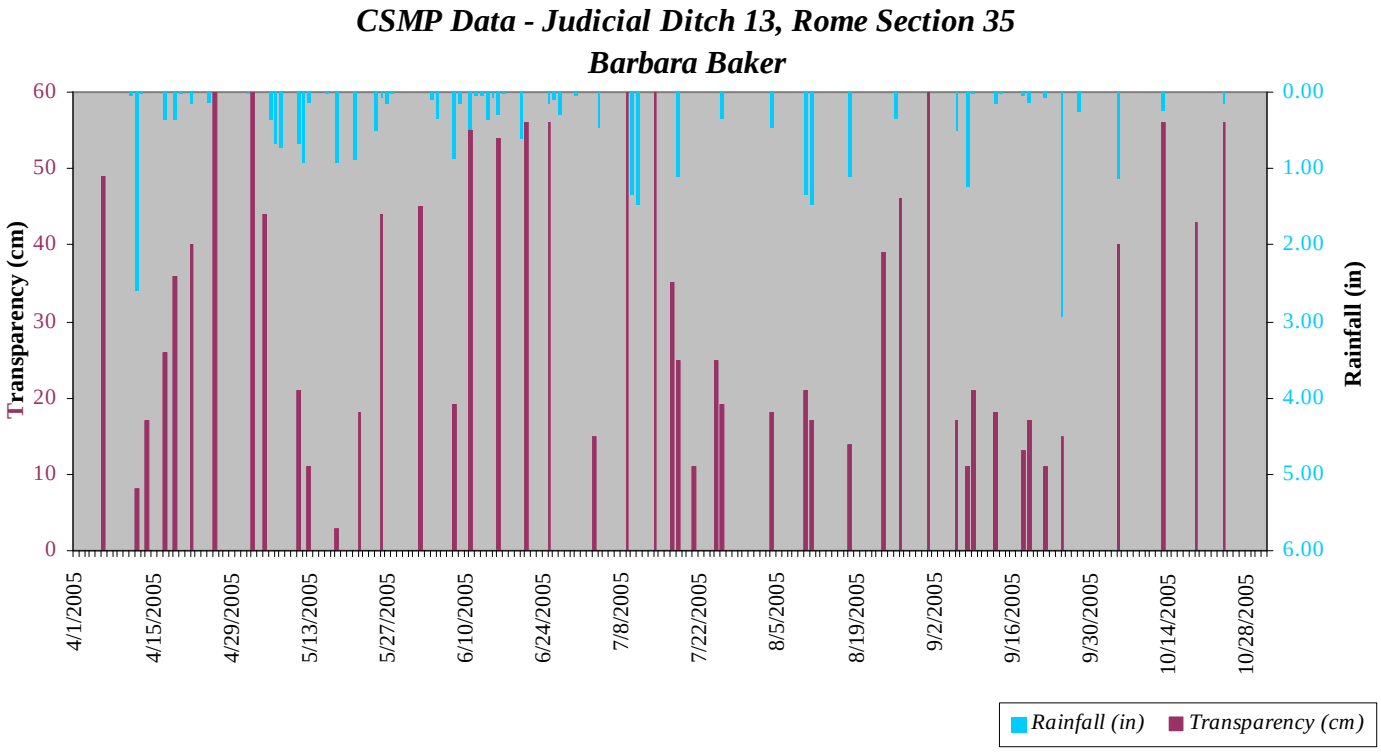
Notice the similar pattern again.

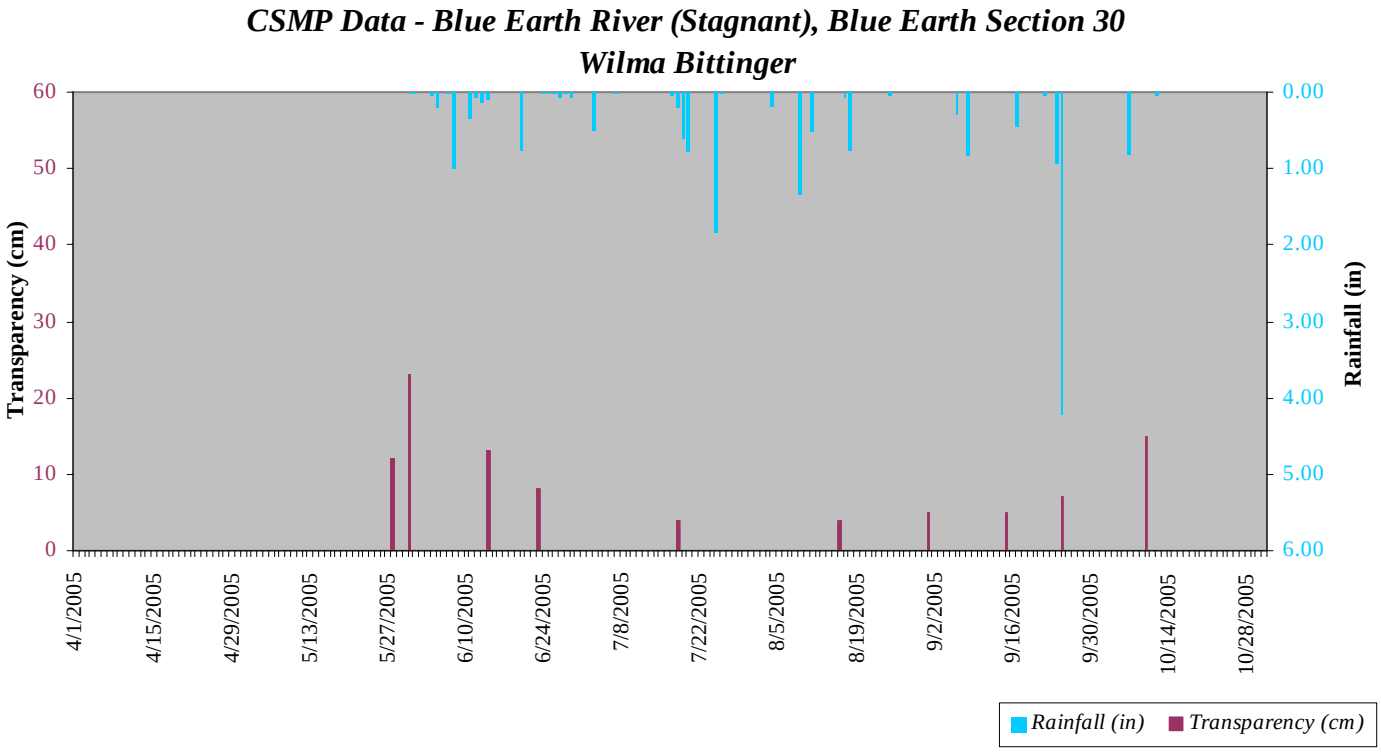


Like the TSS, the transparency follows a similar pattern as the Phosphorus.

A simple conclusion after looking at transparency tube numbers compared with actual lab results is that a transparency reading can be an accurate way to assess a stream. The information that you are collecting at your sample sites does evaluate the clarity of the water. Additionally, your transparency results offer further evaluation of other pollutants that are associated with elevated levels of TSS. The next time you go out to take a transparency reading you can assess what else might be in the water. These comparisons and results will differ from stream to stream, but after all the MPCA relies on your results for their stream impairment evaluations.

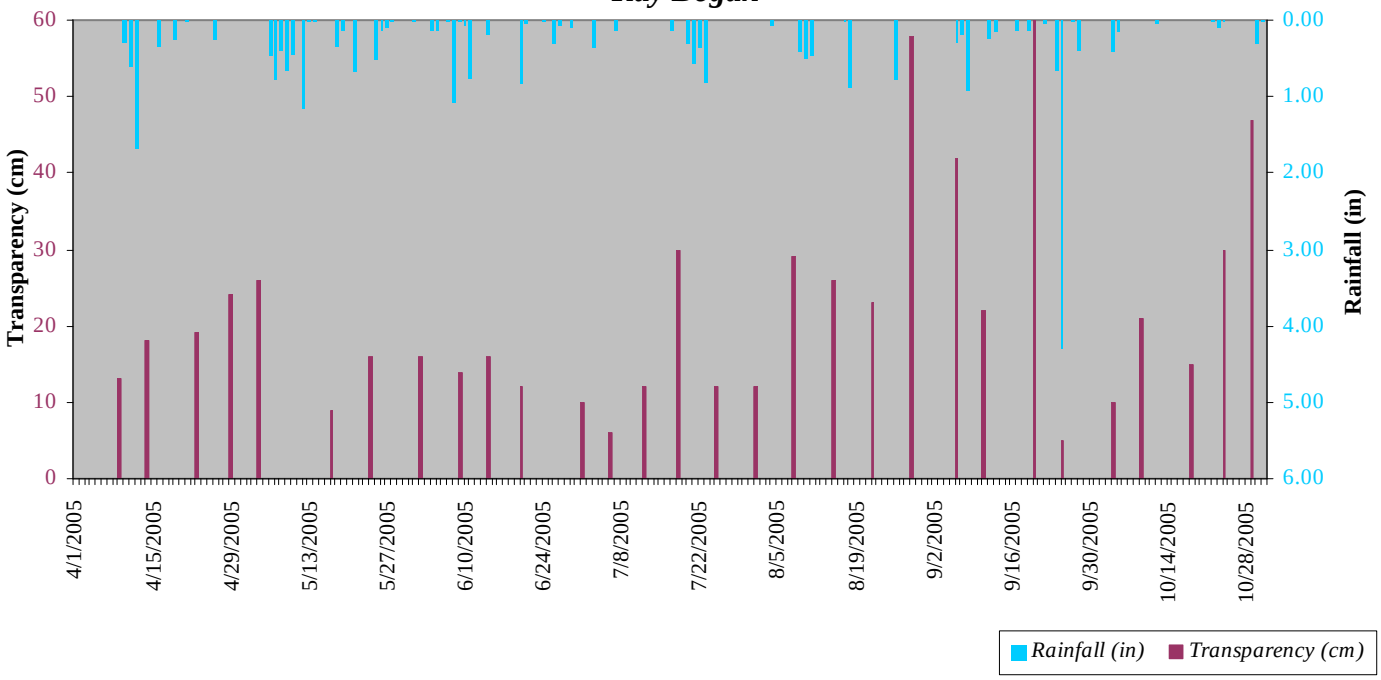
Your 2005 Monitoring Data...





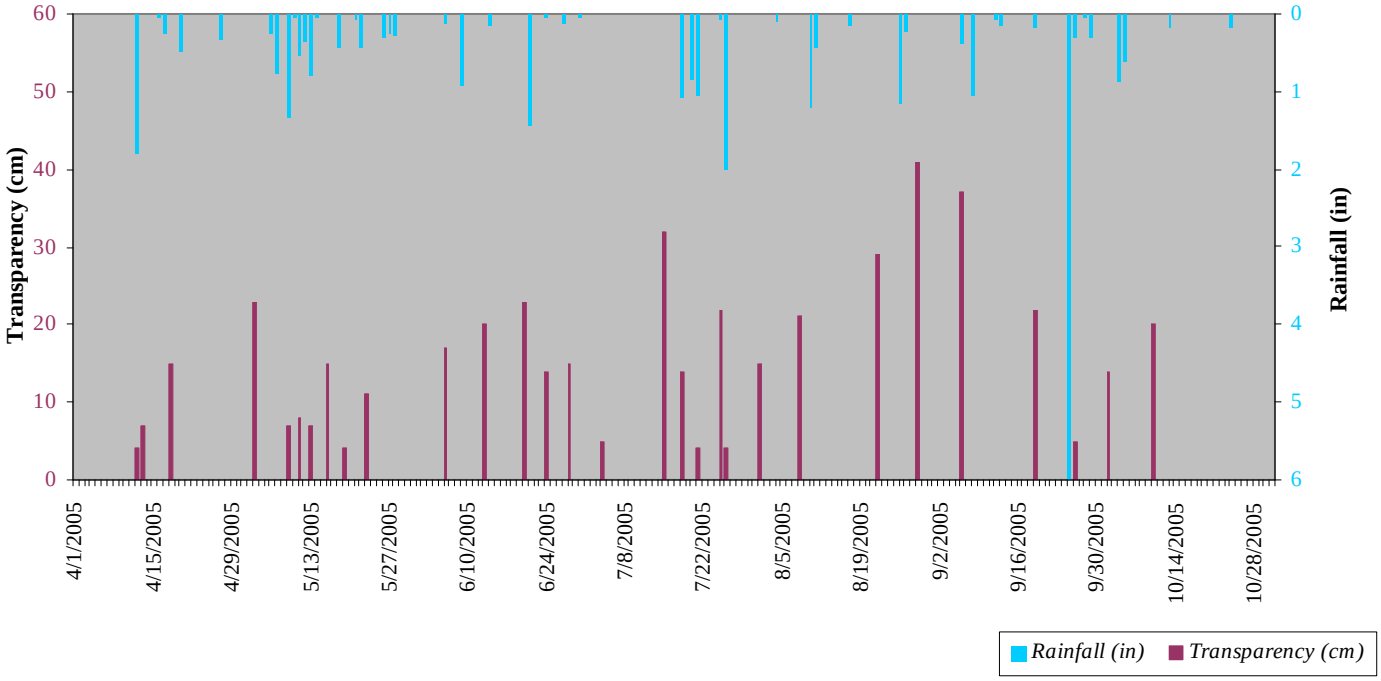
CSMP Data - East Branch Blue Earth River, Blue Earth Section 16

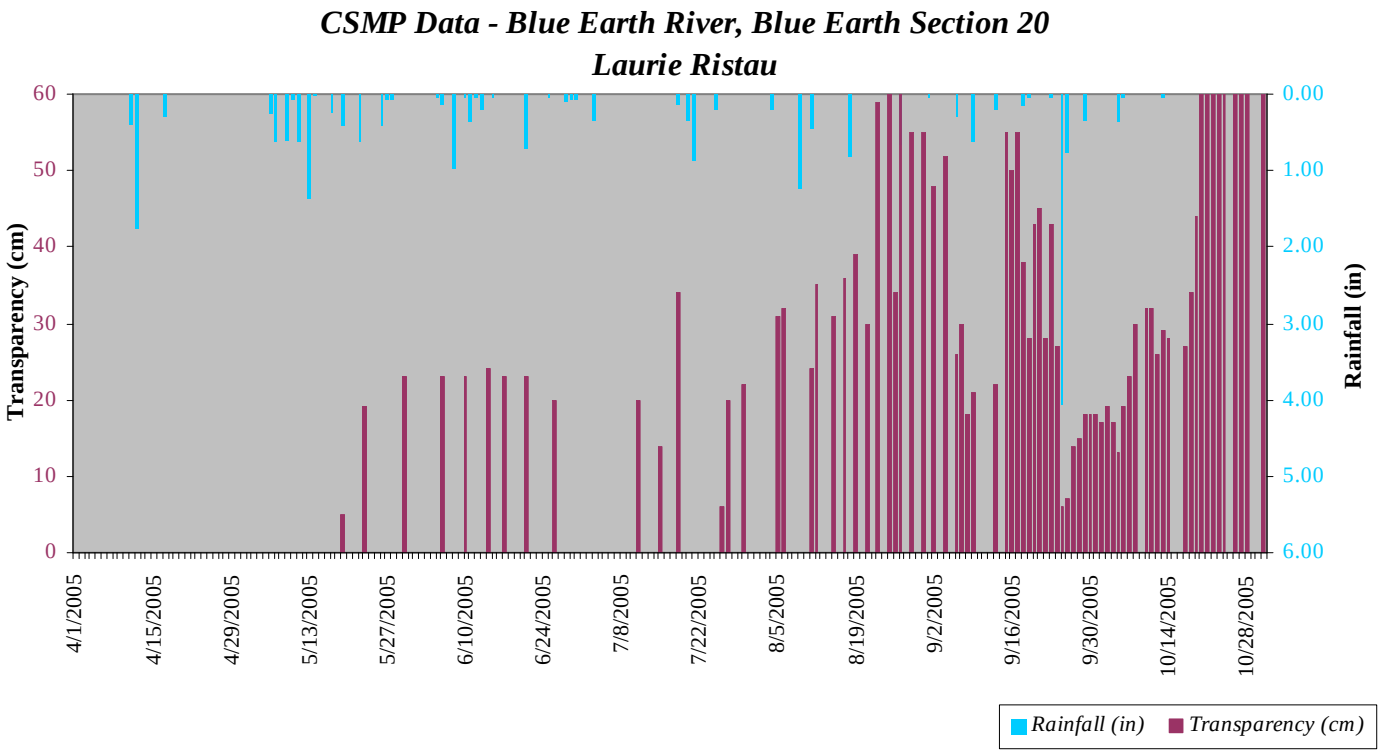
Kay Bogan



CSMP Data - East Branch Blue Earth River, Foster Section 8

Orville Goemann




CSMP Data - Blue Earth River, Blue Earth Section 20
Laurie Ristau
Transparency (cm)
Rainfall (in)
0
10
20
30
40
50
60
0.00
1.00
2.00
3.00
4.00
5.00
6.00
4/1/2005
4/15/2005
4/29/2005
5/13/2005
5/27/2005
6/10/2005
6/24/2005
7/8/2005
7/22/2005
8/5/2005
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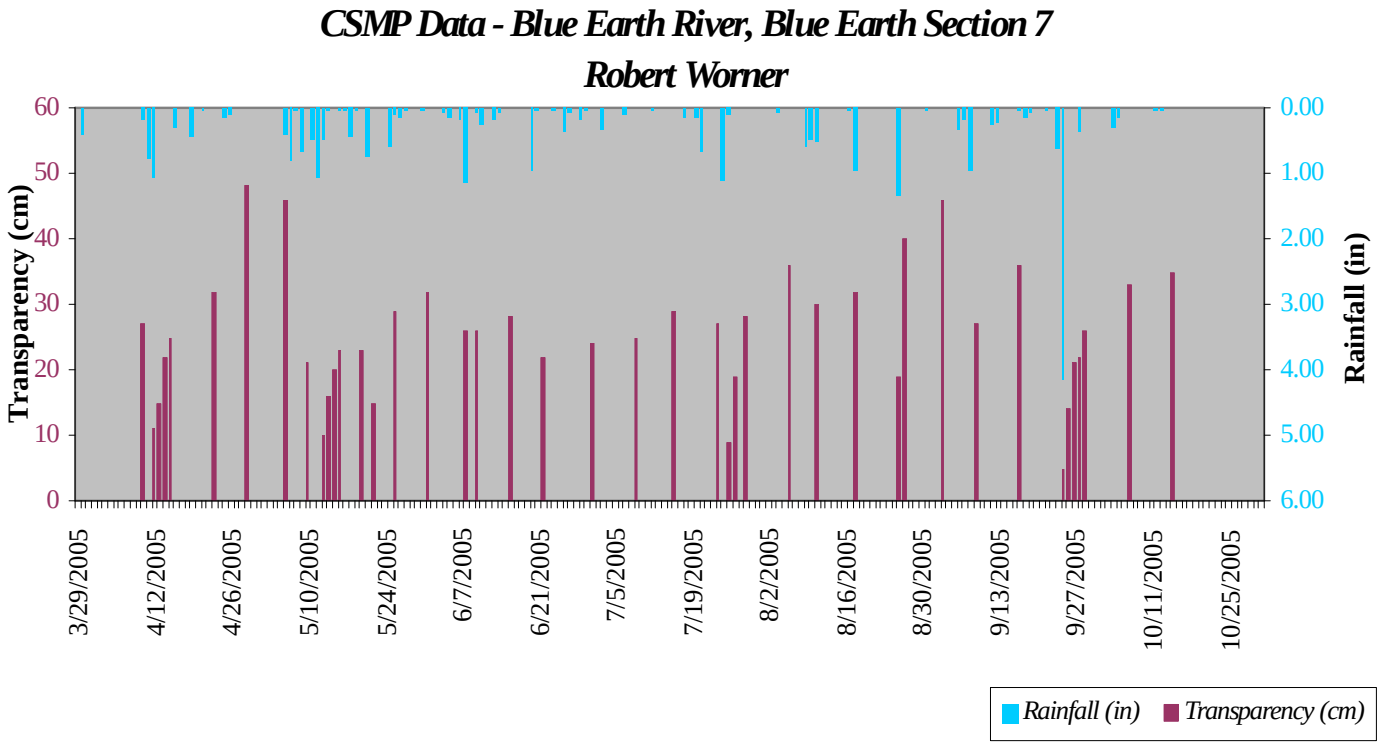
9/16/2005
9/30/2005
10/14/2005
10/28/2005
Rainfall (in)
Transparency (cm)


CSMP Data - Blue Earth River, Blue Earth Section 7
Robert Worner
Transparency (cm)
Rainfall (in)
0
10
20
30
40
50
60
0.00
1.00
2.00
3.00
4.00
5.00
6.00
3/29/2005
4/12/2005
4/26/2005
5/10/2005
5/24/2005
6/7/2005
6/21/2005
7/5/2005
7/19/2005
8/2/2005
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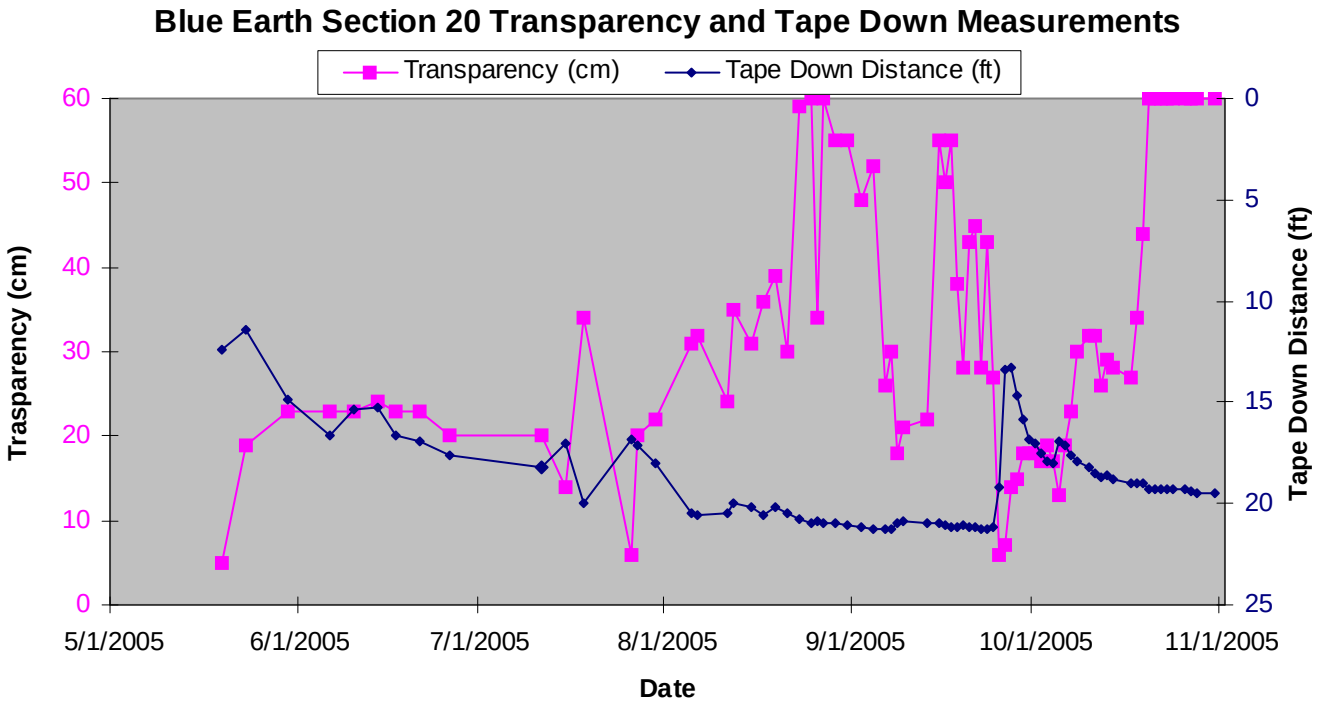
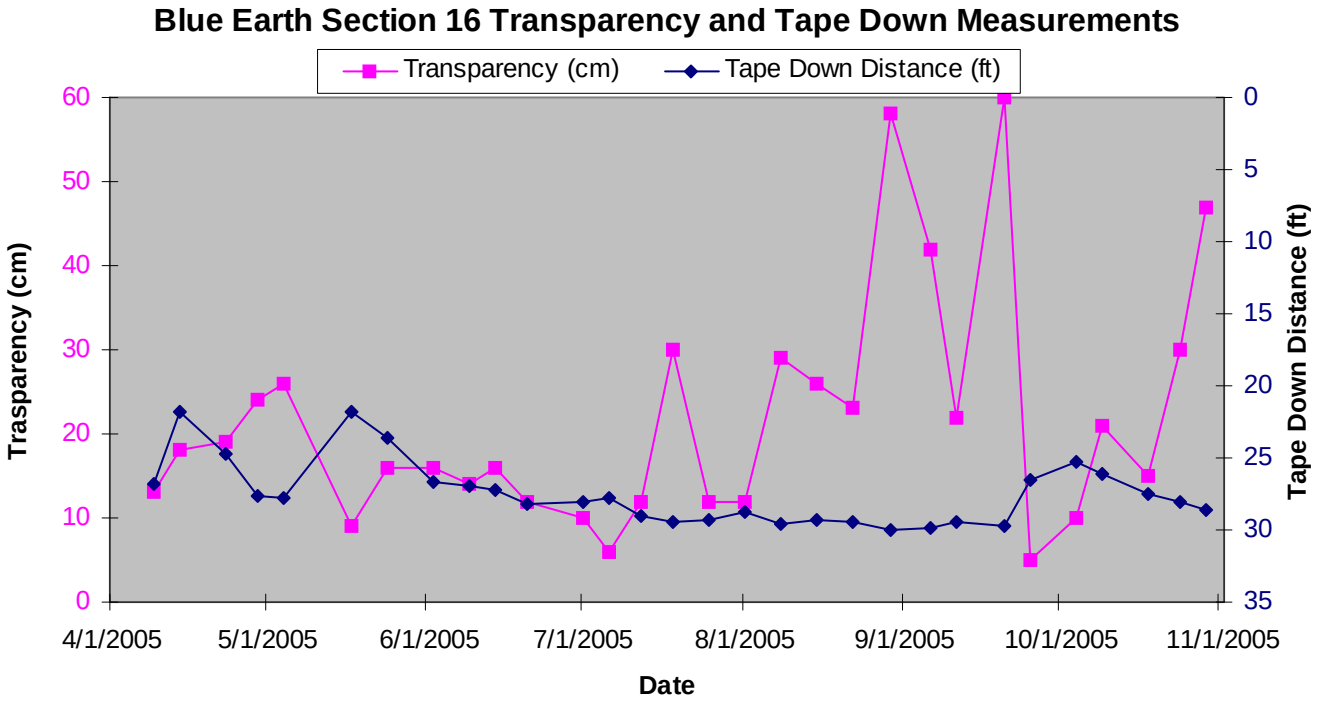
10/11/2005
10/25/2005
Rainfall (in)
Transparency (cm)


Blue Earth Section 20 Transparency and Tape Down Measurements
Transparency (cm)
Tape Down Distance (ft)
Trasparency (cm)
Tape Down Distance (ft)
0
10
20
30
40
50
60
0
5
10
15
20
25
5/1/2005
6/1/2005
7/1/2005
8/1/2005
9/1/2005
10/1/2005
11/1/2005
Date


Blue Earth Section 16 Transparency and Tape Down Measurements
Transparency (cm)
Tape Down Distance (ft)
Trasparency (cm)
Tape Down Distance (ft)
0
10
20
30
40
50
60
0
5
10
15
20
25
30
35
4/1/2005
5/1/2005
6/1/2005
7/1/2005
8/1/2005
9/1/2005
10/1/2005
11/1/2005
Date

For further information, please check out the Faribault County Soil & Water Conservation District/Planning & Zoning Website at www.faribaultcountyswcd.com

You can utilize this site to look at the *2003, 2004 & 2005 Citizen Stream Monitoring Year End Reports*, *maps*, and links to MPCA's site which includes more information on the monitoring program.

This site contains additional information on *impaired waters* and *TMDL's*, which is discussed on Page 3, and also includes a map of all impaired reaches in Faribault County and the Greater Blue Earth River Watershed.

The *2005 Rain Gauge Cooperator Report*, including *1992-2005 monthly reports*, are also available on the site.

For CSMP information, go to Programs & Services / CSMP. Rainfall data can be found under the Rain Gauge Network link.

E-mail me you pictures at b.douglas@faribaultcountyswcd.com and I will include them

2005 Flow Data

Although not as great as the 2004 monitoring season, our streams did experience quite a bit of fluctuation after rainfall events. The following fluctuations in stream height were determined using the Average Tape Down Distance.

Kay Bogan, East Branch Blue Earth River**—8.3 ft.**

Orville Goemann, East Branch Blue Earth River**—3.4 ft.**

Robert Worner, Blue Earth River**—12.2 ft.**

Laurie Ristau, Blue Earth River**—9.8 ft.**

Barbara Baker, Judicial Ditch 13—**4.2 ft**

LOOKING AHEAD...

Once again, we would like to thank all of the Faribault County Citizen Stream Monitors. We look forward to many more years of interesting river watching with you. We hope that you will once again choose to be a monitor and begin to make comparisons of your stream from year to year, and see relationships begin to develop between your streams transparency and precipitation and depth. As more monitoring is done, more conclusions can start to be made about the condition of your stream.

If you know of anyone who might be interested in participating in the Citizen Stream Monitoring Program or if you have any questions yourself, contact the Faribault County Soil and Water Conservation District at (507) 526-2388.

Additional information on the CSMP, including last year's County report can be found at www.faribaultcountyswcd.com

For more information on the Citizen Stream Monitoring Program, to search CSMP results, look up newsletters and publications, or find uses for CSMP data go to *http://www.pca.state.mn.us/water/csmp.html*