Minnesota
F-29-R(P)-24
Area 315
Study 3
March 2013

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

Stream Survey Report

Luxemburg Creek

2012

Mark Pelham

Montrose Area Fisheries Office

Your purchase of fishing equipment and motor boat fuel supports boating access and Sport Fish Restoration.

Funded under Federal Aid by the Sport Fish Restoration Act

Table of Contents

List of Figures

List of Tables

General Information

Stream Name:	Luxemburg Creek
Alternate Name:	None
Tributary Number:	M-073-002
Counties:	Stearns
Nearest Town:	Luxemburg
Source of flow:	Wetland complex west of the town of Luxemburg
Waterway sequence:	Wetland /Luxemburg Creek/Johnson Creek (St. Augusta Creek)/ Mississippi River
Stream Length:	6.74 miles from wetland complex to mouth
Gradient:	17-48 ft/ mile
Sinuosity:	1.3-2.2
Classification:	Class I-C (Coldwater, brown trout)

Watershed Description

Watershed Name and Number

Major:	Mississippi River (17)
Minor:	Luxemburg Creek
Watershed Area:	9,923 acres
Watershed Land Use:	Agricultural 52.5%, Grassland/Pasture 19.1%, Forested 16.2%, Wetland 4.7%, and Developed 5.1% (based on 2006 National Land Cover Database).
Riparian Zone:	The surrounding land is primarily deciduous forest with limited residential development in the lower portion of the stream. The upper portion of the stream is mostly in agriculture or wetland.

Summary

Luxemburg Creek is a small, designated trout stream in Stearns County near Luxemburg, Minnesota. State-owned easements along portions of the stream allow public access. The brown trout population is self-sustaining and population assessments are conducted approximately every other year by backpack electrofishing. Results in 2012 showed substantial improvement in the population compared to results from 2007 to 2010. A stormwater pond overflow in 2001 caused large amounts of sediment to enter the upper stream with negative effects, but much of this has now been transported past the study area. Catch per unit of effort (CPUE) and size improved for juvenile and adult brown trout in 2012. Stream temperatures were higher in 2012, but pose no immediate danger. Development in the watershed poses the greatest threat to the stream.

Study Area

Luxemburg Creek is a cold water stream that was designated as a trout stream in 1951. The headwater is located approximately 1.5 miles southwest of the town of Luxemburg in Stearns County, Minnesota. It flows approximately six miles to the confluence with Johnson Creek. Luxemburg Creek has a gradient ranging between 17 and 48 feet per mile and a sinuosity of 1.47. Land use within the watershed (9,923 acres) was estimated to be 52.5% agricultural, 19.1% grassland/pasture, 16.2% forested, 5.1% developed, and 4.7% wetland (based on 2006 National Land Cover Database, Figure 1). A 1,400 foot easement (acquired between 1990 and 1992) is located within a residential development known as Cherrywood Estates (Figure 2). Additional easements were acquired in 2004 between the mouth and the lower end of the original easement area.

An initial survey of Luxemburg Creek was conducted in 1949 and other surveys were conducted in 1950, 1977, 1980, 1994, and 2000. Electrofishing has been conducted regularly since 2000 in the initial easement area and in a reference area approximately 0.8 miles upstream. Brown trout were last stocked in the 1970s and have become naturalized. Some surveys have included Rosgen classification, water quality testing, and invertebrate sampling (Minnesota Department of Natural Resources 2001, 2008). In summer 2001, four bends were stabilized by using root wad revetments to reduce stream velocity and offer overhead cover.

Temperature and Hydrology

Temperatures were logged hourly from April 26, 2012 to October 30, 2012 for a total of 4,487 readings (Table 1, Figure 3). The maximum temperature recorded was 23.6 °C on July 16. A total of 183 readings were above 20.0 °C and 18 readings were above 22.0 °C. The longest continuous period above 20.0 °C was 37 hours. The temperature regime of Luxemburg Creek has been highly variable among years; maximum temperature from 2006 to 2012 has ranged from 19.2 °C to 25.5 °C (Table 1). The number of readings above 20 °C has ranged from 0 to 231. In 2010 only four readings were above 20 °C and none above 22 °C. The temperature logger was moved in 2012 to the stage logger site on Farmdale Circle at the lower end of the original easement. Both loggers were located at the downstream end of the culvert. A comparison of temperatures in the original easement versus the previous temperature site at 43rd Avenue found no consistent trend; temperatures were higher upstream in 2000, but higher downstream in 2003 (Minnesota Department of Natural Resources 2004).

A stage logger has been in place on Luxemburg Creek since October 2002. The logger is located approximately 0.75 miles above the mouth of Luxemburg Creek at the downstream end of the original easement area and records hourly stage readings. The logger was previously located downstream until 2009, when it was moved due to erosion at the site. New rating curves were developed in 2009 and 2010 (Minnesota Department of Natural Resources 2011). Data from the previous site is similar, but caution should be used in any comparisons with data taken before 2009. The maximum estimated flow in 2012 was 30.2 cubic feet per second (cfs) on May 6 (Figure 4). Base flows were typically 3-4 cfs during the summer. Minimum flows were below one cfs in September. The effect of an unusually mild winter with runoff in January and several larger spring rainfalls can be seen in Figure 4. Summer drought led to very low flows in the fall.

Luxemburg Creek Electrofishing

Three stations were sampled by backpack electrofishing on October 30, 2012. Station one covered the area between culverts in the original easement, station two included the rest of the original easement upstream, and station three was at the reference reach located upstream of the 230th Street crossing (Figure 5). This area is private and has no public access. All reaches are wooded with substantial habitat diversity. The three sites have been nearly identical since 2000.

A total of 71 brown trout were captured in stations one and two, including 48 young-of-year (Figure 6, Table 2). In station three, 132 brown trout were captured, including 108 young-of-year. CPUE was 65/hr for stations one and two combined, 185/hr for station three, and 113/hr for all stations combined. Nineteen brown trout greater than 300 mm were captured in stations one and two, compared to six in station three. The largest individual was 542 mm from station two; this is the largest brown trout ever sampled from Luxemburg Creek. These results are much better than in 2010, which had the lowest catch since 1993 (Minnesota Department of Natural Resources 2011). Electrofishing comparisons have taken place since 2000 between the existing easement area on Luxemburg Creek and the reference reach. The catches of young-of-year and adult trout have been highly variable among years in both reaches (Figure 7).

Management Concerns and Recommendations

Luxemburg Creek seems to be rebounding from several years with poor electrofishing catches. The original easement area has had low catches of both juvenile and adult brown trout and a lack of larger individuals longer than 300 mm since 2006 (Figure 7). Results from 2012 show higher numbers of juveniles and adults. Consistent, low flows in the fall of 2011 may have increased reproductive success. Brown trout are fall spawners and spawning redds are typically built at low flows in shallow, gravel runs.

Luxemburg Creek is located near the city of St. Augusta, which experienced rapid development in the late 1990s and early 2000s. A stormwater pond in a new development near the reference reach overflowed in 2001, causing a large amount of sand and silt to wash into the stream (Minnesota Department of Natural Resources 2004). This coincided with poor reproduction for several years after. Most of this material has been transported downstream but is still affecting the easement area. Some pools have filled with silt and sand, reducing the amount of deeper water habitat available. However, the condition of the original easement area seems improved since 2010 as the stream continues to transport excess sediment downstream. The number of large adults in 2012 validate field observations of more deep water habitat. Excess sand and silt have been mostly scoured out in the reference reach. Suitable spawning substrate was plentiful in the reference reach, but less so in the easement reach. Natural reproduction has been variable over many years of surveys, but seems adequate to ensure a continued brown trout

population in Luxemburg Creek. Both spawning and resting habitat should continue to improve as excess sand and silt are transported further downstream.

Areas in the easement reach were modified in 2001 to provide deeper water with overhead cover for larger trout. Larger trout were found in these areas and similar natural cover prior to the high sediment load reaching the area; results in 2012 may indicate a return to these conditions. Brush layering techniques have been used in recent years to narrow and deepen the channel in the easement reach and downstream. Some success has been evident where brush has been used and the continued movement of excess sediment downstream should benefit these areas. However, it may be several more years before the original easement area has been scoured clear.

Further development in the watershed poses the greatest threat to Luxemburg Creek, although little has occurred in recent years. Increased impervious surface and runoff, siltation, and hydrologic changes from groundwater appropriation pose potential threats to the stream. The current temperature and flow regime are likely not limiting factors. Recent research indicates that brown trout thermal tolerance is higher than previously thought; the same study found that catch-and-release angling has little impact on survival, even in water temperatures greater than 23 °C (Boyd et al. 2010). However, the effect of continuing climate change will likely be negative for all Montrose area trout streams. Angling pressure on Luxemburg Creek is unknown, but anecdotal evidence from landowners suggests that pressure is light. Watershed, riparian and hydrologic protection should be a priority in managing Luxemburg Creek and habitat improvement should continue in easement areas.

Acknowledgments

Thanks to Jason Neuman and Joe Stewig for assistance with fieldwork. Paul Diedrich and Joe Stewig provided helpful manuscript review.

Literature Cited

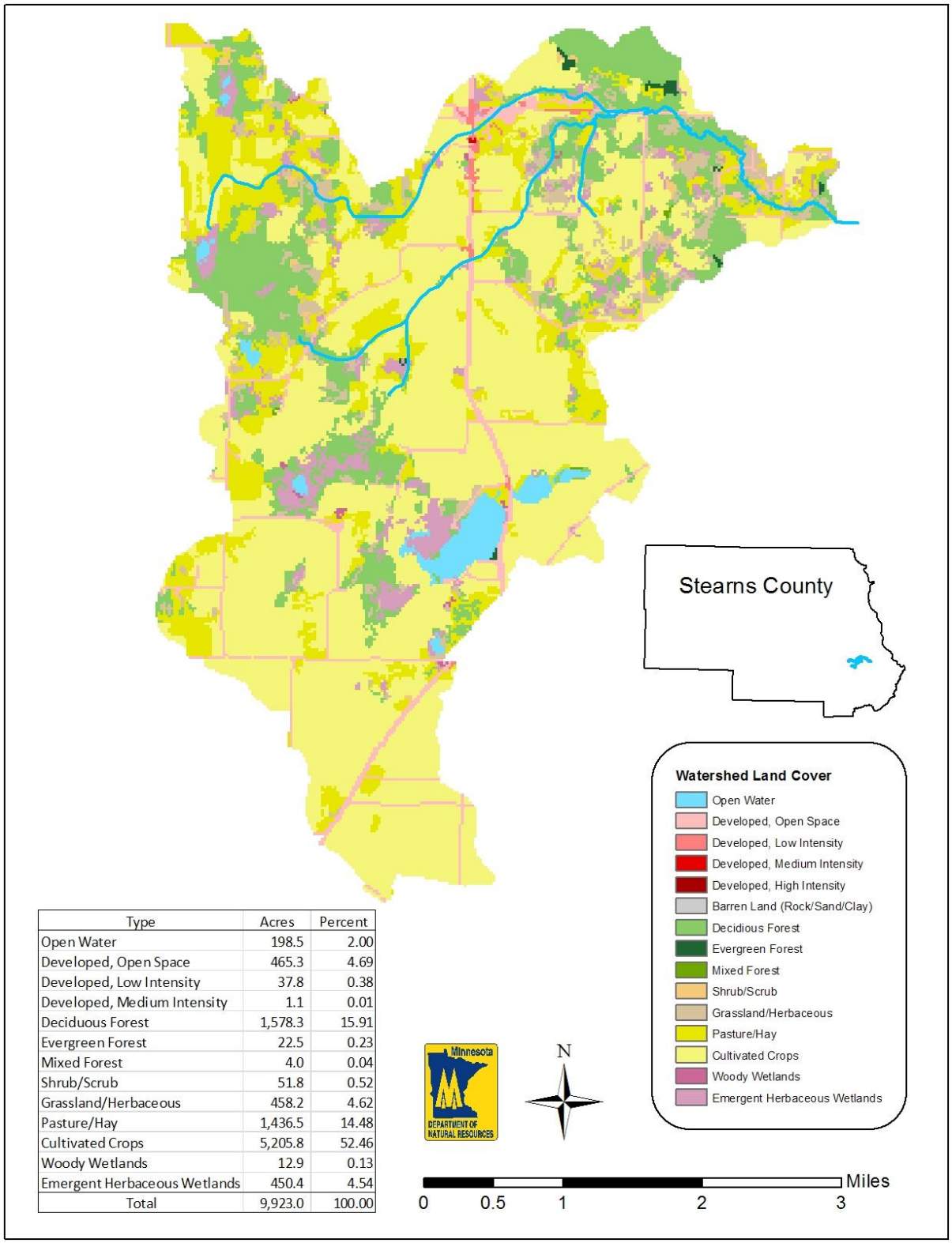
Minnesota Department of Natural Resources. 2011. Luxemburg Creek 2010 Stream Survey Report. Division of Fish and Wildlife, St. Paul, MN.

Boyd, J.W., C.S. Guy, T.B. Horton, and S.A. Leathe. 2010. Effects of Catch-and-Release Angling on Salmonids at Elevated Water Temperatures. North American Journal of Fisheries Management 30:898-907.

Minnesota Department of Natural Resources. 2008. Johnson Creek Watershed 2007 Stream Survey Report. Division of Fish and Wildlife, St. Paul, MN.

Minnesota Department of Natural Resources. 2004. Luxemburg Creek Habitat Improvement Progress Report. Division of Fish and Wildlife, St. Paul, MN.

Minnesota Department of Natural Resources. 2001. Luxemburg Creek 2000 Stream Survey Report. Division of Fish and Wildlife, St. Paul, MN.



Type	Acres	Percent
Open Water	198.5	2.00
Developed, Open Space	465.3	4.69
Developed, Low Intensity	37.8	0.38
Developed, Medium Intensity	1.1	0.01
Deciduous Forest	1,578.3	15.91
Evergreen Forest	22.5	0.23
Mixed Forest	4.0	0.04
Shrub/Scrub	51.8	0.52
Grassland/Herbaceous	458.2	4.62
Pasture/Hay	1,436.5	14.48
Cultivated Crops	5,205.8	52.46
Woody Wetlands	12.9	0.13
Emergent Herbaceous Wetlands	450.4	4.54
Total	9,923.0	100.00

Figure 1. Location and land cover (2006 data) for the Luxemburg Creek watershed.

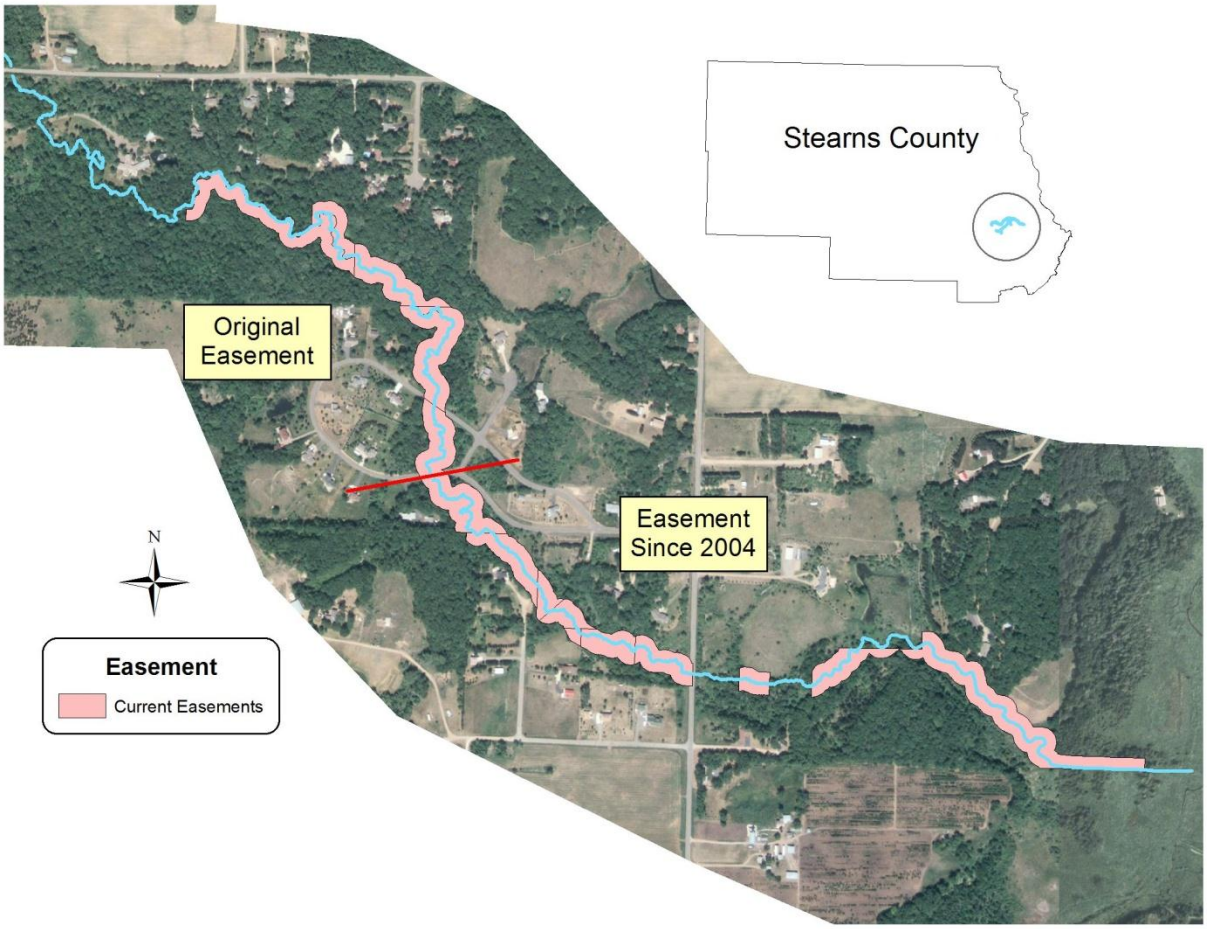


Figure 2. Easement locations on Luxemburg Creek, MN.

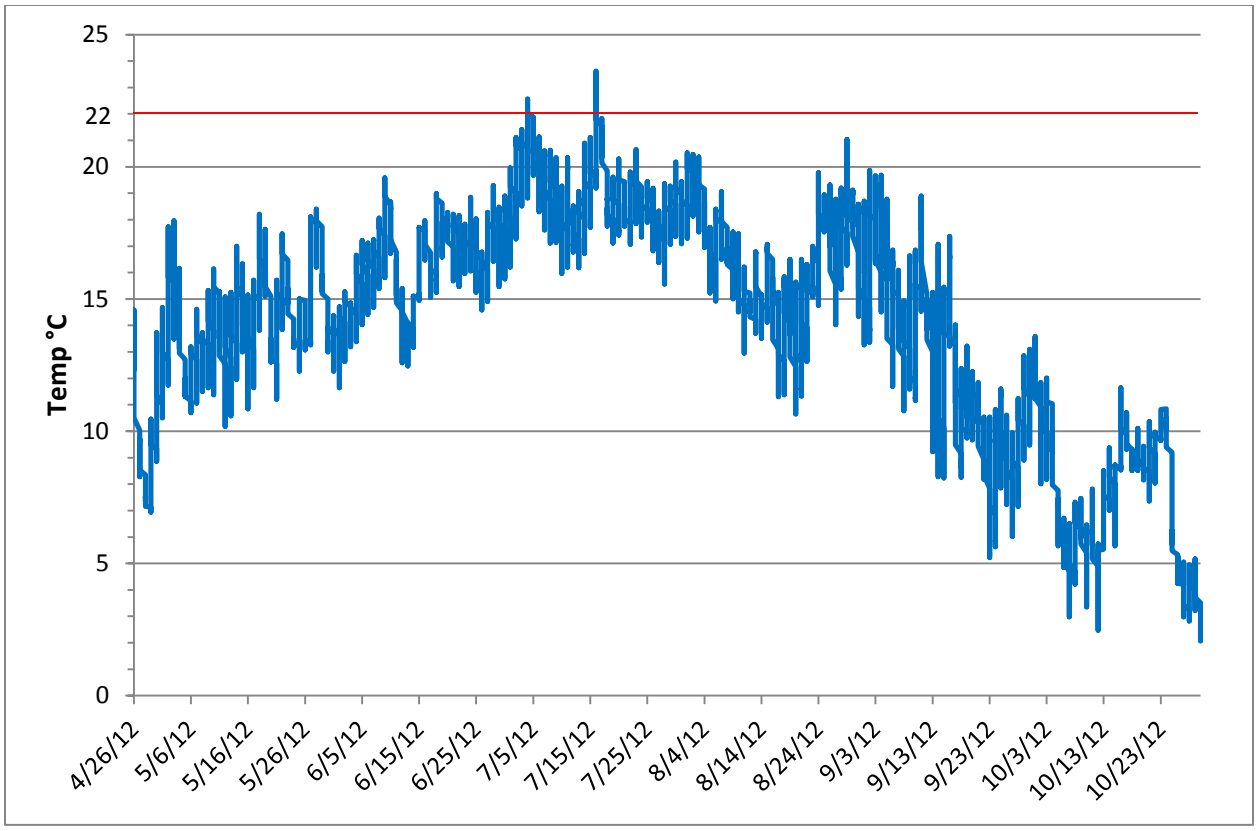


Figure 3. Hourly temperatures at Farmdale Circle, Luxemburg Creek MN, April-October 2012.

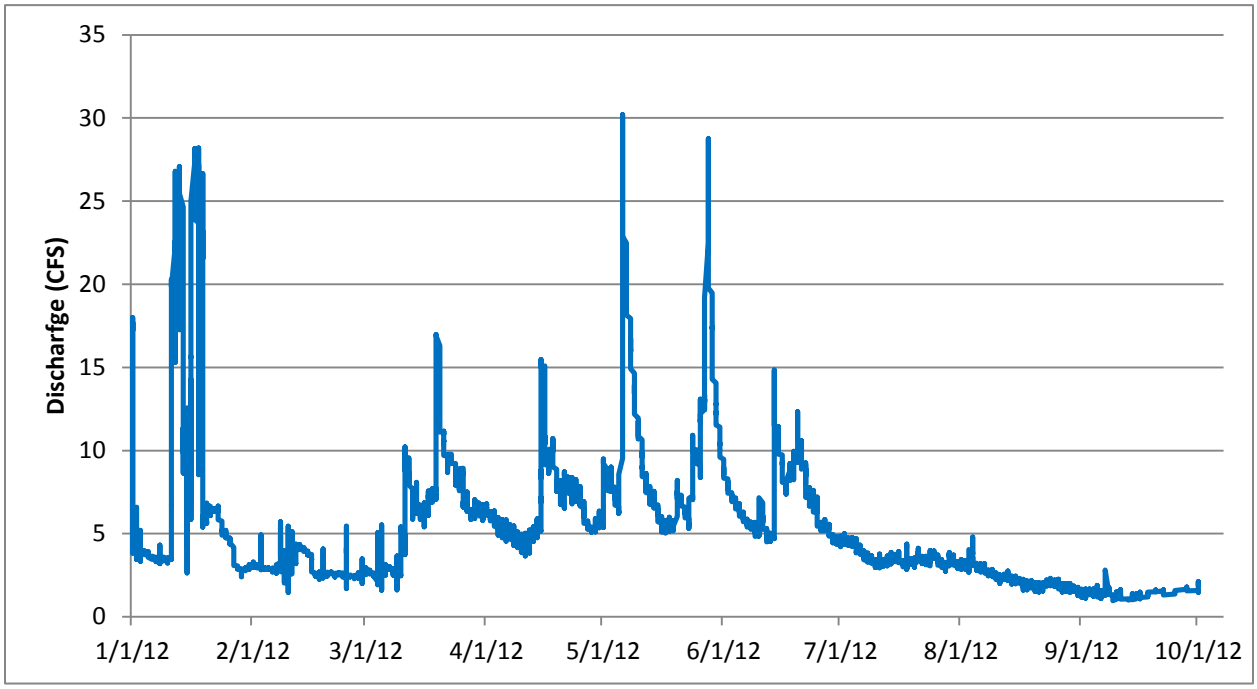


Figure 4. Estimated 2012 hourly discharge for Luxemburg Creek, MN.

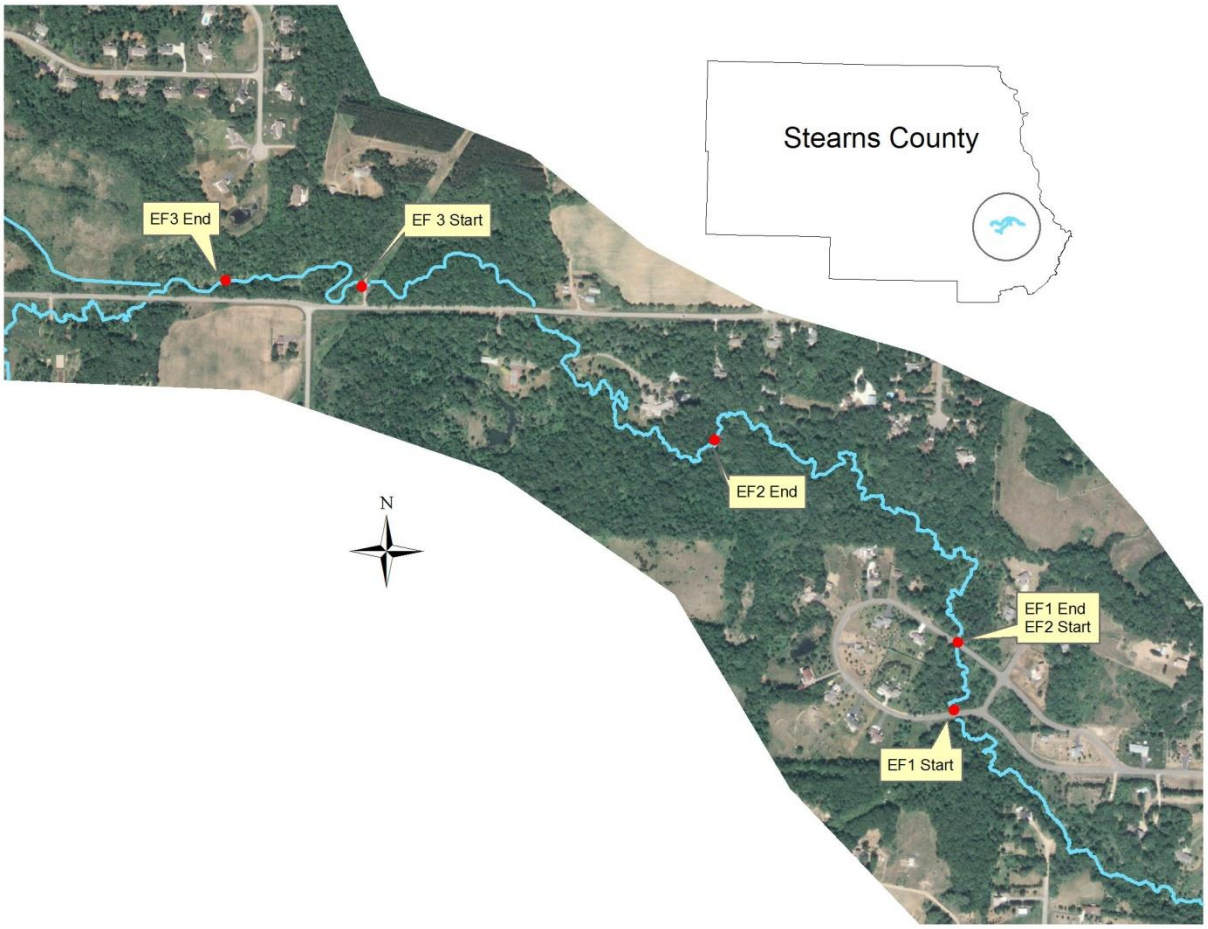


Figure 5. Location of electrofishing sites on October 30, 2012, Luxemburg Creek, MN.

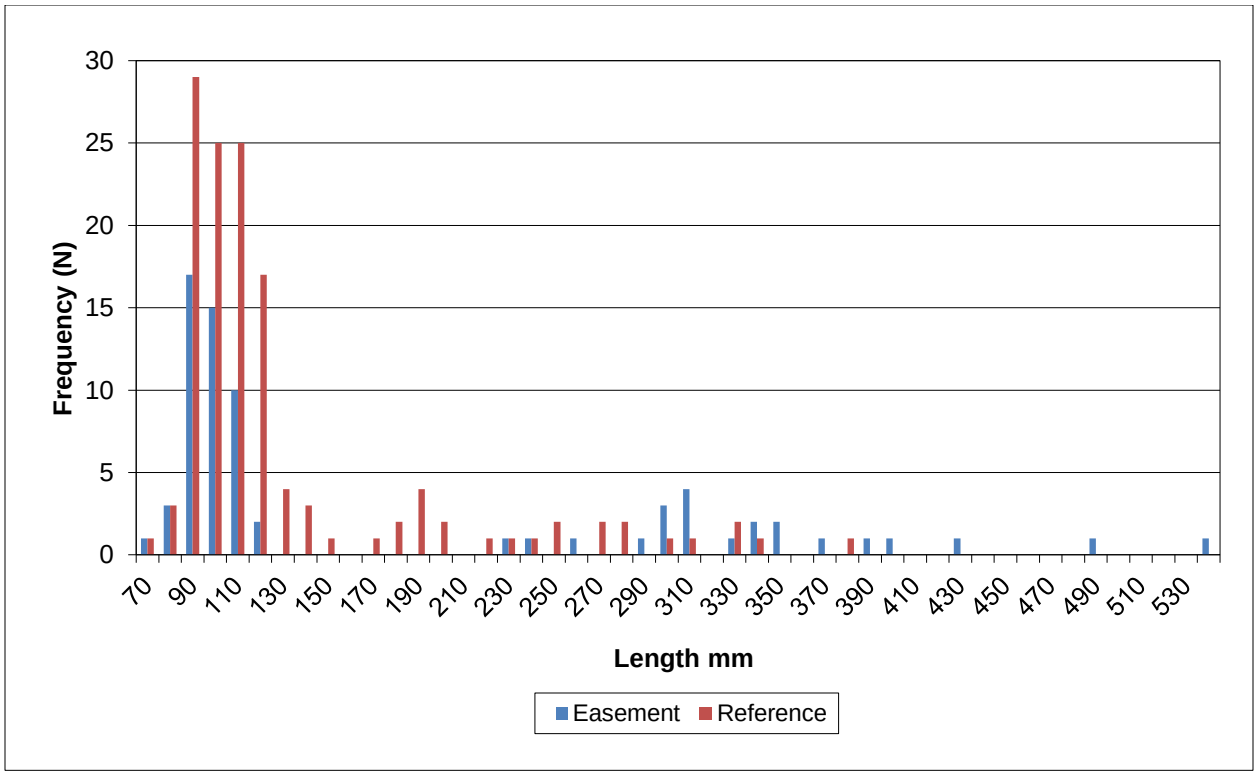


Figure 6. Length (mm) frequency of brown trout captured by electrofishing in easement and reference reaches, Luxemburg Creek, MN, October 30, 2012.

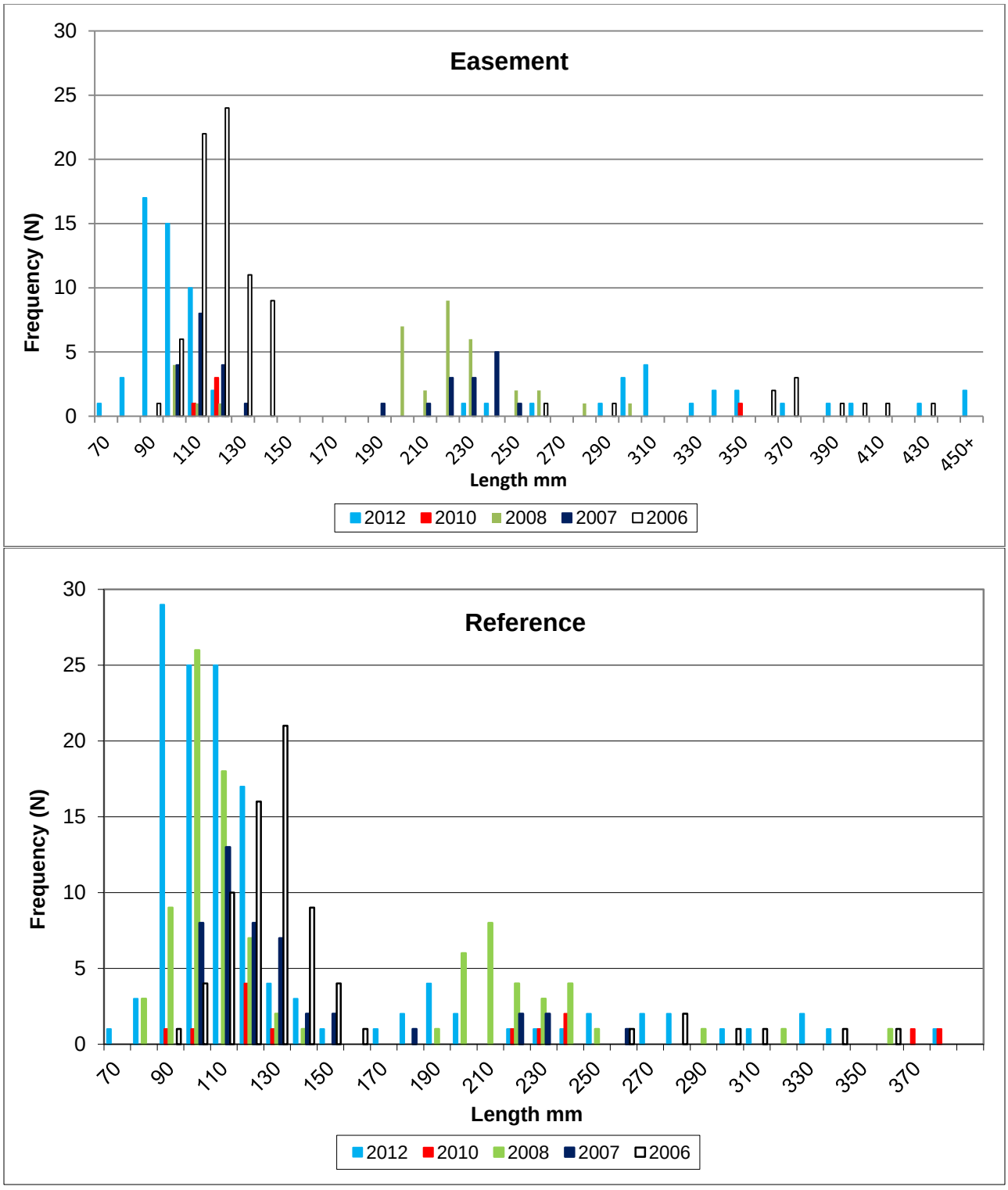


Figure 7. Length frequency of brown trout, Luxemburg Creek, MN, Fall 2006-2012.

Table 1. Temperature statistics for Luxemburg Creek, Spring to Fall 2006-2012.

	2006	2007	2008	2009	2010	2012
Total Readings	4,991	4,229	9,070	4,536	5,233	4,487
N hours > 20° C	231	228	0	0	4	183
N hours > 22° C	47	7	0	0	0	18
Minimum ° C	5.7	5.1	1.7	3.4	2.1	2.1
Average ° C	15.4	15.0	12.8	12.6	12.8	14.2
Maximum ° C	25.5	22.2	19.9	19.2	20.1	23.6

Note: Readings were taken hourly, except for 2008 when they were taken every 30 minutes. The logger failed in 2011.

Table 2. Electrofishing results for brown trout, Luxemburg Creek, October 30, 2012.

Reach:	Reference	Easement	Overall
Total N	132	71	203
CPUE (#/hr)	184.8	65.1	112.8
N >300 mm	6	19	25
Size Range mm	79-388	96-542	79-542
N Age 0	108	48	156
Mean L Age 0 mm	108.4	101.9	106.4

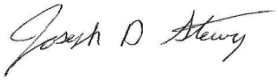
Minnesota Department of Natural Resources
Division of Fish and Wildlife
Section of Fisheries

Stream Survey Report

Luxemburg Creek
2012

3/6/2013

Author Date



3/15/2013

Area Fisheries Supervisor Date

Regional Fisheries Supervisor Date