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Minnesota Department of Natural Resources

Division of Fish and Wildlife

Section of Fisheries

Stream Survey Report

Cold Spring Creek 2009

By

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Table of Contents

Figures & Tables

Summary

Cold Spring Creek is a designated trout stream within the City of Cold Spring in Stearns County, Minnesota. It flows 1.7 miles before entering the Sauk River. Cold Spring Creek has a gradient that ranges between 7.3 and 62 feet per mile and an overall sinuosity of 1.15. The stream has a watershed of 3,320 acres with estimated land use of 47.9% cultivated crops, 27.5% pasture/hay, 17.3% developed, and 4.2% grassland (based on 2001 land use cover data).

Electrofishing in October 2009 resulted in a total of 12 brook trout captured, of which 2 were young-of-year. Trout lengths ranged between 125 and 245mm TL. A fish kill occurred in the spring of 2009 and during the fall survey no trout were captured downstream of Fifth Avenue where two significant stormwater inlets enter the stream. Fish kill events have occurred in the past, but these results are lower than any previous surveys and raise concerns about the ability of the trout population to rebound on its own.

Remote data loggers have been used to record discharge and temperature since 2002. Results in 2009 continue to show a very flashy hydrograph and corresponding spikes in stream temperature. Estimated discharge ranged from 1.7 to over 100 ft^3/second. The maximum temperature recorded in 2009 was 21.8 ℃, but only six hourly readings exceeded 20 ℃.

Habitat improvements have been made in recent years to constrict the stream channel, increase stormwater infiltration, and revegetate the banks with native plants. These efforts should be continued along with greater vigilance in preventing fish kills and habitat degradation due to human activities.

General Information

Stream Name:	Cold Spring Creek
Alternate Name:	Brewery Creek
Tributary Number:	M-74-004
Counties:	Stearns
Nearest Town:	Cold Spring
Source of flow:	Wetland complex northwest of the City of Cold Spring
Waterway sequence:	Wetland /Cold Spring Creek/Sauk River/ Mississippi River
Stream Length:	1.7 miles from wetland complex to mouth
Gradient:	7.3 - 62 ft/mile
Sinuosity:	1.04 -1.22
Classification:	Class I-A (Coldwater, brook trout)

Watershed Description

Watershed Name and Number

Major:	Mississippi River (1) – Sauk River (16)
Minor:	Sauk 16011
Watershed Area:	3,316.5 acres
Watershed Land Use:	47.9% cultivated crops, 27.5% pasture/hay, 17.3% developed, and 4.2% grassland (based on 2001 land use cover data).
Riparian Zone:	In the area containing trout, the surrounding land is primarily residential with much impervious surface. The stream has been impacted by: ditching, stormwater inflows, rip rap, dam building, mowing and removal of riparian vegetation.

Introduction and Study Area

Cold Spring Creek is a designated trout stream with a headwater located approximately three miles northwest of the city of Cold Spring in Stearns County, Minnesota. The stream flows 1.7 miles (2.8 km) within the City of Cold Spring to the confluence with the Sauk River (Figure 1). Most of the stream has been highly modified by culverts, dams, landscaping, storm drain runoff, previous pollution events, bank armoring, and vegetation removal. However, the stream continues to support brook trout due to springs in the area. Cold Spring Creek has an overall gradient of 42.4 ft/mile and a sinuosity of 1.15. The stream has a watershed of 3,320 acres (Figure 2) with estimated land use (from 2001 data) of 47.9% cultivated crops, 27.5% pasture/hay, 17.3% developed, 4.2% grassland, 2.5% forest, and 0.5% wetland (Table 1).

An initial survey of Cold Spring Creek was conducted in 1977. Re-surveys were conducted in 1981 and 1993, and population assessments in 1986, 1991, and 2002-2007. The 2009 survey included electrofishing, temperature, and discharge monitoring.

Hydrology and Temperature

A Global Water stage logger was placed in the lower portion of the stream on September 24, 2002 to measure stage and discharge dynamics (Figure 3). The stage logger records hourly water depth (stage). Estimated flows ranged from 1.7 to over 100 ft^3/second (Figure 4). Corresponding discharges were measured at the site using a Marsh-McBirney flow meter on 15 days during 2009 to calculate a stage/discharge relationship ($y = 36.596x^2 - 53.23x + 21.573$, $R^2 = 0.90$). A large influx of sand has been transported downstream for several years and reached the logger site in 2009, changing the cross-sectional profile of the stream and rendering the previous discharge equation invalid. Stage data was recorded from high flows in March and April, but the stream was unwadeable during these times and direct flow measurements were not made. The highest flow directly measured was 14.9 cfs; estimates (based on stage logger data) that are higher than this may be unreliable, but data from past years suggests that peak flows may exceed 100 cfs. Stage readings and corresponding discharge estimates from January to late March are suspect due to a weakening battery and possible ice formation and are not included in this report.

A Stowaway Tidbit® remote temperature monitor was placed at the stage logger site (Figure 3) in 2009. The monitor was anchored to the streambed and recorded hourly temperatures from April 28 to October 16, 2009 (Figure 5). Only six readings exceeded 20 ℃ during 2009 and the maximum recorded temperature was 21.8 ℃

Rainfall events may have detrimental impacts to Cold Spring Creek due to drastic increases in discharge and corresponding increases in water temperature. Discharge alone may have damaging effects on recruitment when high flows occur during fall spawning or in spring. Spring flows may sweep fry too far downstream or smother eggs with sediment. During 2009, large increases in temperature were associated with rainfall events during warm weather (www.weather.gov, St. Cloud and Paynesville) and increased flow. Water level and discharge data have been recorded since 2002 and show pronounced flashiness in the hydrograph, suggesting that the system acts more as a ditch than a natural stream (Cold Spring Creek Report 2006). Lack of buffer areas, large amounts of impervious surface, and storm water runoff all contribute to the rapid increases in stage and discharge. The stream typically subsides to near base flow level within hours after a rain event.

Electrofishing

Fish were sampled using a Smith Root BP-15D backpack electrofisher with pulsed direct current. Electrofishing stations began at a physical barrier and proceeded upstream to another barrier. Game fish were measured to the nearest mm and catch per unit of effort (CPUE) for trout was calculated for stations where trout were captured. EF 1 extended from the logger site to the dam upstream from Second Street North. EF 2 extended from the dam to the end of the city park property north and west of Fifth Avenue (Figure 3).

In 2009, 12 brook trout were captured, ranging in length from 125-245 mm, including two young-of-year. No trout were sampled in EF 1, but CPUE was 17.4/hr for EF 2. Stations did not correspond to previous years. The trout catch rate was 0.62/100ft for EF2. Catch rates were low compared to previous years and no trout were found below the pool at Fifth Avenue. Length frequency data is compared with previous years in Table 3. A large number of small white suckers (< 6 inches) were captured in EF 1.

Shoreland Restoration and Improvements

In 2004, a DNR Shoreland Habitat Restoration Grant was approved for an area within the Rocori Middle School property. A buffer area was treated with herbicide to remove non-native vegetation. Additional treatment and prescribed burning took place in an effort to further eliminate non-native grasses and shrubs from the area. In May 2004, a re-seeding and mulching project took place with the assistance of students from Rocori Middle School. A cover crop of annual rye grass was planted to minimize overland runoff and erosion during the extended treatment of exotic plants in the buffer area. In 2005, two bends were also stabilized with root wad revetments and Bio-Logs (Coconut fiber rolled into 1 ft diameter tubes or “logs”).

In 2006, an infiltration trench was installed on the Gluek Brewery property in order to filter parking lot and street runoff before it enters the stream between Fifth and Red River Avenues. In addition, the entire north shoreline (357 ft) had European Buckthorn removed and was then replanted with native shrubs and grasses. Bio-Logs were installed below Fifth Avenue in an effort to constrict the flow of the creek and temporarily provide toe stabilization while vegetation becomes established. Four small rock weirs were installed to narrow the stream channel and prevent bank erosion. Brush layering and willow stakes were added between Fifth and Red River Avenues in 2007-08 in a continuing effort to constrict the channel and establish vegetation in the former stream bed. Much of the brush layering at Fifth Avenue was washed out by high flows in early 2009. Brush layering at this site has been repeatedly damaged; a larger rock weir or similar structure may be needed if a constricted channel is to be achieved.

Discussion and Recommendations

Cold Spring Creek suffered a partial fish kill in 2006 for unknown reasons and another in early 2009 due to fire hydrant flushing using chlorinated water. Continuing efforts to educate and work with city staff will be vital if a viable trout fishery is to continue. The population seemed to be recovering in 2007, following the 2006 fishkill, but 2009 results were much worse. Only ten adults and two young-of-year trout were captured in the uppermost reach, suggesting either severe mortality, poor reproduction, or both. The reach above Fifth Avenue continues to serve as a refuge for brook trout and may result in the recolonization of the stream; however, the very low number of trout remaining could result in a genetic bottleneck, reducing fitness.

The riparian buffer along the middle school property should be monitored and will likely require maintenance work to limit weed and tree encroachment. Efforts to constrict the channel along the Gluek Brewery property should be continued and may require new methods to protect the area from high stormwater inflows below the Fifth Avenue bridge. A population assessment should be conducted in 2011 to determine whether the trout population has recovered sufficiently; stocking could be considered if it has not. New cross-sectional measurements should be done in 2010 or 2011 to determine what changes in morphology have occurred since 2002. Annual discharge rating curves for the stage logger may be needed until the sand bedload is flushed through at the site and channel morphology stabilizes.

References

Cold Spring Creek Survey. 2007, 2006, 2005, 2004, 2003, 2002, 1994. Minnesota Department of Natural Resources, Division of Fish and Wildlife, Section of Fisheries, St. Paul.

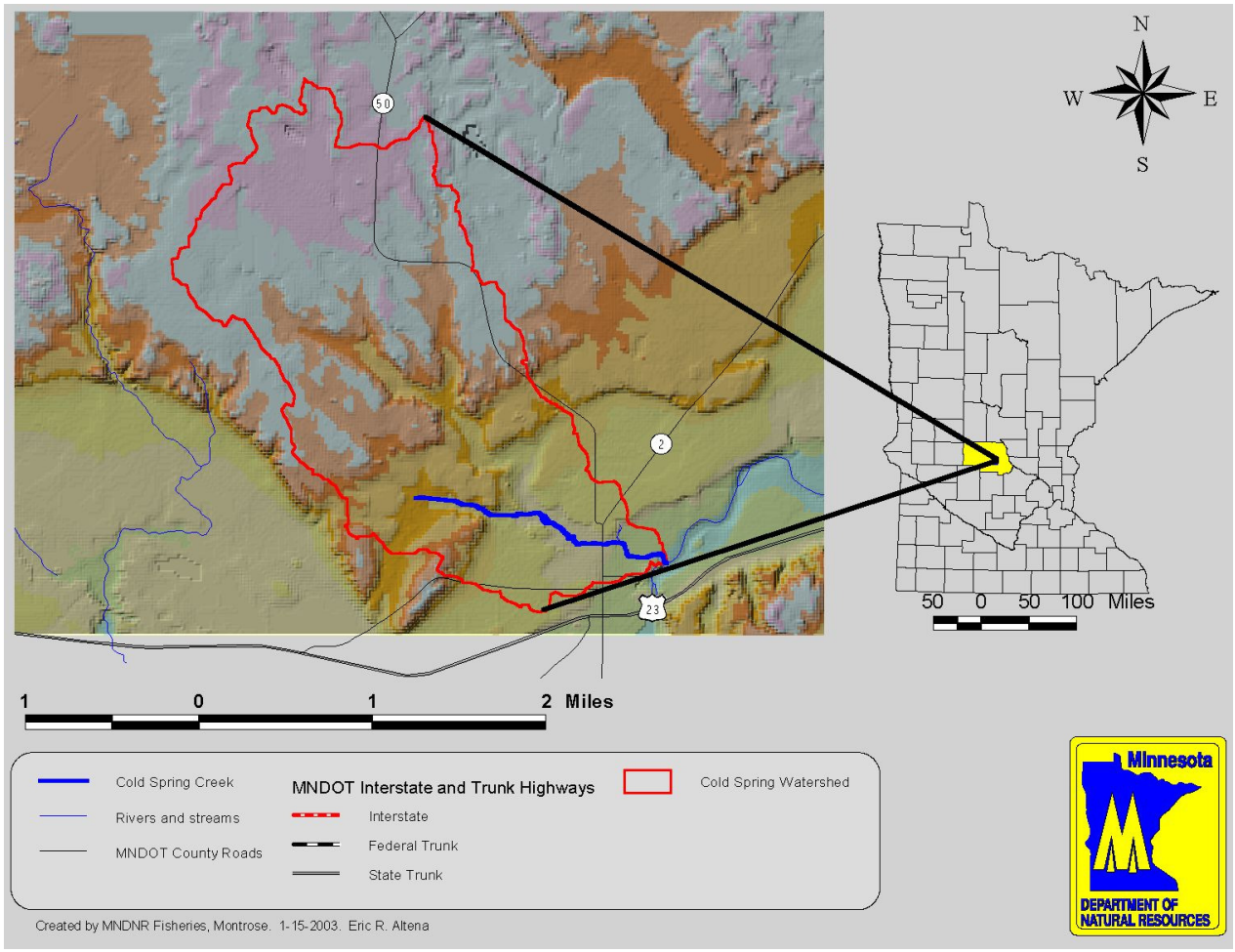
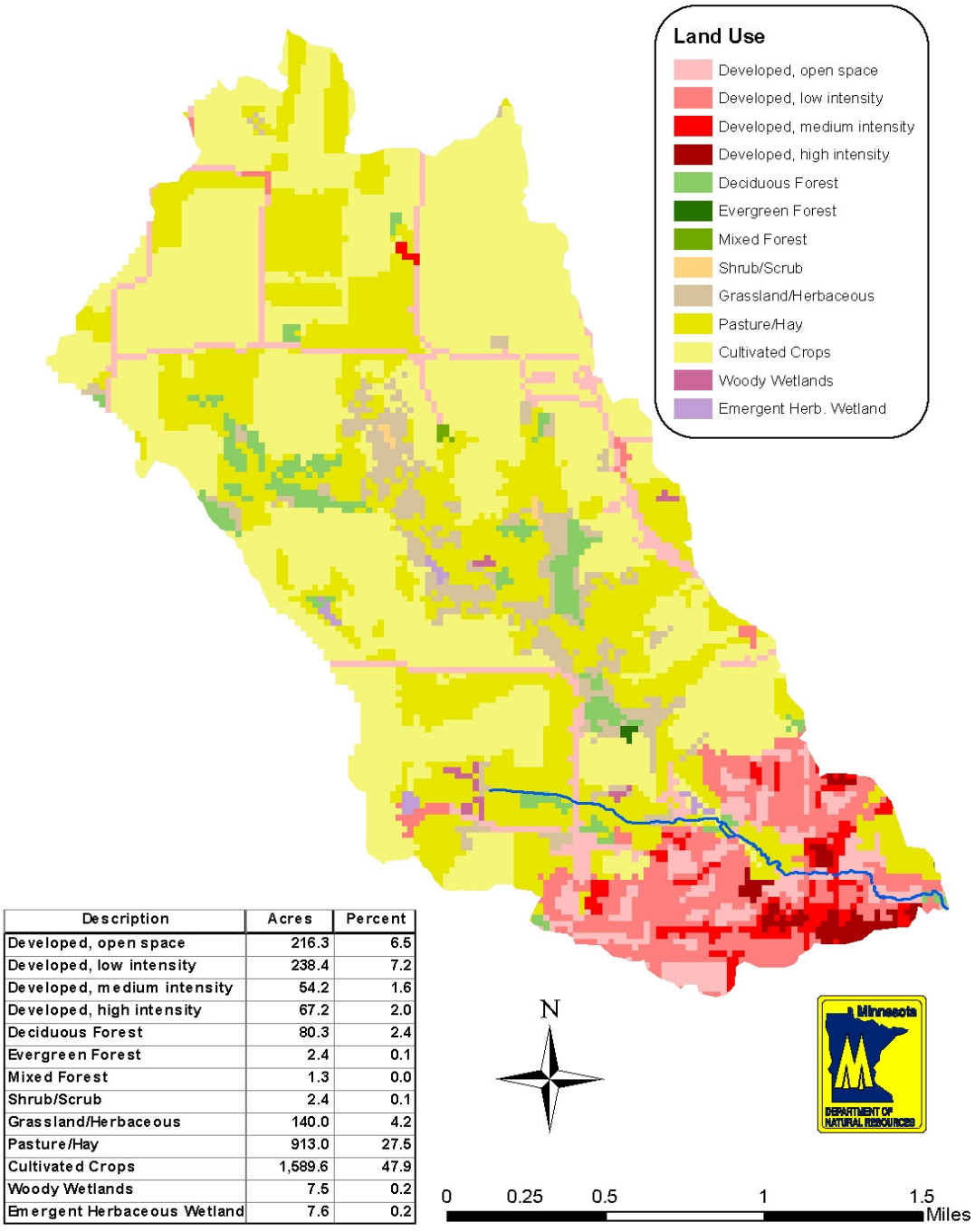


Figure 1. Location of Cold Spring Creek, Minnesota.



Description	Acres	Percent
Developed, open space	216.3	6.5
Developed, low intensity	238.4	7.2
Developed, medium intensity	54.2	1.6
Developed, high intensity	67.2	2.0
Deciduous Forest	80.3	2.4
Evergreen Forest	2.4	0.1
Mixed Forest	1.3	0.0
Shrub/Scrub	2.4	0.1
Grassland/Herbaceous	140.0	4.2
Pasture/Hay	913.0	27.5
Cultivated Crops	1,589.6	47.9
Woody Wetlands	7.5	0.2
Emergent Herbaceous Wetland	7.6	0.2

Figure 2. Cold Spring Creek 2001 watershed land use.

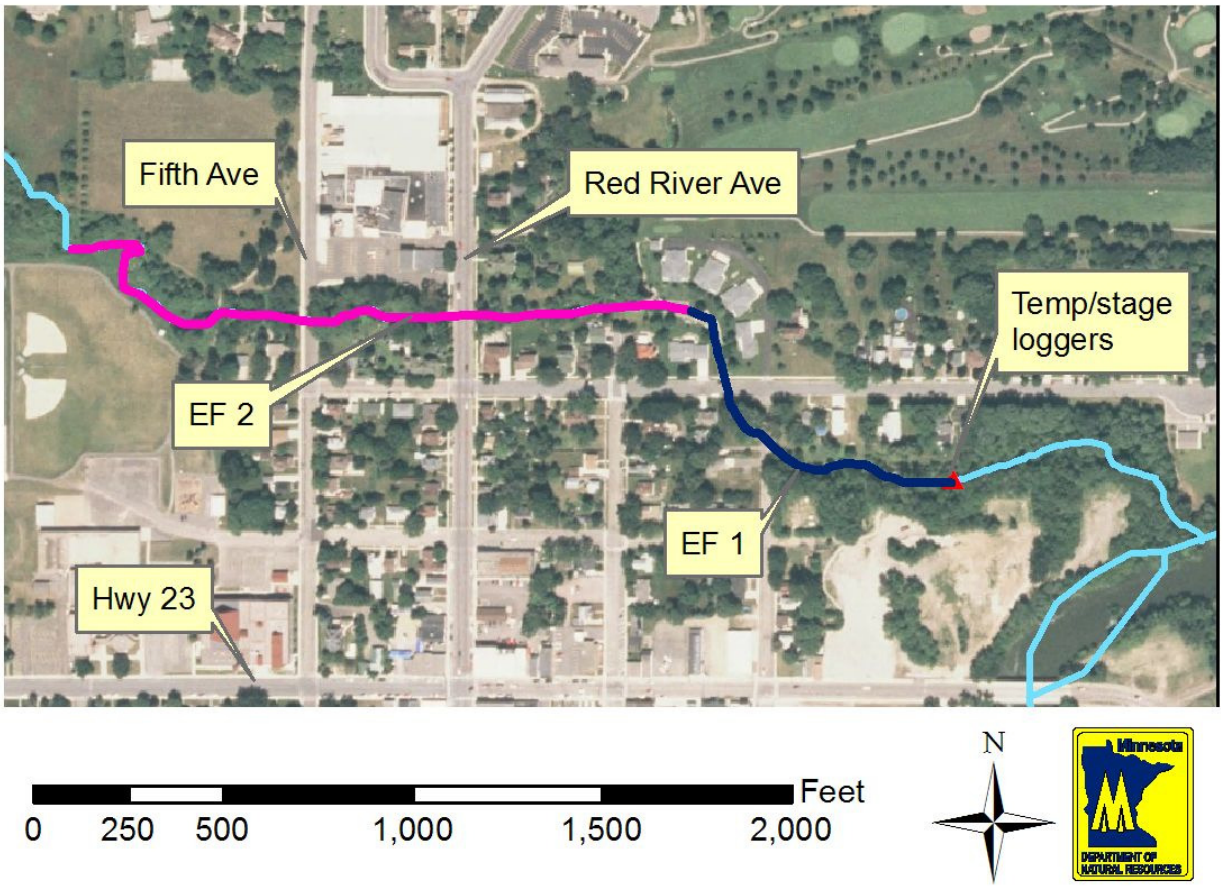


Figure 3. Location of electrofishing stations, temperature and stage monitors on Cold Spring Creek, 2009.

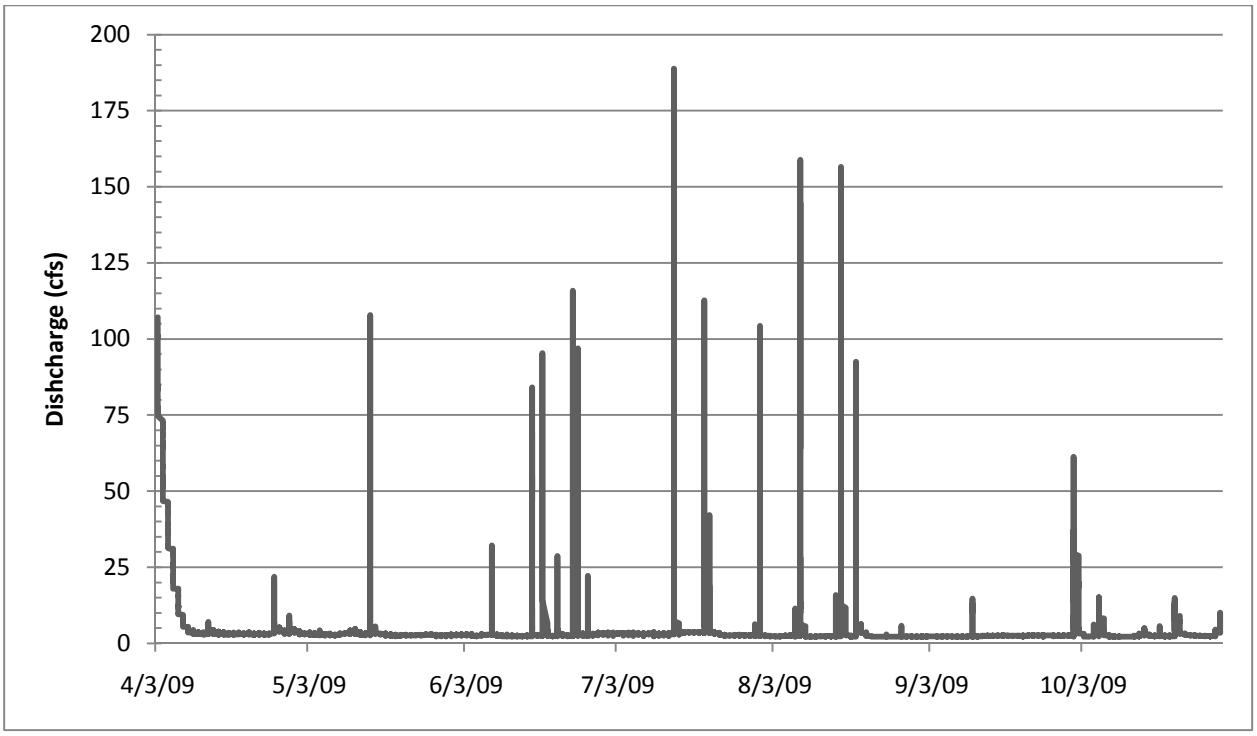


Figure 4. Hourly discharge (ft^3/sec) estimated from a remote stage logger in Cold Spring Creek, April 4 – October 28, 2009.

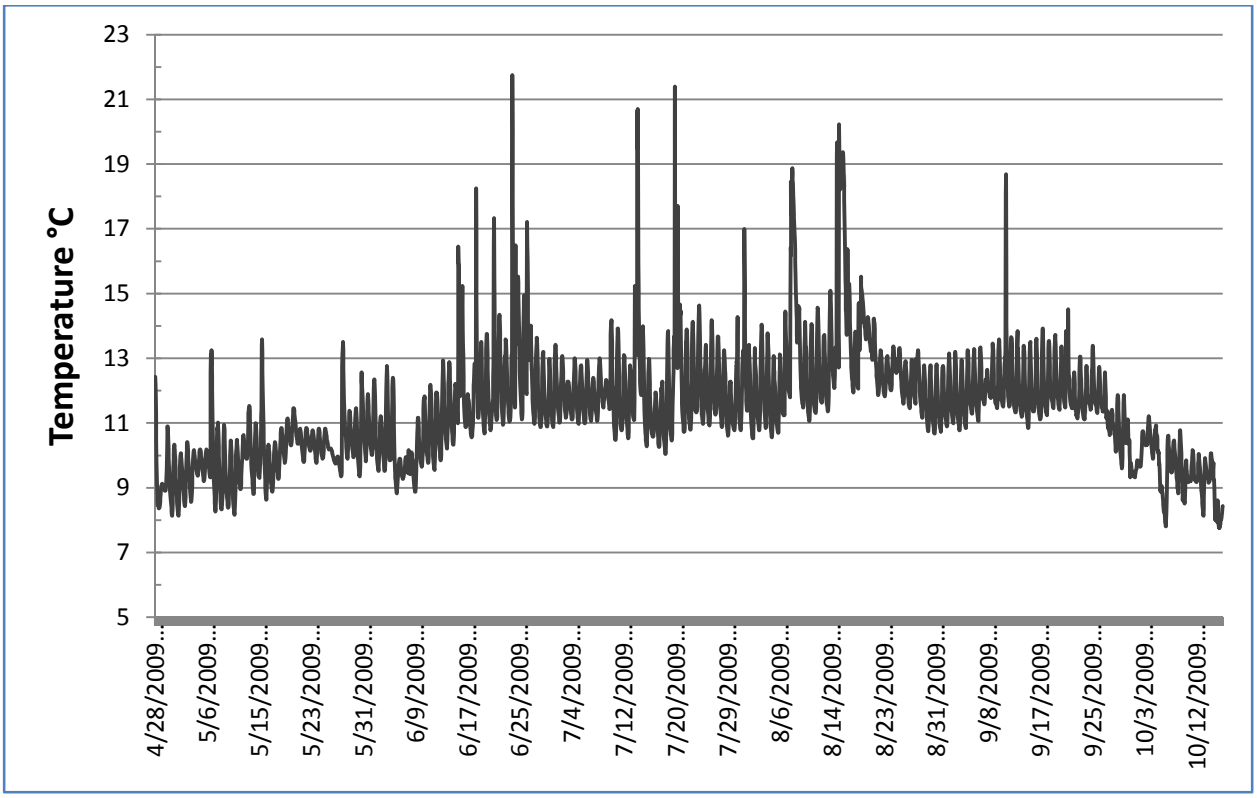


Figure 5. Hourly water temperature (℃) recorded by a remote temperature monitor near the mouth of Cold Spring Creek, April 28 – October 16, 2009.

Table 1. Cold Spring Creek (M–74-4) watershed estimated land use (2001 data).

Land use	*Acres*	*Percent*
Developed	576.1	17.3
Forest	84.0	2.5
Shrub/Scrub	2.4	0.1
Grassland	140.0	4.2
Pasture/Hay	913.0	27.5
Cultivated crops	1,589.6	47.9
Wetlands	15.1	0.5
Total	3,320.2	100.0

Table 2. Cold Spring Creek temperatures (℃), 2002 – 2009.

	2002	*2003*	*2004*	*2005*	*2006*	*2007*	*2009*
Number of readings	6,569	4,800	26,486	19,682	19,014	18,417	4,101
N > 18 ℃	265	22	67	88	89	114	40
N > 20 ℃	125	4	27	19	5	46	6
N > 22 ℃	21	0	0	2	0	12	0
Max	23.8	21.6	21.2	23.1	20.9	23.4	21.8
Overall Mean	13.0	11.0	11.4	11.6	11.6	12.0	11.5
Consecutive hrs > 20 ℃	16	1	2.5	1	1	2.5	2

Table 3. Number of measured brook trout per 10 mm length group from electrofishing all stations, Cold Spring Creek, 2002-2009.

*Length group mm**	*2002*	*2003*	*2004*	*2005*	*2006***	*2007*	*2009*
20					15		
30					15		
40							
50							
60							
70	4	3	1				
80	23	21	6				
90	67	62	19			3	
100	109	73	54	1		6	
110	83	46	39	5		5	
120	67	24	58	17	3	4	
130	10		36	6	2	1	2
140	24	10	25	1	1		
150	1	27	21	3	2	1	
160	4	12	11	6		2	
170	7	23	8	9	1	3	
180	16	24	10	9	1	3	3
190	11	16	4	17		1	1
200	22	13	4	18		5	3
210	9	9	3	13		2	1
220	19	5	2	17		1	1
230	9	12	2	8			
240	6	8		8			
250	5	3		3			1
260	3	2	1	2		1	
270	3	1					
280		1					
290	1	4					
300		1					
310	2	1					
320	1	1					
330	1						
340							
350							
360							
Total	507	402	304	143	40	38	12

*Midpoint of 10 mm group, e.g. 130 mm group contains fish from 125-134 mm.
**Sampled in June following a fish kill event.

Minnesota Department of Natural Resources

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Stream Survey Report

Cold Spring Creek
Progress Report 2009

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