Appendix F: East Chaska Creek Monitoring Reports

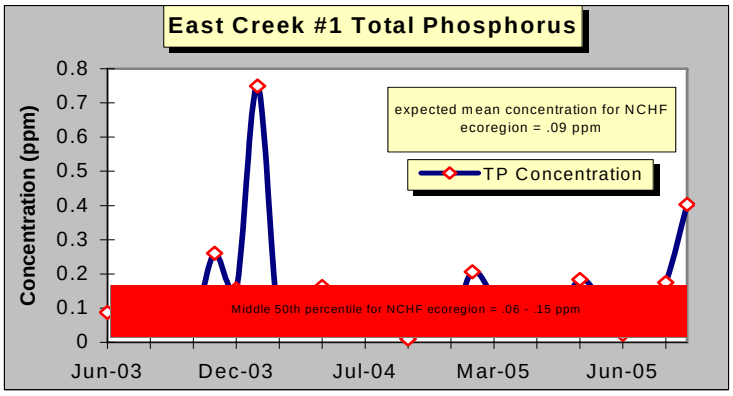
Watershed Outlet Monitoring Program

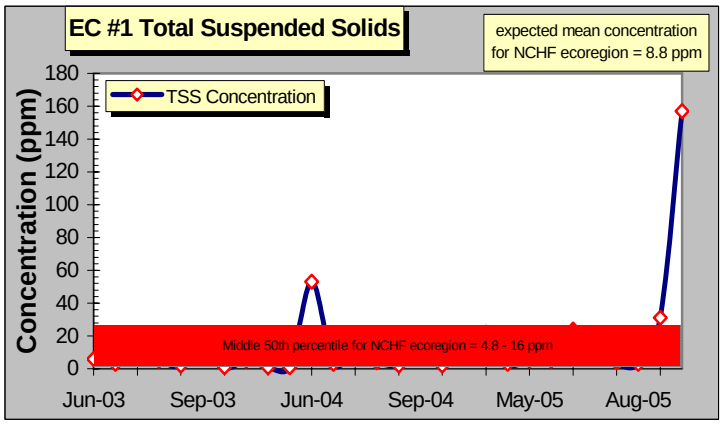
East Chaska Creek Station - EC 1 site
Chaska, MN

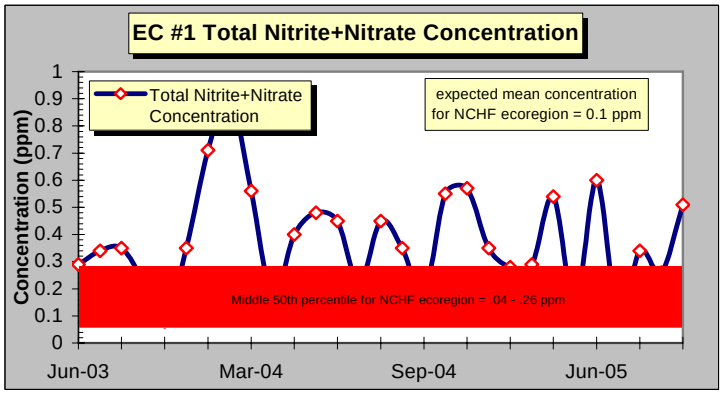
Summary Report
March – November 2010

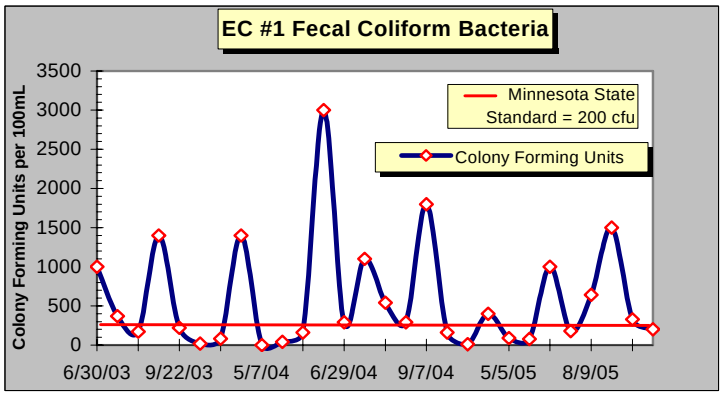
Prepared By: Carver County Environmental Services
Prepared For: Lower Minnesota River Watershed District
November 2010

East Chaska Creek Site #1 Stoughton Ave. Site (EC 1)









This site is located near the Stoughton Avenue bridge as it crosses the Army Core of Engineers water diversion channel. The site was established as a joint venture between Carver County Environmental Services, the Lower Minnesota River Watershed District, and the City of Chaska.

The sites purpose, along with EC #2 and EC #3, is to monitor the entire East Chaska Creek watershed for flow and nutrients. This data will then be used to analyze land use affects on the stream.

Water Quality Summary:

- Nearly all total phosphorous concentration samples were within the expected ecoregion average.
- About half of the nitrite + nitrate concentration samples were near or within the NCHF ecoregion average.
- All but one total suspended solid sample concentrations were within or below the middle 50th percentile for the ecoregion.
- Although more data is needed Fecal Coliform Bacteria levels at the site appear to be a problem.

Introduction

The East Chaska Creek EC 1 site, located in Chaska near the Stoughton Avenue bridge as it crosses the Army Core of Engineers water diversion channel, has been monitored since 2003. The East Chaska Creek watershed drains 9,868 acres of various types of land uses including residential, agricultural, undeveloped, and park/recreation areas (Appendix A). This report summarizes the results of flow, precipitation, and water quality for the 2010 sampling season. This data is preliminary and is subject to change until the Metropolitan Council submits the final report for this period.

Flow and Precipitation

Average flow in East Chaska Creek was 1.74 cubic feet per second (cfs) or 1.12 million gallons per day (mgd) (Table 1). This was more than 46 percent higher than the average flow in 2009 (1.19 cfs). The 2010 sampling season was characterized by dry/ drought conditions in May and July in addition with much higher than average precipitation (and thus stream flow) in August and September. A graph describing flow and precipitation results is provided (Figure 1).

Table 1. Average flow and total precipitation at East Chaska Creek EC 1 Station April – October 2010

Period	Average Flow (cfs/mgd)	Precipitation (inches)	*Average Monthly Precipitation, 1997-2010 (inches)
APRIL	2.11 / 1.36	3.63	2.93
MAY	0.29 / 0.19	2.75	3.85
JUNE	3.27 / 2.11	4.61	4.26
JULY	2.66 / 1.72	2.37	3.36
AUGUST	1.26 / 0.81	6.55	4.96
SEPTEMBER	0.67 / 0.43	5.22	3.40
OCTOBER	1.98 / 1.28	0.96	2.36
TOTAL	1.74 / 1.12	26.09	25.13

*Average monthly precipitation data obtained from the National Weather Service station located near the EC 1 site.

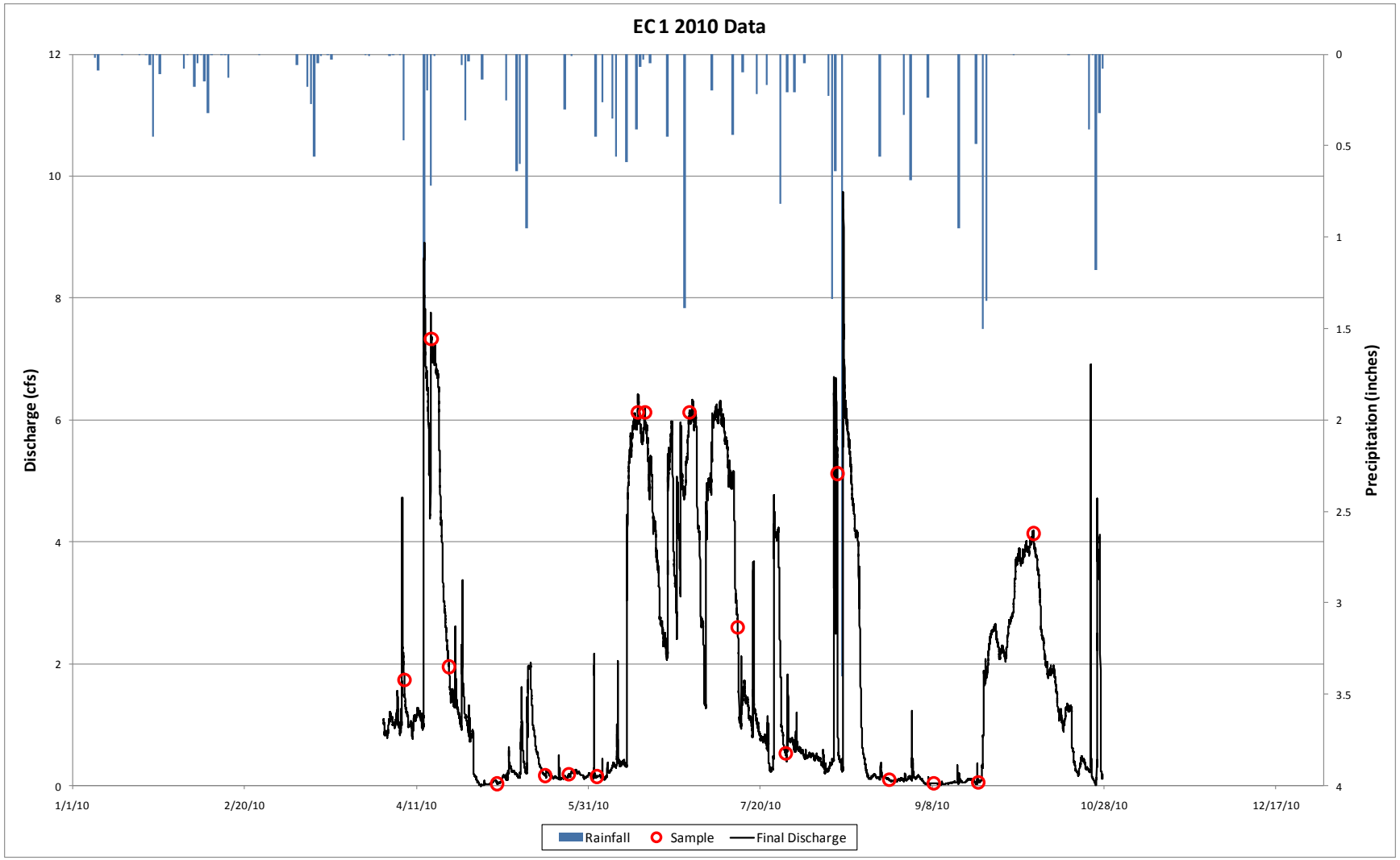


Figure 1. Flow and precipitation at EC 1 Station March-November 2009

Water Quality

Six nutrient samples and thirteen Escherichia Coli (E.coli) samples were collected at the EC 1 station during the 2010 season. Overall, water quality at EC 1 declined when looking at the chemical results for the site. Two parameters showed improvement from 2009 (Alkalinity and Escherichia coli) and one parameter fell within the ecoregion mean while others exceed it. The most dramatic improvement was in the E.coli parameter with a decrease of 21 percent from 2009. The alkalinity, turbidity, and concentrations of total suspended solids (TSS) and volatile solids (VS) were all higher in 2009 than in 2008. Of particular note, the average TSS concentration increased by 58 % from 13.9 mg/ L in 2009 to 22 mg/L in 2010.

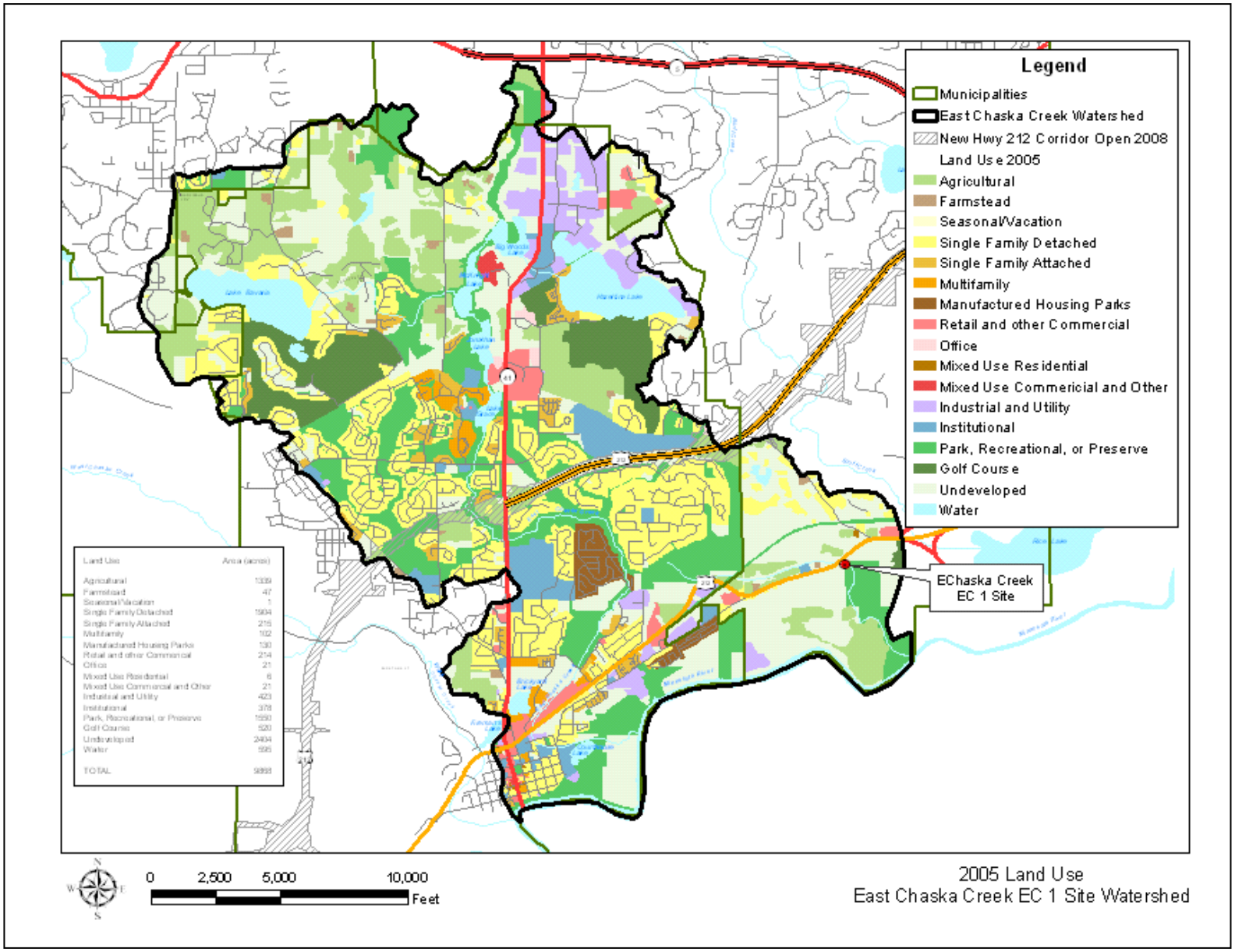
When compared to typical water quality values in the North Central Hardwood Forest ecoregion, those for EC 1 either exceed the mean or fall in the upper range (see table 2). Total suspended solids continued the increasing trend from 2008 and was higher than the ecoregion mean. Additional information about phosphorus and E. coli loading and some statistical analyses can be found in Appendix B. Appendix B contains the draft pages of the 2010 Carver County Water quality report that can be accessed through the Carver County website (http://www.co.carver.mn.us/departments/LWS/wqmp.asp) as a report that can be downloaded or through an interactive GIS water quality mapping program.

Table 2. Average concentrations at East Chaska Creek EC 1 Station April – October 2010.

Parameter	2010 Ave. Concentration	Notes
Alkalinity	190 mg/L $CaCO_3$	
Chemical Oxygen Demand	31 mg/L	
Cadmium	N/A	Not tested at this site
Chloride	N/A	Not tested at this site
Chlorophyll-a	N/A	Not tested at this site
Chromium	N/A	Not tested at this site
Conductivity	N/A	Not tested at this site
Copper	N/A	Not tested at this site
Escherichia Coli	283.9 MPN/ 100 mL	Standard is 126/ 1260*
Hardness	N/A	Not tested at this site
Lead	N/A	Not tested at this site
Nickel	N/A	Not tested at this site
Nitrogen Ammonia	148 µg/L	
Nitrate + Nitrite	462 µg/L	Ecoregion mean (40-260 ug/L)
Phosphorus, Total	0.127 mg/L	Ecoregion mean (0.06 -0.160 mg/L)
Suspended Solids	22 mg/L	Ecoregion mean (4.8 - 16 mg/L)
Turbidity	19 NTRU	Ecoregion mean (3-8.5 NTU)
Volatile Solids	5 mg/L	
Zinc	N/A	Not tested at this site

*As stated in MN Rules Chapter 7050.0222, E. coli shall not exceed 126 organisms per 100 mL as a geometric mean of not less than five samples, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 mL.

Appendix A



2005 Land Use data source provided by Metropolitan Council Environmental Services

Watershed Outlet Monitoring Program

East Chaska Creek Station – Site EC 2

Chaska, MN

Summary Report

March – October 2010

Prepared By: Carver County Environmental Services
Prepared For: Lower Minnesota River Watershed District
December 2010

CARVER COUNTY

Introduction

The East Chaska EC 2 site, located in Chaska near the intersection of two walking paths behind Brandondale at 715 Creek Trail, has been monitored since 2003. The East Chaska Creek watershed drains 9,868 acres of various types of land uses including residential, agricultural, undeveloped, and park/recreation areas (Appendix A). This data is preliminary and is subject to change until the Metropolitan Council submits the final report for this period.

Flow and Precipitation

Average flow in East Chaska Creek from March to October was 7.87 cubic feet per second (cfs) or 5.09 million gallons per day (mgd) (Table 1). This is higher than the average flow from 2009 (6.02 cfs) even though there was less total precipitation in 2010. The 2010 sampling season was characterized by dry/ drought conditions in May and July in addition with much higher than average precipitation (and thus stream flow) in August and September. A graph describing flow and precipitation results is provided (Figure 1).

Table 1. Average flow and total precipitation at East Chaska Creek EC 2 Station March – October 2010

Period	Average Flow (cfs/mgd)	Precipitation (inches)	*Average Monthly Precipitation, 1997-2010 (inches)
MARCH	70.70 / 45.69	1.18	1.74
APRIL	5.50 / 3.55	3.63	2.93
MAY	3.93 / 2.54	2.75	3.85
JUNE	1.21 / 0.78	4.61	4.26
JULY	0.79 / 0.51	2.37	3.36
AUGUST	11.98 / 7.74	6.55	4.96
SEPTEMBER	10.76 / 6.95	5.22	3.40
OCTOBER	1.42 / 0.92	2.01	2.36
TOTAL	7.87 / 5.09	27.27	26.87

*Average monthly precipitation data obtained from National Weather Service station located near the EC 2 site

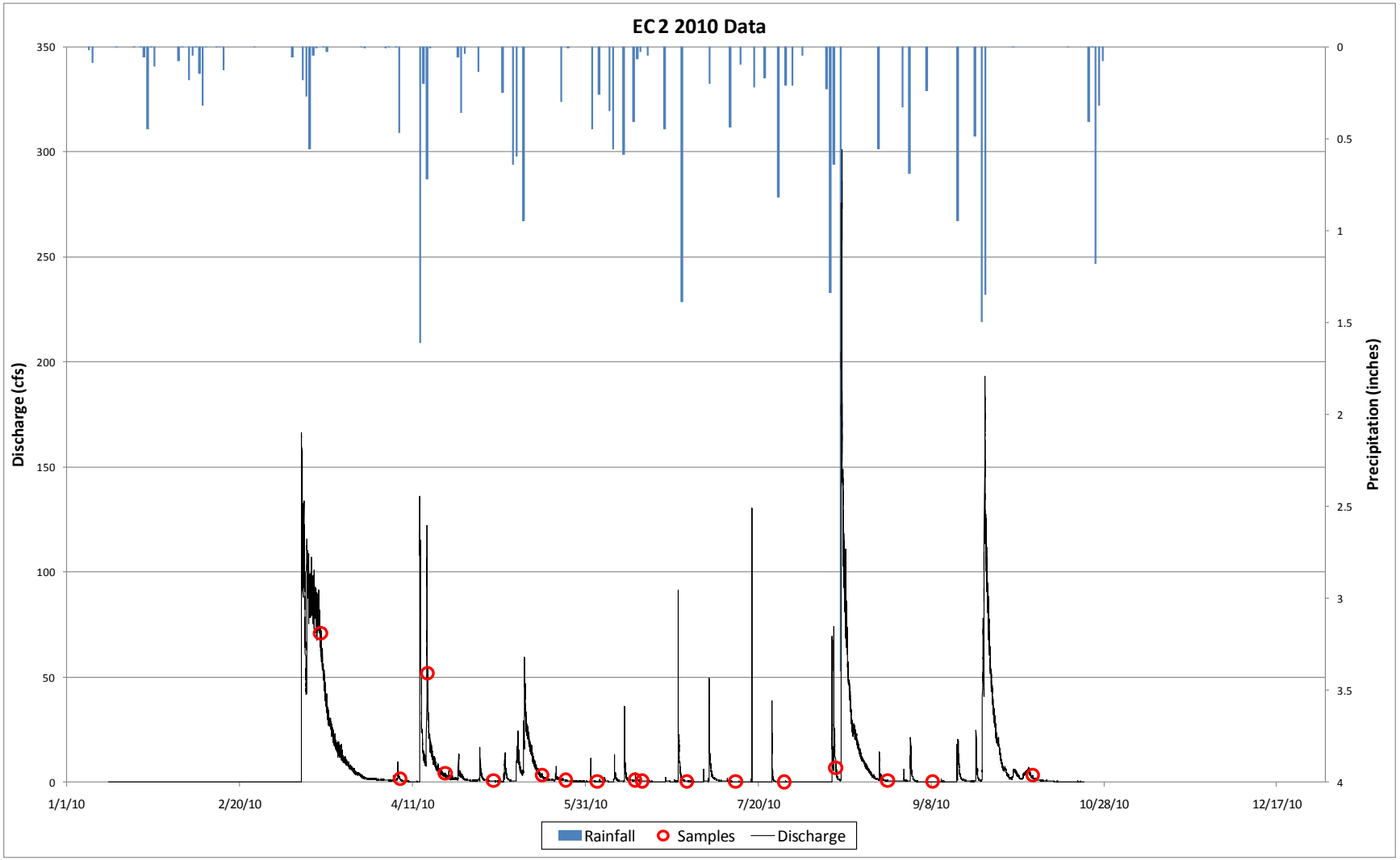


Figure 1. Flow and precipitation at East Chaska Creek EC 2 Station March - October 2010

Water Quality

Six nutrient samples and twelve Escherichia Coli (E.coli) samples were collected at the EC 2 station during the 2010 season. In general, the water quality at EC 2 declined from last year. Four of the nine parameters tested had results that improved upon 2009 results. Nitrate+Nitrite, Total Phosphorus, Suspended Solids, Turbidity and Volatile Solids all declined in water quality from 2009. The most noticeable improvements were in the amount of E.coli in the water decreasing by 21 percent from 2009.

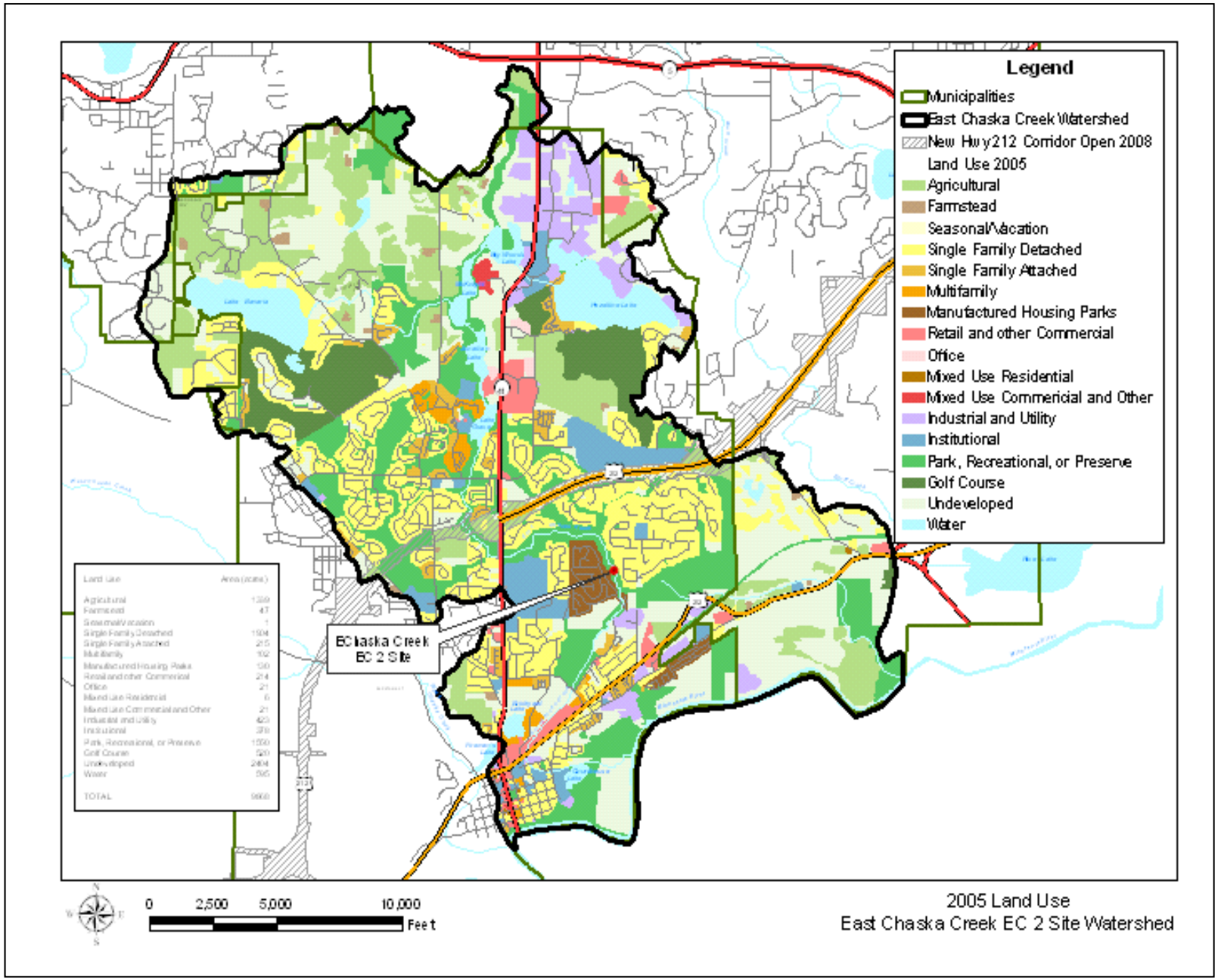
When compared to other streams in the North Central Hardwood Forest ecoregion, the results for EC 2 are less encouraging. While the average concentrations of total Phosphorus and suspended solids fell with in the range of the ecoregion mean, the average concentrations of Nitrate+Nitrite and the average turbidity exceeded it (see Table 2). Another concern at EC 2 is the concentration of E. coli. Even though the average concentration of E. coli decreased by 21 percent from 287 MPN/ 100 mL in 2009 to 226 MPN/ 100 mL in 2010, it is still high when compared to the state standard. Additional information about phosphorus and E. coli loading, statistical analyses, and biomonitoring data can be found in Appendix B. Appendix B contains the draft pages of the 2010 Carver County Water quality report that can be accessed through the Carver County website (http://www.co.carver.mn.us/departments/LWS/wqmp.asp) as a report that can be downloaded or through an interactive GIS water quality mapping program.

Table 2. Average concentrations at East Chaska Creek EC 2 Station March – October 2010.

Parameter	2010 Ave. Concentration	Notes
Alkalinity	176 mg/ L $CaCO_3$	
Chemical Oxygen Demand	37 mg/ L	
Cadmium	N/A	Not tested at this site
Chloride	N/A	Not tested at this site
Chlorophyll-a	N/A	Not tested at this site
Chromium	N/A	Not tested at this site
Conductivity	N/A	Not tested at this site
Copper	N/A	Not tested at this site
Escherichia Coli	225.9 MPN/ 100 mL	Standard is 126/ 1260*
Hardness	N/A	Not tested at this site
Lead	N/A	Not tested at this site
Nickel	N/A	Not tested at this site
Nitrogen Ammonia	130 µg/ L	
Nitrate + Nitrite	453 µg/ L	Ecoregion mean (40-260 ug/L)
Phosphorus, Total	0.142 mg/L	Ecoregion mean (0.060-0.160 mg/L)
Suspended Solids	33 mg/ L	Ecoregion mean (4.8 - 16 mg/L)
Turbidity	19 NTRU	Ecoregion mean (3-8.5 NTU)
Volatile Solids	6 mg/ L	
Zinc	N/A	Not tested at this site

*As stated in MN Rules Chapter 7050.0222, E. coli shall not exceed 126 organisms per 100 mL as a geometric mean of not less than five samples, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 mL

Appendix A



2005 Land Use data source provide by Metropolitan Council Environmental Services

Watershed Outlet Monitoring Program

East Chaska Creek Station – Site EC 2

Chaska, MN

Summary Report

March – October 2010

Prepared By: Carver County Environmental Services
Prepared For: Lower Minnesota River Watershed District
December 2010

CARVER COUNTY

Introduction

The East Chaska EC 2 site, located in Chaska near the intersection of two walking paths behind Brandondale at 715 Creek Trail, has been monitored since 2003. The East Chaska Creek watershed drains 9,868 acres of various types of land uses including residential, agricultural, undeveloped, and park/recreation areas (Appendix A). This data is preliminary and is subject to change until the Metropolitan Council submits the final report for this period.

Flow and Precipitation

Average flow in East Chaska Creek from March to October was 7.87 cubic feet per second (cfs) or 5.09 million gallons per day (mgd) (Table 1). This is higher than the average flow from 2009 (6.02 cfs) even though there was less total precipitation in 2010. The 2010 sampling season was characterized by dry/ drought conditions in May and July in addition with much higher than average precipitation (and thus stream flow) in August and September. A graph describing flow and precipitation results is provided (Figure 1).

Table 1. Average flow and total precipitation at East Chaska Creek EC 2 Station March – October 2010

Period	Average Flow (cfs/mgd)	Precipitation (inches)	*Average Monthly Precipitation, 1997-2010 (inches)
MARCH	70.70 / 45.69	1.18	1.74
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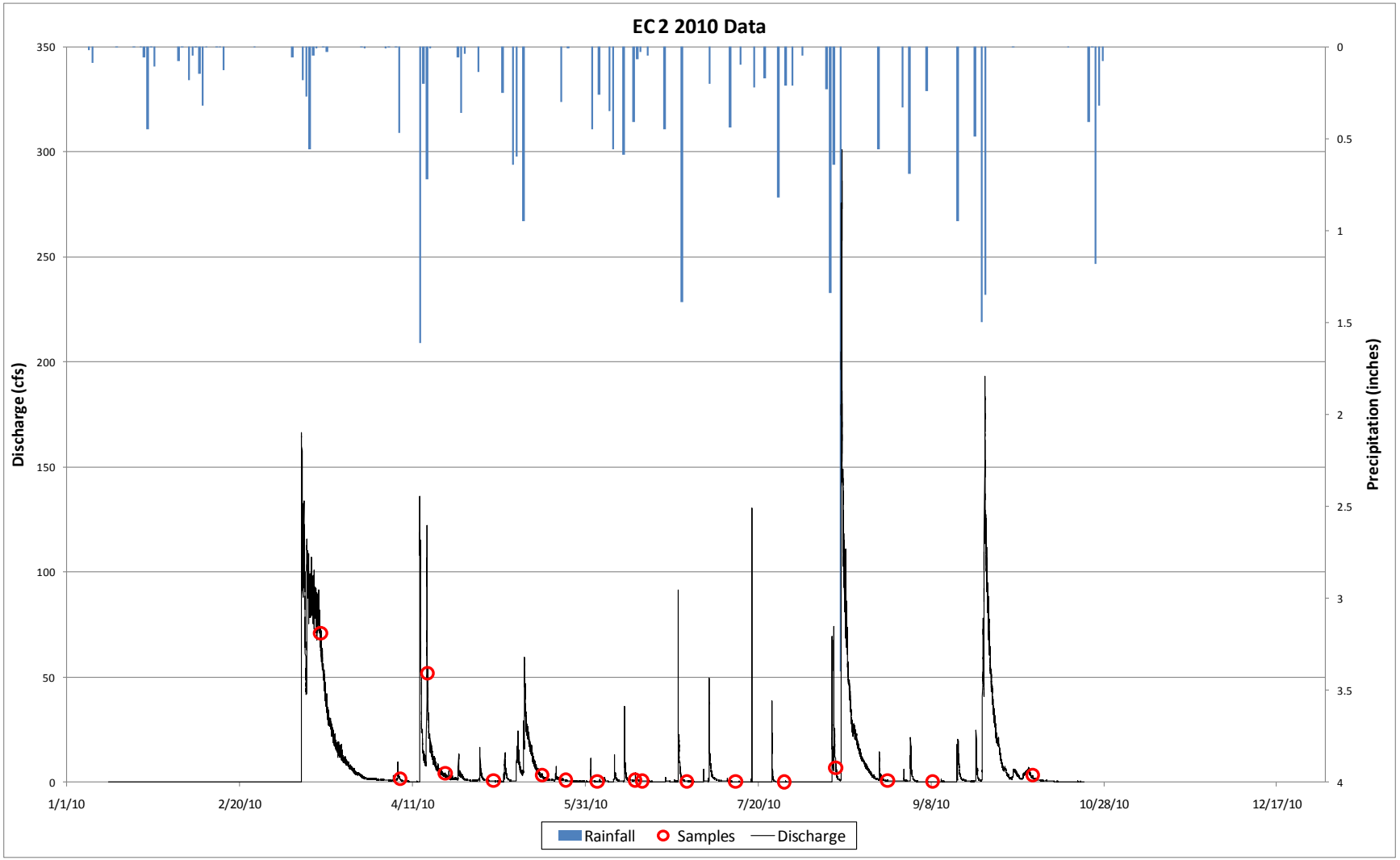

Figure 1. Flow and precipitation at East Chaska Creek EC 2 Station March - October 2010

Water Quality

Six nutrient samples and twelve Escherichia Coli (E.coli) samples were collected at the EC 2 station during the 2010 season. In general, the water quality at EC 2 declined from last year. Four of the nine parameters tested had results that improved upon 2009 results. Nitrate+Nitrite, Total Phosphorus, Suspended Solids, Turbidity and Volatile Solids all declined in water quality from 2009. The most noticeable improvements were in the amount of E.coli in the water decreasing by 21 percent from 2009.

When compared to other streams in the North Central Hardwood Forest ecoregion, the results for EC 2 are less encouraging. While the average concentrations of total Phosphorus and suspended solids fell with in the range of the ecoregion mean, the average concentrations of Nitrate+Nitrite and the average turbidity exceeded it (see Table 2). Another concern at EC 2 is the concentration of E. coli. Even though the average concentration of E. coli decreased by 21 percent from 287 MPN/ 100 mL in 2009 to 226 MPN/ 100 mL in 2010, it is still high when compared to the state standard. Additional information about phosphorus and E. coli loading, statistical analyses, and biomonitoring data can be found in Appendix B. Appendix B contains the draft pages of the 2010 Carver County Water quality report that can be accessed through the Carver County website (http://www.co.carver.mn.us/departments/LWS/wqmp.asp) as a report that can be downloaded or through an interactive GIS water quality mapping program.

Table 2. Average concentrations at East Chaska Creek EC 2 Station March – October 2010.

Parameter	2010 Ave. Concentration	Notes
Alkalinity	176 mg/ L $CaCO_3$	
Chemical Oxygen Demand	37 mg/ L	
Cadmium	N/A	Not tested at this site
Chloride	N/A	Not tested at this site
Chlorophyll-a	N/A	Not tested at this site
Chromium	N/A	Not tested at this site
Conductivity	N/A	Not tested at this site
Copper	N/A	Not tested at this site
Escherichia Coli	225.9 MPN/ 100 mL	Standard is 126/ 1260*
Hardness	N/A	Not tested at this site
Lead	N/A	Not tested at this site
Nickel	N/A	Not tested at this site
Nitrogen Ammonia	130 µg/ L	
Nitrate + Nitrite	453 µg/ L	Ecoregion mean (40-260 ug/L)
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Turbidity	19 NTRU	Ecoregion mean (3-8.5 NTU)
Volatile Solids	6 mg/ L	
Zinc	N/A	Not tested at this site

*As stated in MN Rules Chapter 7050.0222, E. coli shall not exceed 126 organisms per 100 mL as a geometric mean of not less than five samples, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 mL

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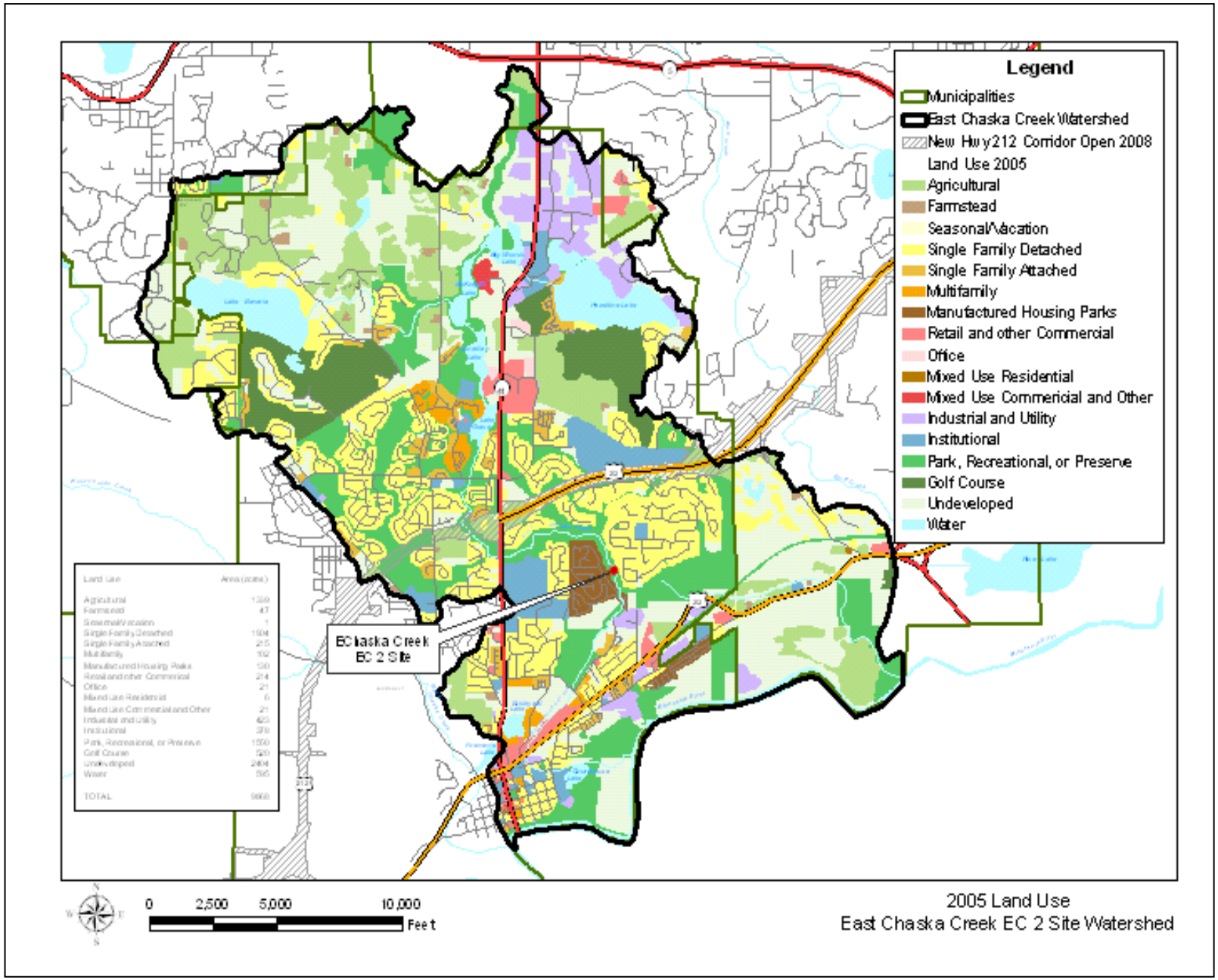
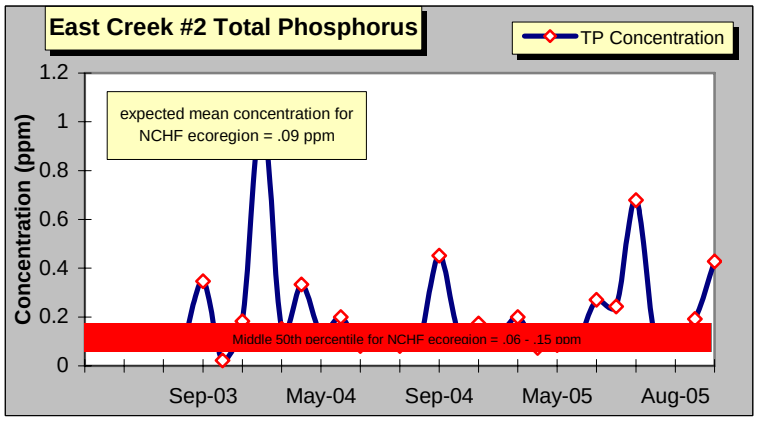
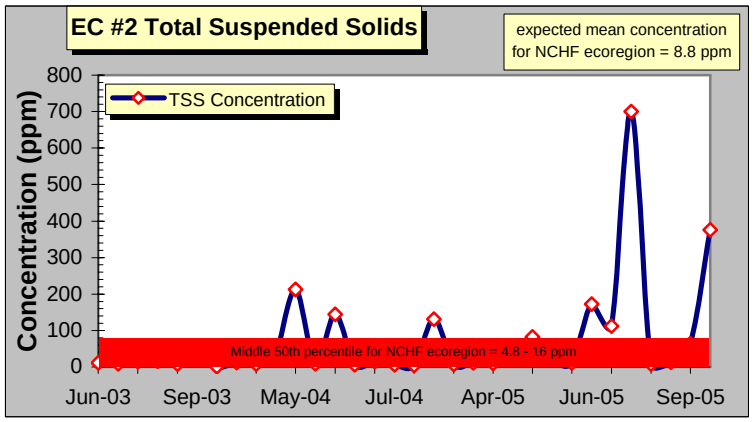
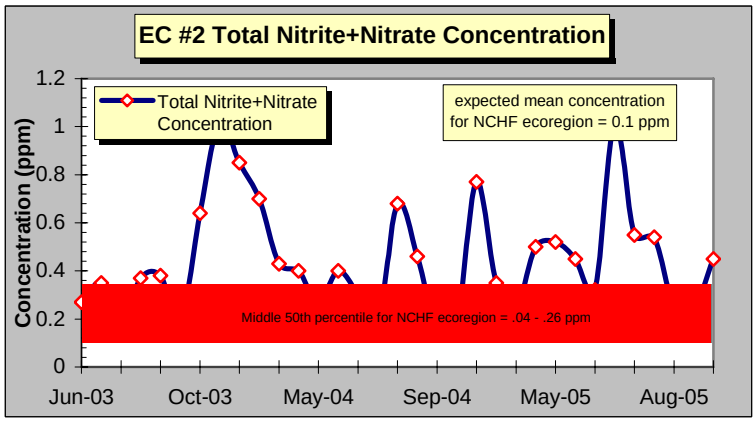


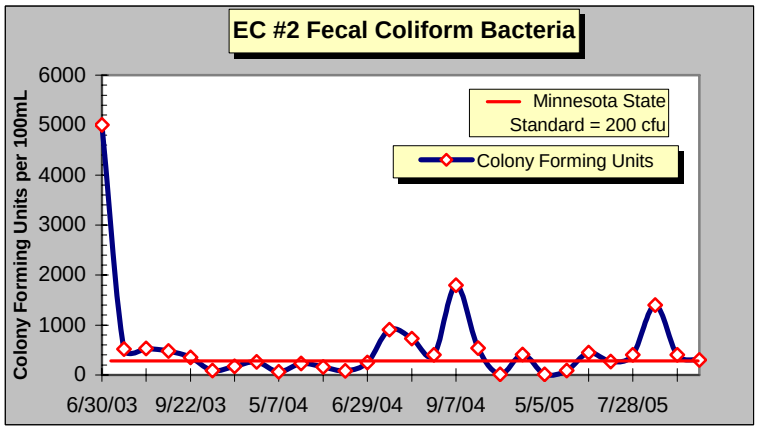
2005 Land Use data source provide by Metropolitan Council Environmental Services

East Chaska Creek Site #2 Upstream behind Brandondale (EC 2)









This site is located near the intersection of two walking paths behind Brandondale at 715 Creek Trail. The site was established as a joint venture between Carver County Environmental Services, the Lower Minnesota River Watershed District, and the City of Chaska.

The sites purpose, along with EC #1 and EC #3, is to monitor the entire East Chaska Creek watershed for flow and nutrients. This data can then be utilized to analyze landuse effects within the watershed on the stream.

Water Quality Summary:

- Total phosphorous concentration samples were near or below the expected ecoregion average.
- Approximately half of the nitrite + nitrate concentration samples were above the NCHF ecoregion average.
- A majority of total suspended solid sample concentrations were within or below the middle 50th percentile for the ecoregion.
- Although more data is needed, Fecal Coliform Bacteria levels at the site appear to be a problem at the site.

Watershed Outlet Monitoring Program

East Chaska Creek Station – EC 3 Site
Chaska, MN

Summary Report
April – October 2010

Prepared By: Carver County Environmental Services
Prepared For: Lower Minnesota River Watershed District
December 2010

CARVER COUNTY

Introduction

The East Chaska Creek EC 3 site, located near the Carver County Courthouse on the old channel of East Chaska Creek, has been monitored since 2003. The East Chaska Creek watershed drains 9,868 acres of various types of land uses including residential, agricultural, undeveloped, and park/recreation areas (Appendix A). This data is preliminary and is subject to change until the Metropolitan Council submits the final report for this period.

Flow and Precipitation

Average flow in EC 3 was 4.13 cubic feet per second (cfs) or 2.67 million gallons per day (mgd) (Table 1). This was considerably higher than the average flow of 2.25 cfs in 2009. The 2010 sampling season was characterized by dry/ drought conditions in May and July in addition with much higher than average precipitation (and thus stream flow) in August and September. A graph describing flow and precipitation results is provided (Figure 1).

Table 1. Average flow and total precipitation at East Chaska Creek EC 3 Station April – October 2010

Period	Average Flow (cfs/mgd)	Precipitation (inches)	*Average Monthly Precipitation, 1997-2010 (inches)
APRIL	1.79 / 1.16	3.63	2.93
MAY	7.31 / 4.72	2.75	3.85
JUNE	1.89 / 1.22	4.61	4.26
JULY	0.32 / 0.21	2.37	3.36
AUGUST	9.19 / 5.94	6.55	4.96
SEPTEMBER	5.38 / 3.48	5.22	3.40
OCTOBER	2.65 / 1.71	2.01	2.36
TOTAL	4.13 / 2.67	26.09	25.13

*Average monthly precipitation data obtained from the National Weather service station located near the EC 3 site.

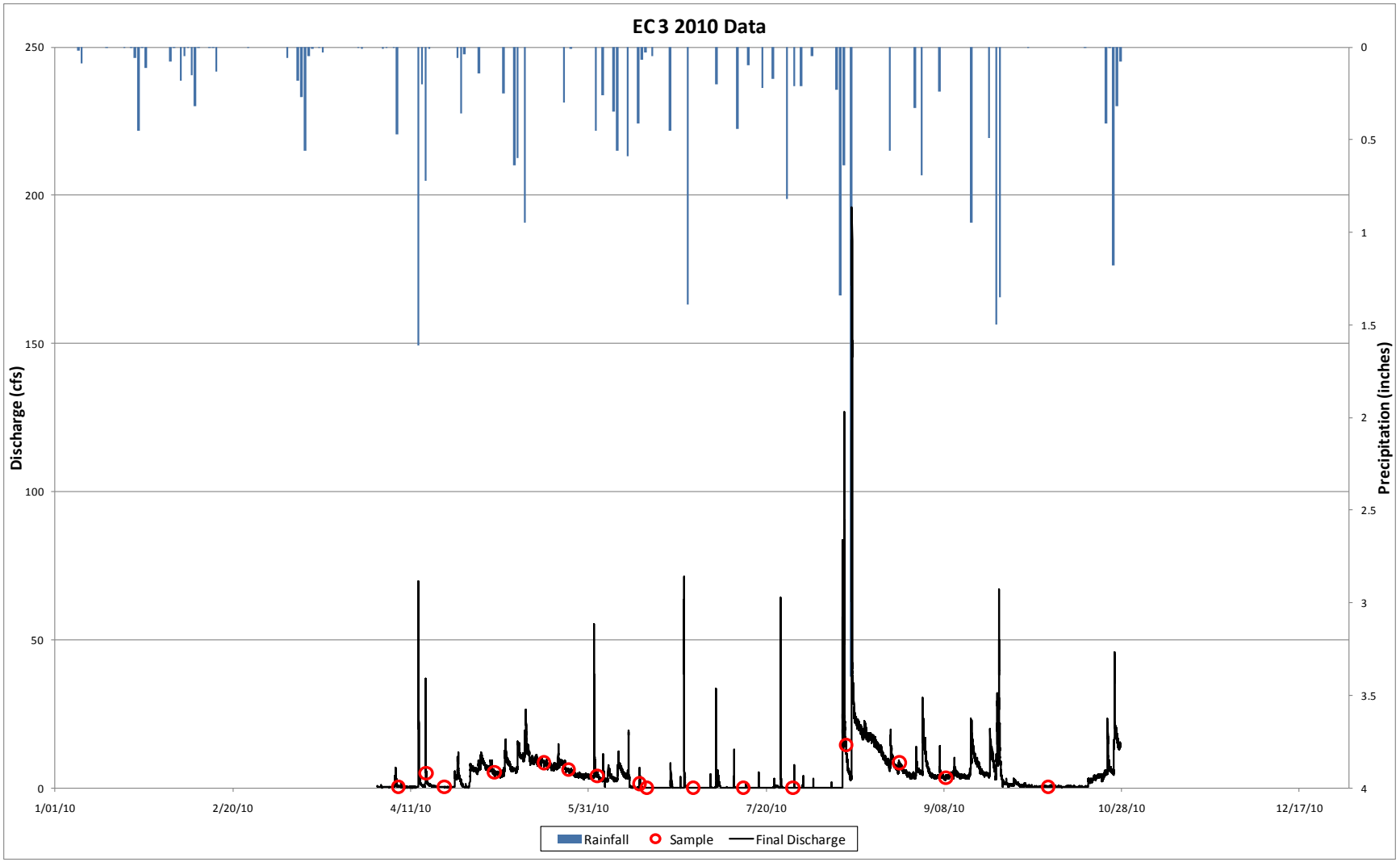


Figure 1. Flow and precipitation at East Chaska Creek EC 3 Station April - October 2010

Water Quality

Six nutrient samples and twelve Escherichia Coli (E.coli) samples were collected at the EC 3 Station during the 2010 season. Overall, water quality was poor with most parameters falling above the ecoregion mean. The concentration of E. coli declined from 727 MPN/ 100 mL in 2009 to 428 MPN/100 mL in 2010 and the concentration of Nitrate+Nitrite increased from 212 µg/L in 2009 to 1042 µg/L in 2010.

It should be noted that the majority of parameters were above the North Central Hardwood ecoregion means (see Table 2). The exception to this is Total Phosphorus concentrations, which are within the ecoregion mean. Additional information about phosphorus and E. coli loading and some statistical analyses can be found in Appendix B. Appendix B contains the draft pages of the 2010 Carver County Water quality report that can be accessed through the Carver County website (http://www.co.carver.mn.us/departments/LWS/wqmp.asp) as a report that can be downloaded or through an interactive GIS water quality mapping program.

Table 2. Average concentrations at East Chaska Creek EC 3 Station April – October 2010.

Parameter	2010 Ave. Concentration	Notes
Alkalinity	203 mg/L $CaCO_3$	
Chemical Oxygen Demand	30 mg/L	
Cadmium	N/A	Not tested at this site
Chloride	N/A	Not tested at this site
Chlorophyll-a	N/A	Not tested at this site
Chromium	N/A	Not tested at this site
Conductivity	N/A	Not tested at this site
Copper	N/A	Not tested at this site
Escherichia Coli	428.1	Standard is 126 / 1260*
Hardness	N/A	Not tested at this site
Lead	N/A	Not tested at this site
Nickel	N/A	Not tested at this site
Nitrogen Ammonia	103 µg/L	
Nitrate + Nitrite	1045 µg/L	Ecoregion mean (40-260 ug/L)
Phosphorus, Total	0.101 mg/L	Ecoregion mean (0.060-0.160 mg/L)
Suspended Solids	23 mg/L	Ecoregion mean (4.8 - 16 mg/L)
Turbidity	18 NTRU	Ecoregion mean (3-8.5 NTU)
Volatile Solids	5 mg/L	
Zinc	N/A	Not tested at this site

*As stated in MN Rules Chapter 7050.0222, E. coli shall not exceed 126 organisms per 100 mL as a geometric mean of not less than five samples, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 mL.

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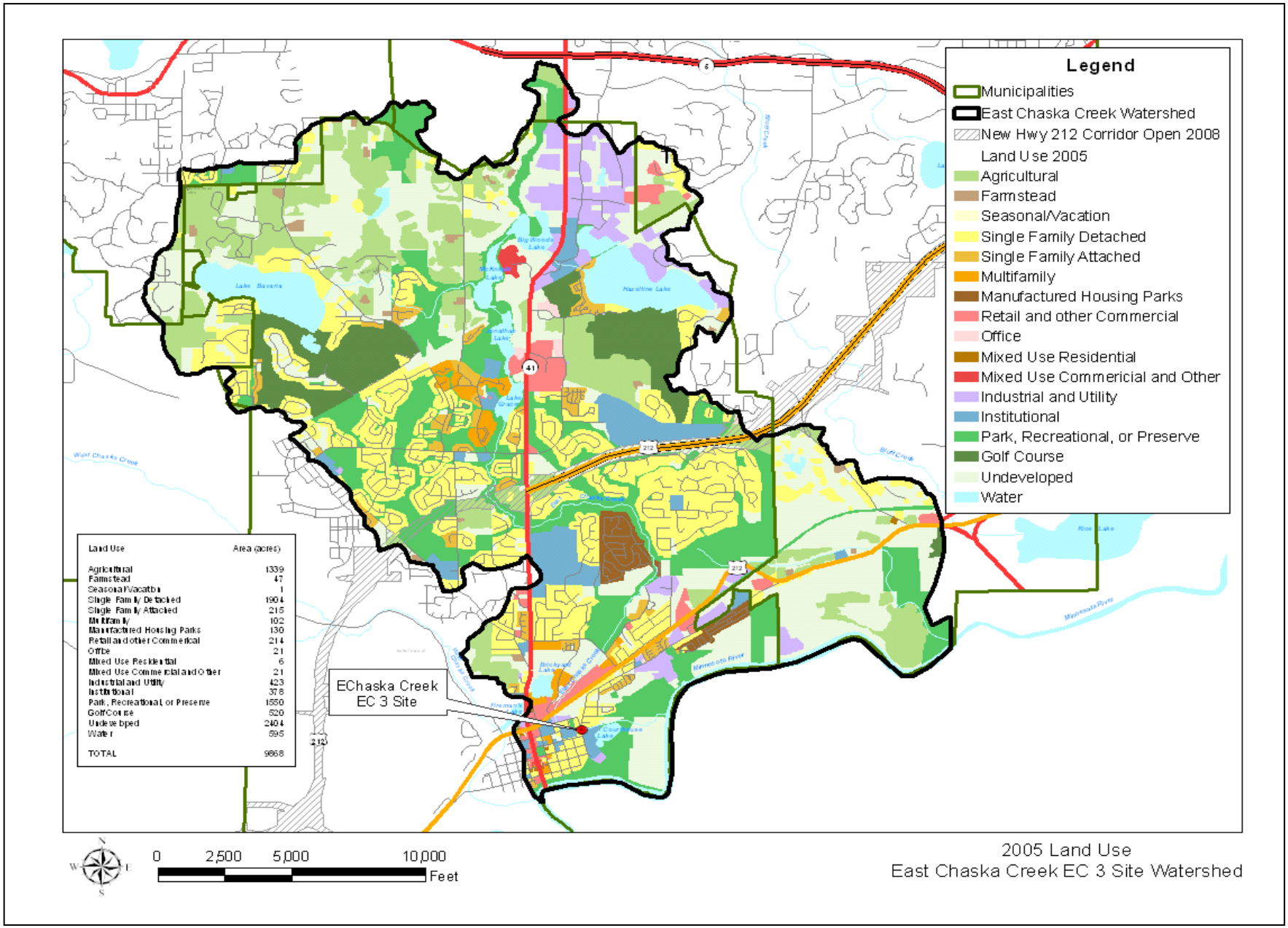
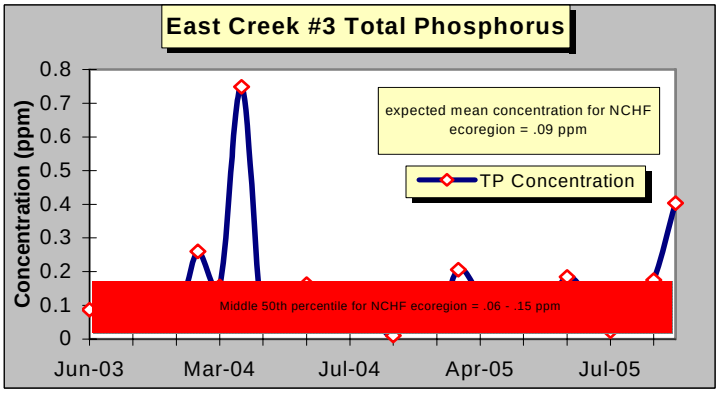
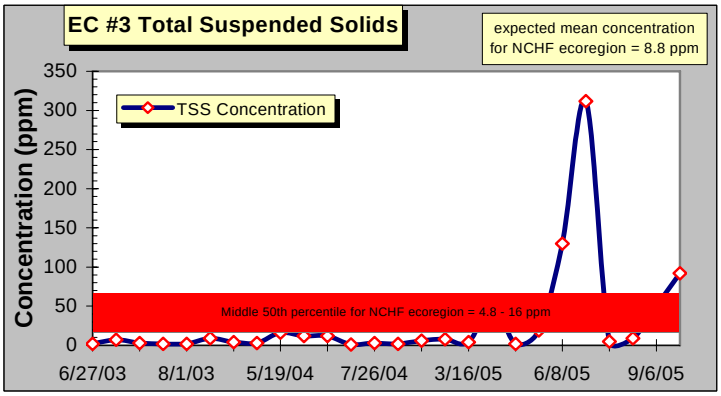
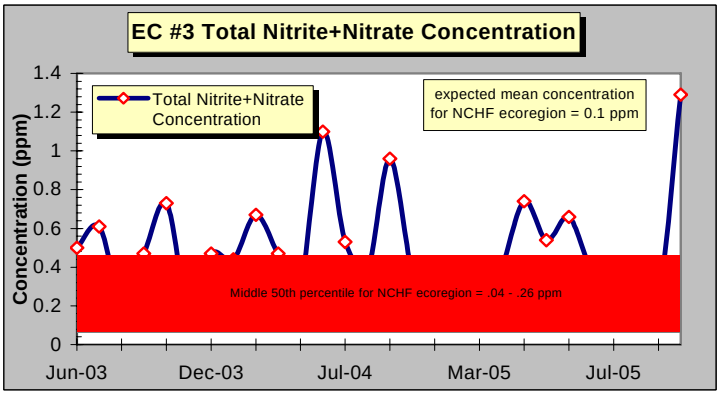


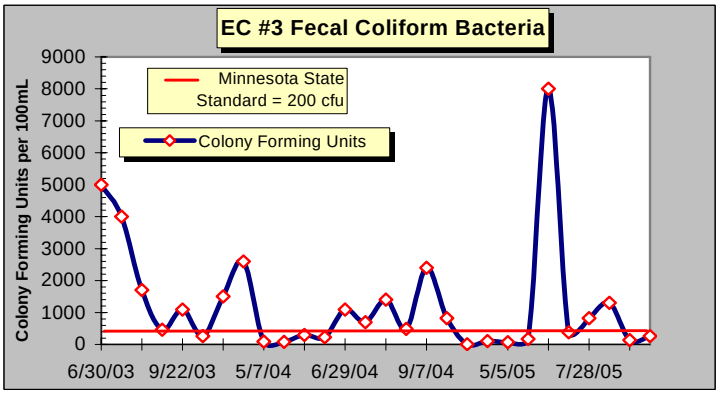
2005 Land Use data source provided by Metropolitan Council Environmental Services.

East Chaska Creek Site #3 Courthouse Site (EC 3)









This site is located near the Carver County Courthouse on the old channel of East Chaska Creek. The channels flow is controlled by valves operated by the City of Chaska and installed by the COE as part of the flood control project. The site was established as a joint venture between Carver County Environmental Services, the Lower Minnesota River Watershed District, and the City of Chaska.

The sites purpose, along with EC #2 and EC #1, is to monitor the entire East Chaska Creek watershed for flow and nutrients. This data will then be used to analyze land use affects on the stream.

Water Quality Summary:

- The large majority of total phosphorous concentration samples were within the expected ecoregion average.
- A majority of the nitrite + nitrate concentration samples are at or above the NCHF ecoregion average.
- Total suspended solid sample concentrations were within or below the middle 50th percentile for the ecoregion.
- Although more data, is needed Fecal Coliform Bacteria levels appear to be a problem at this site.