Minnesota Department of Natural Resources
Division of Fish and Wildlife
Section of Fisheries

Stream Survey Report

Thiel Creek

2011

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SUMMARY

Thiel Creek is a designated trout stream with its headwater located three miles northeast of the town of Kimball in Stearns County, Minnesota. It flows 1.5 miles to the confluence with Lake Louisa on the Clearwater River chain of lakes. The stream has a watershed of 216 acres with estimated land use of 5.7% residential, 63.0% forest, 5.0% grassland/shrub, 9.5% pasture/hay, 13.8% cultivated crops, and 3.0% wetland.

Rosgen stream classification was performed at two sites; both were classified as C4. Both sites were slightly entrenched, had a high width to depth ratio, moderate sinuosity, and substrate dominated by fine to medium gravel. A temperature monitor collected hourly readings from April to September. Past surveys found a very favorable temperature regime, but in 2011 many readings during July were above the brook trout thermal threshold of 68°F. School Section Lake is located north of the Thiel Creek watershed, but a water control structure and channel allow high water from the lake to be released into the stream. The lake level was very high in 2011 and water was released during the summer, likely increasing stream temperatures.

Fish sampling via backpack electrofishing captured 82 brook trout in 1.36 hours of effort for an overall catch per unit effort (CPUE) of 60.4/hr. Among four stations, CPUE ranged from 35.6/hr to 81.1/hr. The catch per 100 feet was 5.0 overall, ranging from 1.4 to 9.1. These catch rates were substantially lower than in previous surveys. The only other species captured was one small northern pike. Brook trout ranged in length from 98 to 231 mm with a mean length of 178 mm. Captured fish were not aged, but these fish likely represent ages 0 to 2, based on aging from previous surveys.

Several steep hillsides have recently collapsed into the stream, depositing a large amount of sediment downstream and creating a new channel. An effort will be made by the Stearns County Soil and Water Conservation District and partners to stabilize these sites and restore the channel. Excess sediment and high temperatures may help explain the low catch rate in 2011. No angling easements or public access exist for Thiel Creek and an effort should be made to provide the public with an additional angling opportunity for brook trout.

STUDY AREA

Thiel Creek is a designated trout stream with its headwater located three miles northeast of the town of Kimball in Stearns County, Minnesota. It flows 1.5 miles to the confluence with Lake Louisa on the Clearwater River chain of lakes (Figure 1). The creek has a gradient ranging between 25 and 57 feet per mile and an overall sinuosity of 1.96. The watershed is 216 acres (Figure 2) with estimated land use of 5.7% residential, 63.0% forest, 5.0% grassland/shrub, 9.5% pasture/hay, 13.8% cultivated crops, and 3.0% wetland (Table 1). A residential development has been built along the lower portion of the creek since the 2001 survey was conducted. The stream has a reproducing population of brook trout with no past records of stocking.

METHODS

Thiel Creek was initially surveyed in 1977; resurveys were done in 1980, 1985, 1994, and 2001. Information was recorded on the fish community, physical and chemical characteristics, and invertebrate species composition and abundance. Available habitat was surveyed in 1994 (O'Shea 1995) and Rosgen classification was performed in 2001 (Altena 2002).

During the current survey, Rosgen stream classification (Rosgen 1996) was performed at two sites established in 2001 on the middle and lower sections of the creek (Figure 3). Slope, sinuosity, entrenchment ratio, pebble count, and other metrics were calculated. Elevations were recorded using a Trimble Spectra Precision Laser level. RiverMorph 4.3 software was used to analyze the data and calculate stream classifications (RiverMorph 2011). Temperatures were recorded hourly using a Hobo Pendant data logger (model UA-001-08) in the lower section of the stream from April 29, 2011 to September 15, 2011 (Figure 3).

Fish were sampled with a Smith Root BP-15D backpack electrofisher using pulsed DC current. Four stations were sampled, approximating the sites from the 2001 survey. Brook trout were measured to the nearest mm and released.

RESULTS

Land use has changed in the watershed. Data from the 1991 and 2001 National Land Cover Data shows an increase in forest (47.9 to 63.0%) and residential (1.7 to 5.7%) use (Table 1). Categories decreasing included pasture/hay (20.7 to 9.5%) and grassland/shrub (14.5 to 5.0%). The addition of a new development (Lakes of Fairhaven) along the lower portion of Thiel Creek since 2001 has further increased residential land use.

Rosgen classification was performed at two sites established during the 2001 survey (Figure 3). The upper site is located approximately 0.2 miles downstream of County Road 44. This station was slightly entrenched (4.2), and had a high width to depth ratio (14.8) and moderate sinuosity (1.4; Table 2). D_{50} particle size was fine gravel (5.4 mm) and fines (sand or silt) made up 22.7% of the pebble count. The lower site is approximately 0.4 miles upstream from the mouth and was also slightly entrenched (3.8) with a high width to depth ratio (14.1) and moderate sinuosity (1.3). D_{50} particle size was medium gravel (8.2 mm) and fines (sand or silt) made up 11% of the pebble count. Both stations were classified as a C4 stream type. The C4 stream type can be negatively impacted by direct manipulation of the stream channel or by increases in flow and sediment within the watershed (Rosgen 1996). Rapid lateral movement is possible if riparian vegetation is removed.

Fish sampling via backpack electrofishing captured 82 brook trout in 1.36 hours of effort for an overall catch per unit effort (CPUE) of 60.4/hr (Table 3). CPUE ranged from 81.1/hr at station 1 to 35.6/hr at station 3. The catch per 100 feet was 5.0 overall, ranging from 9.1 at station 1 to 1.4 at station 4. The only other species captured was one small northern pike (198 mm TL, 44g.) Brook trout ranged in length from 98 to 231 mm (Table 4) with a mean length of 178 mm. Captured fish were not aged , but these fish likely represent ages 0 to 2; no fish older than age 2 were found in the 2001 survey and the maximum length for age 2 was 245 mm.

Temperature data from 2011 was marginal for brook trout survival in the lower portion of the stream (Figure 4). During the summer, 582 hourly readings were above 68°F with a maximum of 75.8°F. High temperatures were recorded primarily during July

and early August. In late July, 114 consecutive hours were above 68°F. During the 2001 season, no readings were found above 68°F.

DISCUSSION

Land use in the watershed has experienced a decrease in grassland and pasture and an increase in forest and residential use from the 1991 data to 2001 (Table 1). The Lakes of Fairhaven development was built after 2001, further increasing residential use, likely at the expense of forest, grassland, and pasture cover types. The development has used stormwater retention, a communal septic system, and other practices to minimize impact to Thiel Creek, but the effectiveness of these is unknown.

A community park is located near the mouth of the creek and the creek flooded into the park during 2010. A large amount of sediment was deposited in the lower portion of the creek and the park. This effectively blocked the existing channel and a new channel formed in the park. An inspection of the stream above the park in 2011 found that several steep hillsides had collapsed into the creek, releasing a large amount of sediment. An effort will be made by the Stearns County Soil and Water Conservation District (SWCD) to stabilize the stream banks in 2012 before redirecting the creek out of the park.

Water temperatures in 2001 were much more favorable than in 2011 (Altena 2002; Figure 4). Two factors may account for this difference. July 2011 was characterized by high rainfall and hot weather, likely allowing warm water to run off into the stream. Also, School Section Lake is located north of the Thiel Creek watershed, and a water control structure and channel allow high water from the lake to be released into the stream. The lake level was very high in 2011 and water was released during the summer. The temperature of Thiel Creek was monitored daily near the release site and releases were halted when the creek temperature reached 68°F.

Stream classification at the lower site was C4 in 2011 and 2001. Little change was evident; the substrate was dominated by medium gravel and other metrics were quite similar (Altena 2001). The upper site was also classified as C4 in 2011, but was classified as E4 in 2001. This indicates that the upper site is less sinuous, with a

shallower, wider channel than in 2001. This could be an effect of high flows in 2010 and 2011. Given time and stable conditions, the stream may revert to the E4 type in the future.

Brook trout numbers and catch rate declined in 2011 compared to earlier surveys (Tables 3 and 4). Numbers decreased across all sizes, but only one trout smaller than 130 mm was captured in 2011, whereas high numbers were found in 2001 and 1994. The length frequency suggests that the population is dominated by age one fish, with some larger young-of-the-year and age two trout (Figure 5). Unfavorable temperatures, high flows and an unusually large sediment load may have limited survival and reproduction during the past two seasons.

Management Implications

Thiel Creek has historically had a high density of small brook trout, but few larger fish. The lack of deeper pools and cover likely limit the potential for larger trout. An effort should be made to pursue angling easements along the creek south of County Road 44. This would allow the needed habitat improvement work to improve the size structure of the population and provide anglers with a unique fishery to enjoy. No easements currently exist. However, efforts by the Stearns SWCD to stabilize the steep banks that have collapsed into the stream and repair the lower channel should be encouraged and aided. The right design could yield habitat improvements along with bank stabilization. Land use in the watershed seems to pose no current threat to stream health, but further development should be limited and designed carefully. Future releases of water from School Section Lake should be carefully planned and monitored, preferably occurring when lake water is below 68°F.

REFERENCES

Altena, E.R. 2002. Thiel Creek Stream Survey Report. Minnesota Department of Natural Resources, Division of Fish and Wildlife, Section of Fisheries, St. Paul.

O'Shea, D. 1995. Thiel Creek Stream Survey Report. Minnesota Department of Natural Resources, Division of Fish and Wildlife, Section of Fisheries, St. Paul.

RiverMorph, LLC. (2011) RiverMorph version 4.3, www.rivermorph.com. Copyright 2001-2011. RiverMorph LLC, Louisville, KY.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO.

Table 1. Thiel Creek watershed estimated land use (percent) comparison, 2001 to 2011.

Land Use	2011*	2001**
Residential	5.7	1.7
Forest	63.0	47.9
Grassland/Shrub	5.0	14.5
Pasture/Hay	9.5	20.7
Cultivated Crops	13.8	14.7
Wetland	3.0	0.1
Undefined	0.0	0.4

* Based on 2001 National Land Cover Data
** Based on 1991 National Land Cover Data

Table 2. Results of Rosgen classification sites, Thiel Creek, 2011.

Parameter	Upper station	Lower station
Floodprone elevation (ft)	92.31	94.25
Bankfull elevation (ft)	90.58	92.73
Floodprone width (ft)	60.74	56.43
Bankfull width (ft)	14.39	14.79
Entrenchment ratio	4.22	3.81
Mean depth (ft)	0.97	1.05
Max depth (ft)	1.73	1.52
Width/Depth ratio	14.84	14.09
Bankfull area (sq ft)	14	15.56
Wetted perimeter (ft)	15.78	15.59
Hydraulic radius (ft)	0.89	1
Slope (ft/ft)	0.005	0.008
Sinuosity	1.38	1.31
% fines (sands and silts)	22.7	11
Pebble count D50 (mm)	5.42 mm	8.18 mm
Stream type	**C4**	**C4**

Table 3. Electrofishing stations and catch information of brook trout from Thiel Creek on September 15, 2011.

Station	Length (ft)	Effort (sec)	N	CPUE	N/100 ft
EF1	361	1,464	33	81.1	9.1
EF2	430	2,028	35	62.1	8.1
EF3	355	708	7	35.6	2.0
EF4	494	687	7	36.7	1.4
Total	1,640	4,887	82	60.4	5.0

Table 4. Length frequency of brook trout and catch statistics from backpack electrofishing, Thiel Creek MN, 1994-2011.

	Brook Trout		
Length Group (mm)	**2011**	**2001**	**1994**
<70		32	604
80		36	222
90	1	34	88
100		7	47
110		5	57
120		12	93
130	2	14	101
140	8	29	68
150	9	26	57
160	7	15	35
170	17	11	29
180	11	10	28
190	9	2	16
200	8	3	12
210	4	4	13
220	5		10
230	1		4
240			1
250			2
260			0
270			1
Total	82	241	1488
Effort (hr)	1.36	1.01	4.42
Length (ft)	1,640	2,181	4,587
CPUE	60.4	237.8	336.1

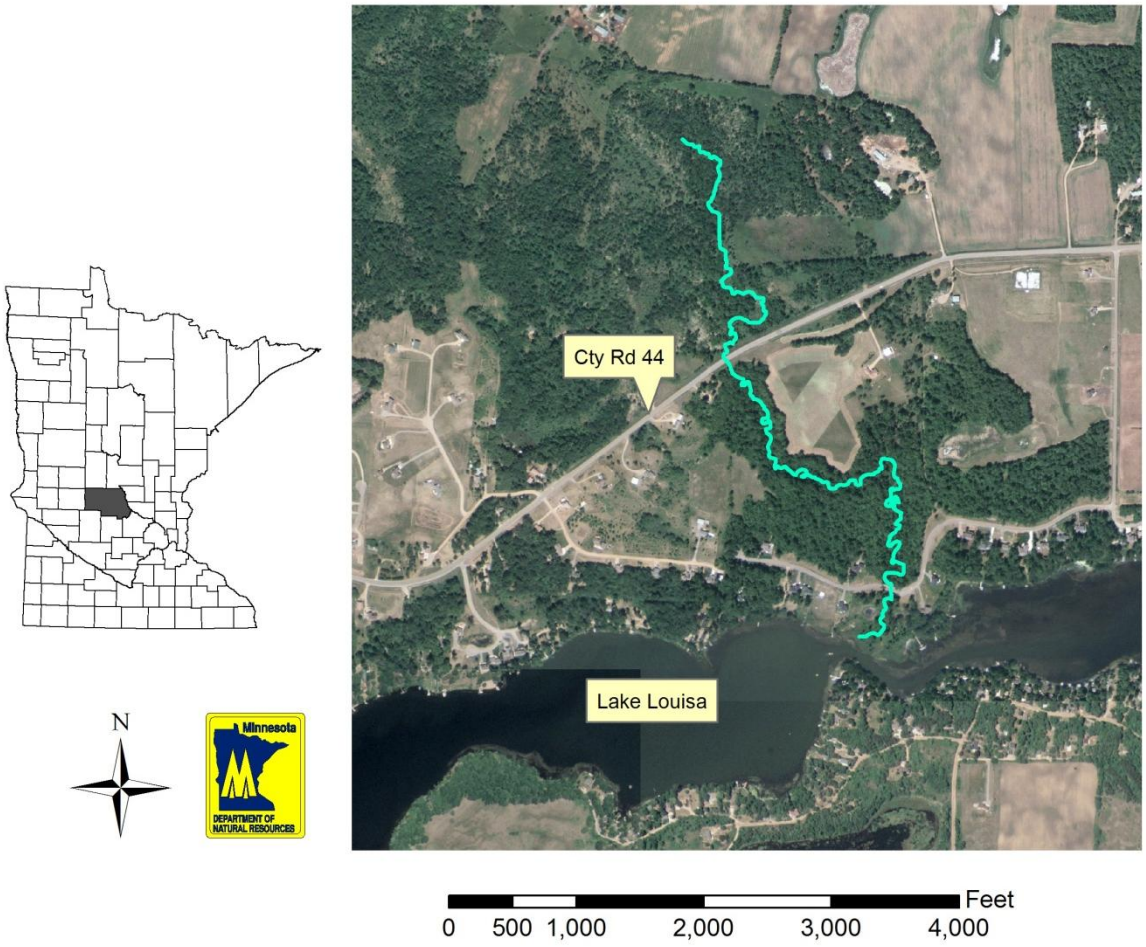

Figure 1. Location of Thiel Creek, Stearns County, MN.

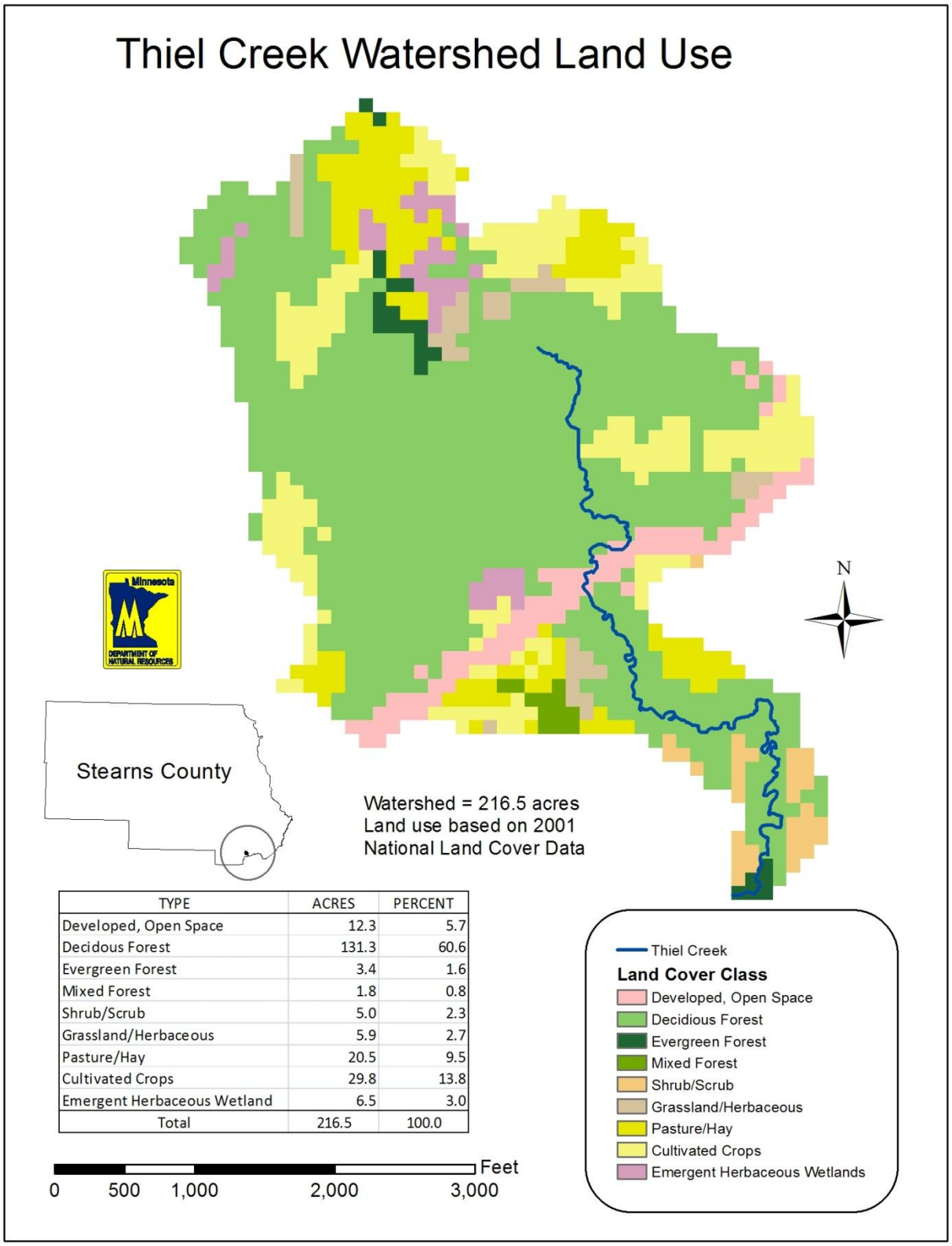

Figure 2. Watershed land use, Thiel Creek, MN.

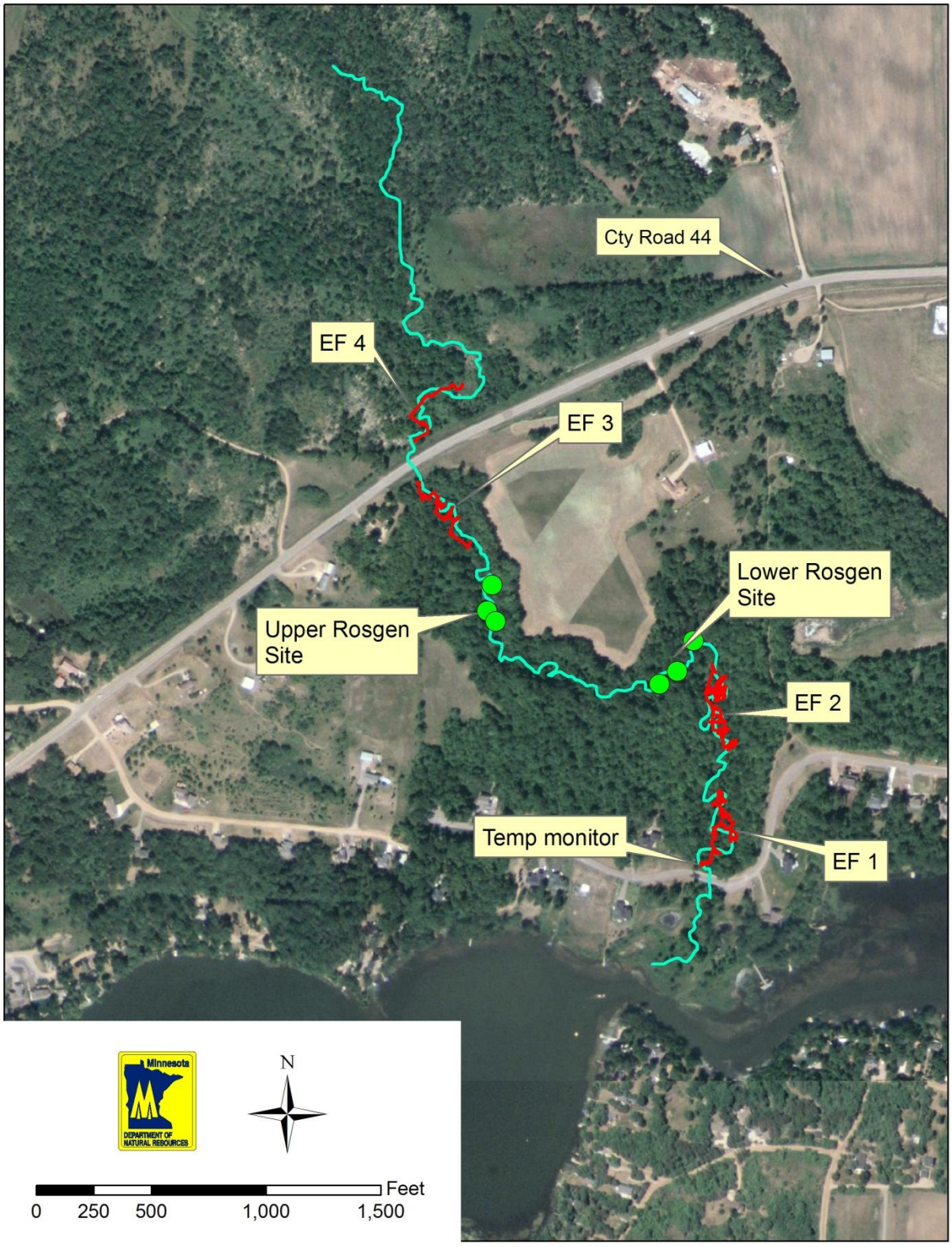

Figure 3. Location of electrofishing, temperature monitor, and Rosgen classification sites, Thiel Creek, 2011.

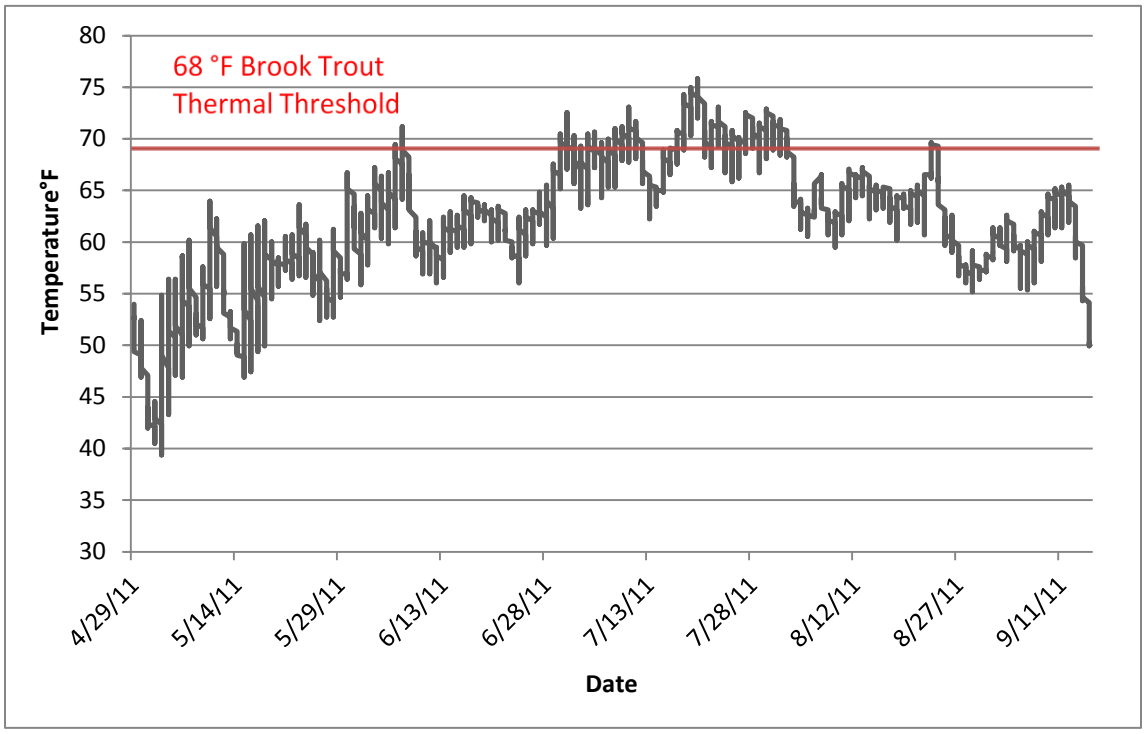

Figure 4. Hourly temperatures (°F) at Lakes of Fairhaven, Thiel Creek, MN, April-October 2011.

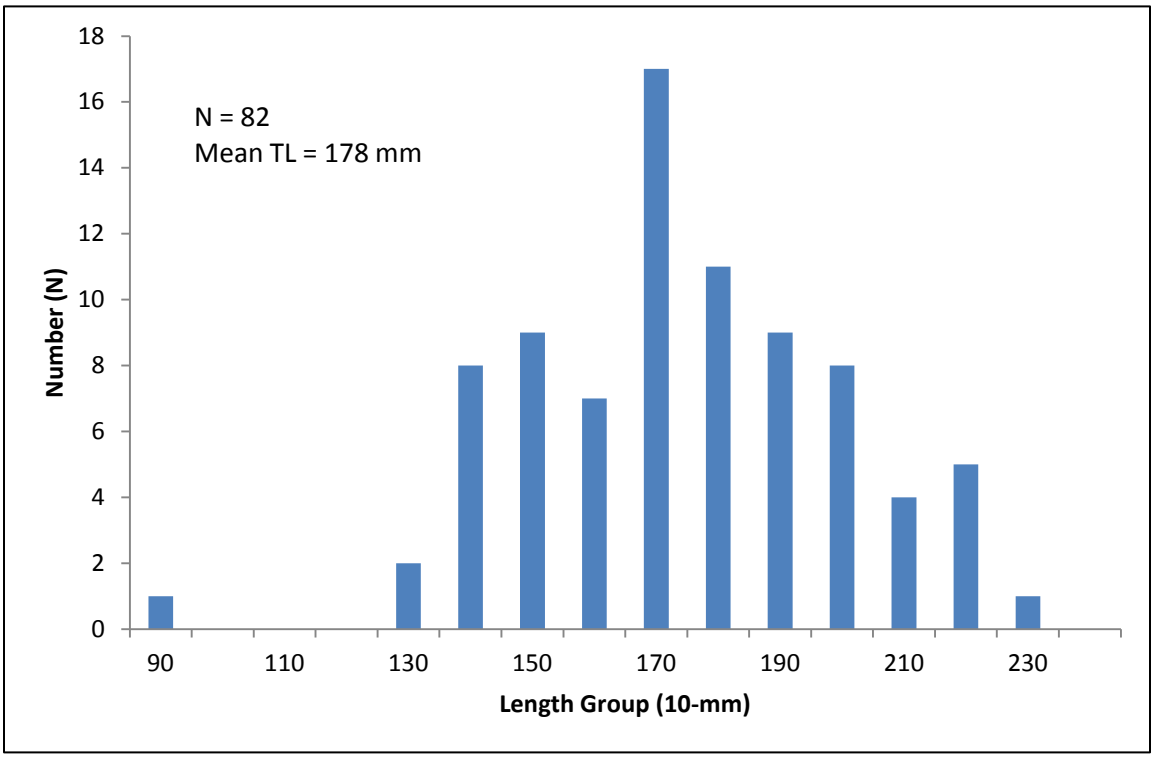

Figure 5. Length frequency of brook trout captured by electrofishing, Thiel Creek, MN 2011.

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Date

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