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

**Stream Survey Report** 

Luxemburg Creek

2015

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## **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

nber
Mississippi River (17)
Luxemburg Creek
9,922 acres
Agricultural 51.3%, Forested 15.7%, Grassland/Pasture 14.1%, Developed 5.8%, and Wetland 4.4% (based on 2011 National Land Cover Database).
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. A Brown Trout population is self-sustaining and population assessments are conducted approximately every three years by backpack electrofishing. Results in 2012 and 2015 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 most of this has now been transported past the study area. Catch per unit of effort (CPUE) was high and size structure was good. Habitat improvement may be useful, but the stream is in good condition in the study area and appears to be improving. Stream temperatures were very favorable in 2015 and likely aided young-of-year (YOY) survival. Development in the watershed has slowed in recent years, but may pose a threat to the stream in the future.

#### **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. The stream 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 (9,922 acres) was estimated to be 51% agricultural, 16% forested, 14% grassland/pasture, 6% developed, and 4% wetland (based on 2011 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. Brush layering has also been used periodically to stabilize stream banks and deepen the channel.

#### **Temperature and Hydrology**

Temperatures were logged hourly from March 24 to November 4, 2015 for a total of 5,399 readings using an Onset HOBO Tidbit monitor (Figure 3, Table 1). The maximum temperature recorded was 20.0 °C on September 6 and only one reading was above 20°C, likely due to a relatively cool, dry summer. The temperature regime of Luxemburg Creek has been highly variable among years; maximum temperature from 2006 to 2015 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. The temperature logger was moved in 2012 to Farmdale Circle at the lower end of the original easement. A comparison of temperatures in the original easement versus the previous temperature site at 43<sup>rd</sup> 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 was in place on Luxemburg Creek from 2012 to 2014 at the temperature logger site on Farmdale Circle and from 2002 to 2012 approximately 0.5 miles upstream from the mouth at Johnson Creek (Minnesota Department of Natural Resources 2013). Base flows were typically 3-4 cubic feet per second (cfs) during the summer and minimum flows of approximately one cfs occurred in the fall. Maximum flows above 30 cfs were recorded during spring runoff or spring/summer rain events. The stage logger was removed in the fall of 2014.

#### Luxemburg Creek Electrofishing

Three stations were sampled by backpack electrofishing on November 4, 2014. Station one covered the area between Farmdale Circle 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 4). 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 243 Brown Trout were captured in stations one and two, including 217 YOY (Figure 5, Table 2). In station three, 62 Brown Trout were captured, including 44 YOY. Catch per unit of effort (CPUE) was 133/hr for stations one and two combined, 95/hr for station three, and 123/hr for all stations combined. Nine Brown Trout greater than 300 mm were captured in stations one and two, compared to seven in station three. Overall, lengths ranged from 81 to 390

mm. Electrofishing comparisons have taken place since 2000 between the existing easement area on Luxemburg Creek and the reference reach. The catches of YOY and adult trout have been highly variable among years in both reaches (Table 3). The stream above the reference reach and below Farmdale Circle has been sampled during other surveys, but Brown Trout catches have been low (Minnesota Department of Natural Resources 2001, 2007).

#### **Management Concerns and Recommendations**

Luxemburg Creek appears to be in good condition based on observed stream conditions and higher Brown Trout catch rates in 2012 and 2015. Both the easement area and reference reach had high catches of YOY in 2015, along with good numbers of adults longer than 300 mm. Results from surveys in 2007, 2008, and 2010 were poor and found few larger trout and lower numbers of YOY, particularly in the easement (Table 3). Stream temperatures were very favorable in 2015 and likely improved YOY survival. Although natural reproduction has been highly variable over time, it seems sufficient to sustain the population under current conditions.

Development in the watershed has slowed in recent years, but still poses the greatest threat to the stream. Luxemburg Creek is located near the city of St. Augusta, which experienced rapid development in the late 1990s and early 2000s. A storm water 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 and reduced pool depths. Sand and silt are still prevalent in some pools, but continued transport downstream and bank scouring should lead to more overhead cover and deeper habitat for large fish. The condition of the stream has improved noticeably since 2010 (Minnesota Department of Natural Resources 2011). Suitable spawning substrate was abundant in the reference reach and availability in the easement area has been increasing. The riparian area is heavily wooded and large woody debris provides additional overhead cover.

Areas in the easement reach were modified in 2001 using root wads and rock vanes and successfully provided deeper water with overhead cover for larger trout, prior to sediment loading after 2001. 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. These efforts should continue as resources permit. However, it may be several more years before the original easement area has been scoured clear and it is unclear whether the modifications made in 2001 will function again as designed.

Hydrologic changes due to increased groundwater appropriation and the effect of climate change pose additional threats to the stream. Increased use of irrigation by agriculture may threaten the headwater area of Luxemburg Creek, as would wells to serve future development. Mapping ground water resources near the stream and limiting appropriations would be helpful. The effects of a warming climate have been pronounced in Minnesota and will likely prove detrimental to trout streams in the Sauk Rapids Management Area. Much of the riparian area of Luxemburg Creek is forested, but efforts to provide shade in the upper reaches of the stream may be beneficial.

### Acknowledgments

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### **Literature Cited**

Minnesota Department of Natural Resources. 2013. Luxemburg Creek 2012 Stream Survey Report. Division of Fish and Wildlife, St. Paul, MN.

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

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. 2007. 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.



Figure 1. Location and land cover (2011 data) for the Luxemburg Creek watershed.



Figure 2. Easement locations on Luxemburg Creek, MN.



Figure 3. Hourly temperatures at Farmdale Circle, Luxemburg Creek MN, March-October 2015.



Figure 4. Location of electrofishing sites on November 4, 2015, Luxemburg Creek, MN.



Figure 5. Length (mm) frequency of Brown Trout captured by electrofishing in easement and reference reaches, Luxemburg Creek, MN, November 4, 2015.

	2006	2007	2008	2009	2010	2012	2015
Total Readings	4,991	4,229	9,070	4,536	5,233	4,487	5,399
N hours > 20° C	231	228	0	0	4	183	1
N hours > 22° C	47	7	0	0	0	18	0
Minimum ° C	5.7	5.1	1.7	3.4	2.1	2.1	0.2
Maximum ° C	25.5	22.2	19.9	19.2	20.1	23.6	20.0

Table 1. Temperature statistics for Luxemburg Creek, Spring to Fall 2006-2015.

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, November 4, 2015.

Reach:	Reference	Easement	Overall	
Total N	62	243	305	
CPUE (#/hr)	95.0	132.6	123.0	
N >300 mm	7	9	16	
Size Range mm	91-390	81-364	81-390	
N Age 0	44	217	261	
Mean L Age 0 mm	109	110	110	

Length	2006	2007	2008	2010	2012	2015	Length
	2000	2007	2000	2010	2012	2015	9100p
80			2		2		80
90	3	12	0	1	46	15	00
100	10	25	30	1	40	10	100
110	24	20	10	1	40	49	110
120	34	19	19	7	10	50	120
120	44	15	2	1	19	30	120
140	10	2	1	I	3	10	140
150	7	2	1		1	5	150
160	1					5	160
170	1	1			1		170
180		1			2		180
190			1		4	2	190
200		1	13		2	1	200
210		4	10		-	6	210
220		6	13	1	1	4	220
230		4	9	1	2	3	230
240		2	4	2	2	3	240
250		1	3	_	2	2	250
260	2	•	2		1	-	260
270	-		<u> </u>		2	3	270
280	2		1		2	1	280
290	1		1		1	1	290
300	1		1		4	1	300
310	1		•		5	4	310
320	•		1		0	2	320
330			•		3	1	330
340	2				3	2	340
350	_			1	2	2	350
360	3		1			2	360
370	3			1	1	2	370
380	1			1	1		380
390	1				1	1	390
400	1				1		400
410	1						410
420							420
430	1				1		430
440							440
450							450
460							460
470							470
480							480
490					1		490
500							500
510							510
520							520
530							530
540					1		540
550							550
N caught	178	99	132	18	203	305	
CPUE	2.33	2.07	2.11	1.31	1.80	2.48	
(N/hr)	77.7	47.8	62.0	13.7	112.8	123.0	

Table 3. Length (mm) frequency of Brown Trout, Luxemburg Creek, MN, Fall 2006-2015.

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Luxemburg Creek 2015

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