

Minnesota  
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Area 315  
Study 3  
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**Minnesota Department of Natural Resources  
Division of Fish and Wildlife  
Section of Fisheries**

**Stream Survey Report**

**Johnson Creek Watershed  
(Johnson and Luxemburg Creeks)  
2007**

**Montrose Area Fisheries Office**



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*General Information Johnson Creek*

Stream Name: Johnson Creek

Alternate Name: St. Augusta Creek, Meyers Creek

Tributary Number: M-073-002-001

Counties: Stearns

Nearest Town: St. Augusta

Source of flow: Wetlands SW of St. Cloud/St. Augusta, Stearns County, springs

Waterway sequence: Wetland /Johnson Creek/ Mississippi River

Stream Length: 5.2 miles, from headwater to confluence with Luxemburg Creek  
6.1 miles from confluence with Luxemburg Creek to Mississippi River

Gradient: 19.2 feet/mile from headwater to Luxemburg Creek  
8.2 ft/mile from Luxemburg Creek to Mississippi River

Sinuosity: 1.2 lower, 1.3 upper

Classification: Class ID (Marginal trout)

**Watershed Description**

Watershed Name and Number

Major: Mississippi River – St. Cloud M-17

Minor: Johnson Creek 17019

Watershed Area: Upstream of Luxemburg Creek 9,325 acres, at Mississippi River 37,120

Watershed Land Use: Agriculture 49.5%, grassland/pasture 22.1%, forest 16.6%, and residential 4.2%.

Riparian Zone: The surrounding land is primarily farmland or residential development. The stream is bordered by wetland or reed canary grass in upper reaches, with some willows and alders along the banks downstream. Aerial photos show that several stream reaches have been channelized. Farming practices in the upper portions of the stream take place with limited buffer areas between crops and the stream channel.

*General Information Luxemburg Creek*

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 Unnamed  
Watershed Area: 7,976 acres  
Watershed Land Use: Agricultural 48.9%, Grassland pasture 21.4%, forested 17.4 % and residential 4.2% (based on 1991 Land Use Land Cover data).  
Riparian Zone: The surrounding land is primarily residential woodland. The uppermost portion of the stream is in agriculture. Since 1991, land use has changed within the watershed and riparian corridor to include additional residential developments and subsequent decreases in forested land cover.

### *Johnson Creek*

Johnson Creek was initially listed as a designated trout stream in 1951. Initial stocking of brown trout occurred in 1950 and continued through 1970 with a total stocking of 5,037 yearlings. From 1971 through 1979, 100-200 yearling brown trout were stocked per year. An initial assessment of Johnson Creek occurred in 1977. Water temperatures in 1977 were 63°F during August. Backpack electrofishing in 1977 reported only sculpin, burbot and carp. More extensive sampling conducted in 1980 reported higher overall stream temperatures and numerous additional species of fish, including: white sucker, northern redbelly dace, central mudminnow, northern pike, burbot, Johnny darter, sculpin and brook stickleback. Beaver dams, ditching and cattle grazing were cited as problems, along with marginal temperatures for brown trout.

### *Luxemburg Creek*

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 (Figure 1). Luxemburg Creek has a gradient ranging between 17 and 48 feet per mile and a sinuosity of 1.47. Land use within the watershed (7,976 acres) was estimated to be 48.9% agricultural, 21.4% grassland/shrub, 17.4% forested and 4.2% residential (Table 1). A 132 by 1400 foot easement (acquired between 1990 and 1992) is located within a residential development known as Cherrywood Estates and Creek Side Addition. Additional easement area was acquired in 2004 between the mouth and the lower end of the existing easement area.

An initial survey of Luxemburg Creek was conducted in 1949, which compiled information on fish communities, physical and chemical characteristics, invertebrate species composition and abundance. Follow-up surveys were conducted in 1950, 1977, 1980, and 1994. According to angler reports, the creek has produced trout larger than 600 mm; the creek may have the potential to produce these larger brown trout if quality habitat is available.

In summer 2001, four bends were stabilized by placing root wads facing upstream at a 30° angle, to minimize stream velocity and offer overhead cover. Electrofishing has occurred annually, in an effort to document changes in the fish community in response to habitat alterations. Electrofishing has been performed since 2000 in the entire initial easement area and in a reference area approximately 0.8 miles upstream.

### *Temperature*

The Johnson Creek watershed is large (37,120 acres), with three larger tributaries (Trout Creek, Luxemburg Creek, and Robinson Hill Creek), which are designated trout streams (Figure 1). The potential for impacts from human disturbance is great due to the large watershed. Within the Johnson Creek Watershed, temperature loggers (Dallas Semi-Thermochron or Stowaway Tidbit) were placed to measure daily variation in water temperature. Monitors were placed in two locations and were programmed to record hourly water temperature between April and November 2006 and 2007 (Figure 2). Temperature loggers from previous years displayed low enough temperatures to support brown trout (critical thermal maximum < 28°C for 24 hours) throughout the Johnson Creek watershed to Stearns County Road 7 in St. Augusta. During 2006, a monitor located near CR 7 in St. Augusta recorded 13 consecutive hours of temperature greater than 28°C (Table 2). A temperature monitor was deployed in the same location in 2007 but failed and no data was recovered.

### *Johnson Creek Watershed Electrofishing*

During 2007 three stations were sampled by backpack electrofishing and all were on Luxemburg Creek (Figure 3).

Luxemburg Creek electrofishing was done at three locations, two covering the entire easement area and one upstream at a reference location. The confluence of Luxemburg Creek and Johnson Creek has been channelized within the last 50 years.

Electrofishing comparisons have taken place since 2000 between the existing easement area on Luxemburg Creek and a reference reach upstream (Table 3). The easement area of the creek has moderate sinuosity and good habitat diversity. In previous years, electrofishing has shown an improving brown trout population, although year-to-year variability seems high. Species captured in 2007 include: black bullhead, blacknose dace, black crappie, brown trout, central mudminnow, creek chub, hybrid sunfish, mottled sculpin, and white sucker (Table 4). In 2006 the catch of brown trout was substantially higher than previous years and 2007. A total of 84 brown trout between 90 and 430 mm TL were sampled in 2007 compared to 151 in 2006. Since 2001 the population has been recovering from an apparent year class failure associated with runoff and silt deposition from a development site adjacent to the creek.

The reference reach of Luxemburg Creek has substantial habitat diversity and is located upstream of the east crossing on 230<sup>th</sup> Street. This area is private and has limited access. A total of 73 brown trout between 90 mm and 270 mm TL were captured by electrofishing.

Annual electrofishing in Luxemburg Creek has been a valuable tool for assessing the relative impacts of sediment on the trout population. Although no significant difference in habitat improved sites versus unaltered sites has been observed, annual electrofishing has given a better picture of the variability in the brown trout population in Luxemburg Creek (Figure 4). However, annual variability can be high and apparent causes are difficult to determine. Monitoring in 2006 and 2007 indicated that it is not necessary to stock brown trout fingerlings in Luxemburg Creek.

#### *Luxemburg Creek Hydrology*

A stage logger has been in place on Luxemburg Creek since October 2002. The logger is located approximately ½ mile from the mouth of Luxemburg Creek and records hourly stage readings. More than 20 individual flow readings were recorded between October 2002 and September 2006 to develop a rating curve ( $R^2 = 0.93$ ). Mean daily readings were plotted for values recorded between March and November 2003-2005 and compared to average daily readings recorded between March and November

2006. The Luxemburg Creek Watershed has a relatively normal discharge profile compared to regionally based curves. During 2006 at least one peak flow event was recorded that was considerably higher than the three year average (Figure 5). The discharge profile suggests Luxemburg Creek has peak flow events associated with larger rain events. However, the lack of impervious surface area allows the stream to have a less flashy profile than other streams in the area.

#### *Johnson Creek Hydrology*

A stage logger was installed in Johnson Creek at the County Road 7 bridge in July 2007. Flow measurements in 2007 were insufficient to develop a discharge curve. Additional flow measurements will be taken in 2008 and hourly discharge will be calculated for 2007-08.

Rosgen methodology was used to evaluate stream characteristics on July 12-13, 2007. One cross-section and a longitudinal profile were measured immediately upstream from the County Road 7 bridge. The channel was determined to be type C4 with a sand/gravel bed. Sinuosity was 1.1 with a slope of 0.27%. The channel is slightly entrenched (ratio = 2.4) and the flood prone width is 62.6 feet. This width is slightly less than might be expected and reflects a narrowing of the valley at the bridge site. Stream reaches above and below the site appear to have greater sinuosity and presumably lower slope. These areas should be evaluated in 2008 as time permits.

#### *Management Concerns and Recommendations*

Luxemburg Creek electrofishing has revealed both an abundance and paucity of year class production in consecutive years. Some of these instances have been explained while others have not. During 2006, brown trout survival and recruitment increased. Habitat improvement areas all held trout when they were sampled. While significant differences between reference and easement areas are not statistically observed, anecdotal evidence suggests that future distribution of brown trout may depend heavily on areas with easements and further habitat improvement to support adult trout. Sampling within the watershed has also shown that Luxemburg Creek has been the only stream with sustained reproduction and recruitment. Based on the low number of brown trout in surrounding streams, Luxemburg Creek may



provide one of the only sources of quality spawning habitat with high water quality to allow trout survival. Stocking brown trout fingerlings within the remainder of the watershed may be an option if public easements were available or landowner agreements were achieved. Similarly, if easements were obtained along other portions of Johnson or Robinson Hill creeks, habitat alteration could be a viable option.

Johnson Creek has been subject to poor land use practices in the past and has the potential to become degraded further. Increases in impervious surface will increase runoff to the stream, affecting overall hydrology and lowering base flows by reducing recharge to ground water supplies. Options to incorporate infiltration methodology have been brought to the attention of the St. Augusta City Council, and discussions have stressed the importance of local trout streams. The St. Augusta City Council has been invited to attend Non-point Education for Municipal Officials (NEMO) to receive information on best management practices and storm water ordinances.

Future sampling effort should include additional temperature monitoring and geomorphic classification in other areas of the watershed. Previous electrofishing of the main stem of Johnson Creek has shown a lack of brown trout despite suitable habitat, temperature and discharge. With the close proximity of St. Cloud and St. Augusta and predicted growth of these areas, the streams and watershed may be subject to increases in discharge, sediment loads and habitat degradation. Considerable effort should be made to acquire angling easement areas within the watershed. Annual temperature and discharge monitoring near CR 7 in St. Augusta may show (as in 2006) that the designated portion of Johnson Creek could be extended. This extension may offer more protection from future development as it occurs within the watershed.

# Johnson (St. Augusta) Creek Watersheds

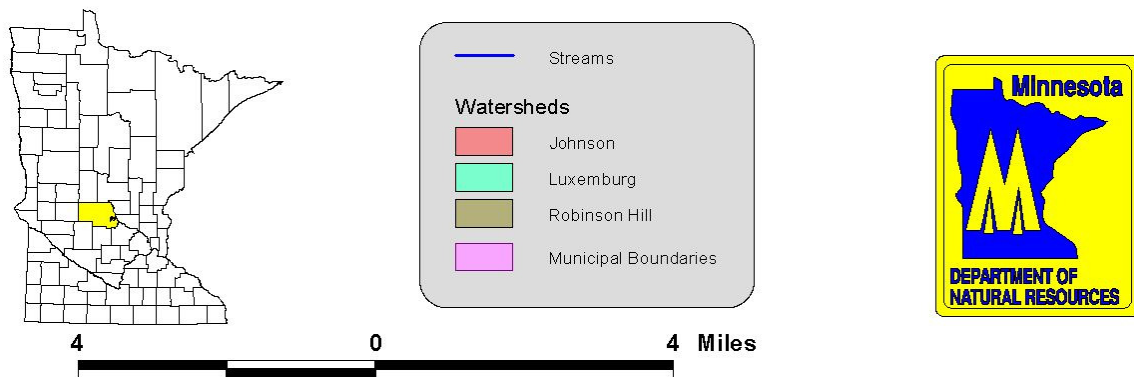
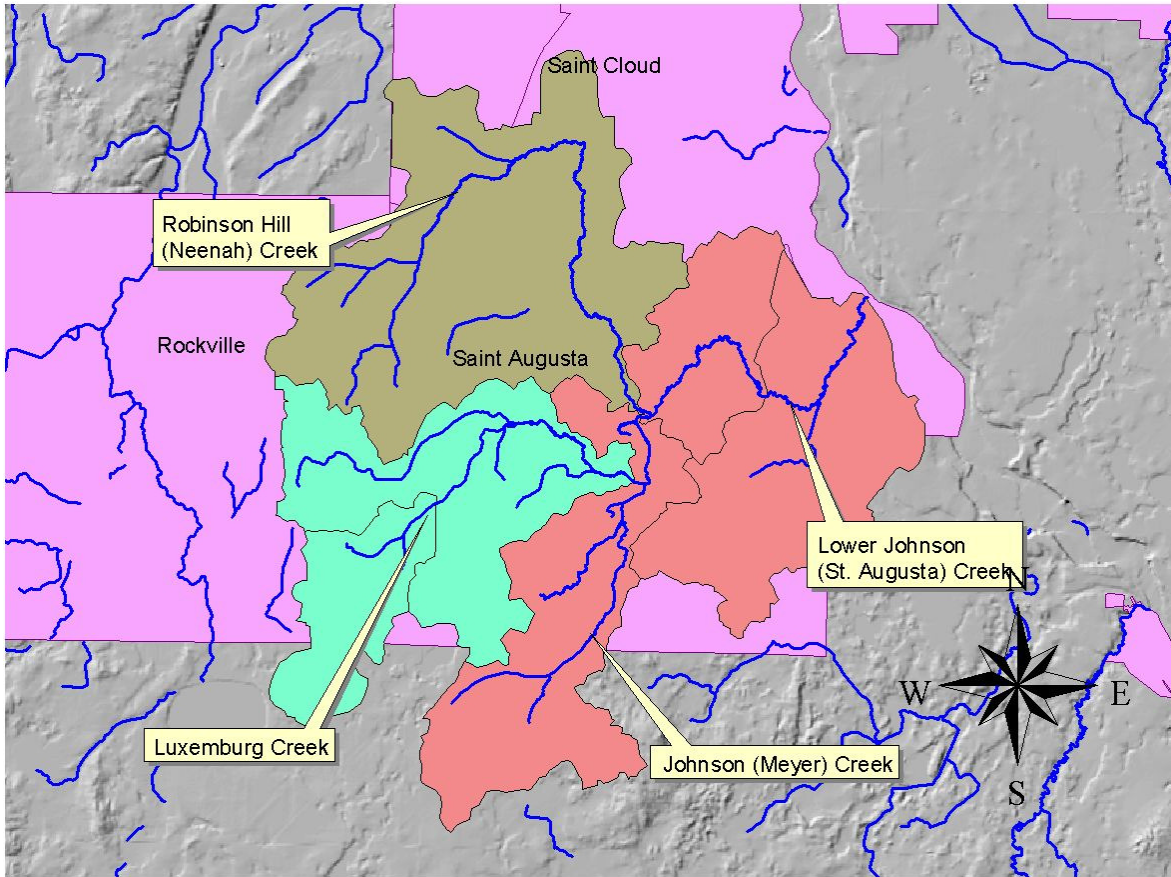


Figure 1. Location of the Johnson Creek Watershed and sub-watersheds near St. Augusta MN, 2007.

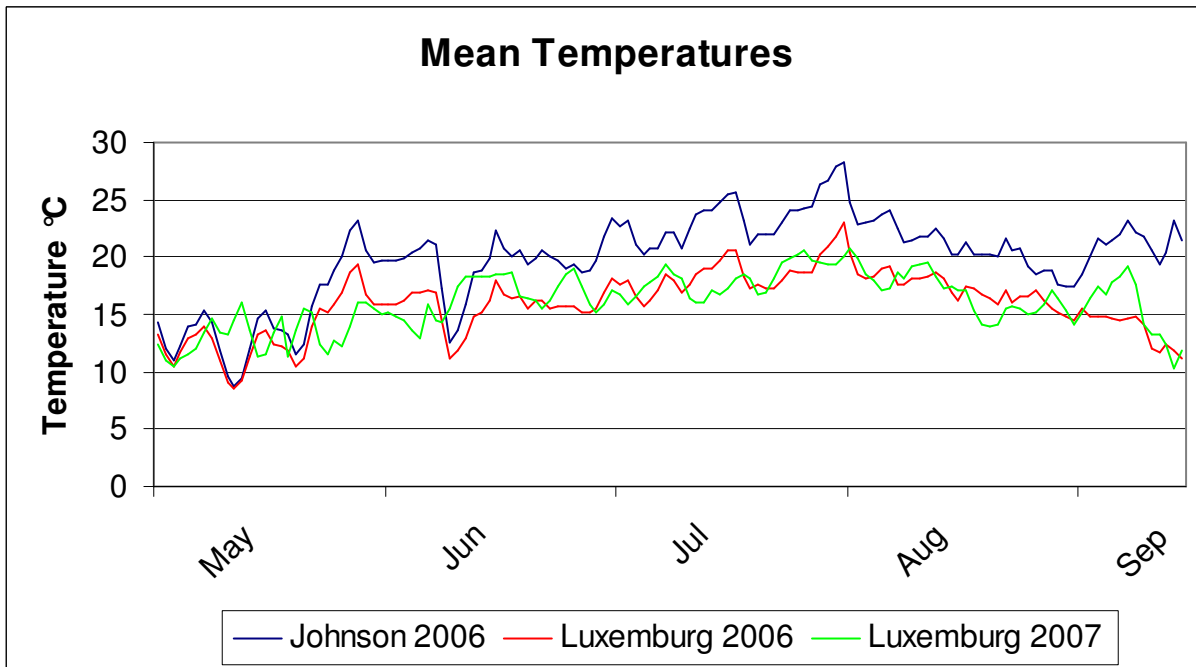
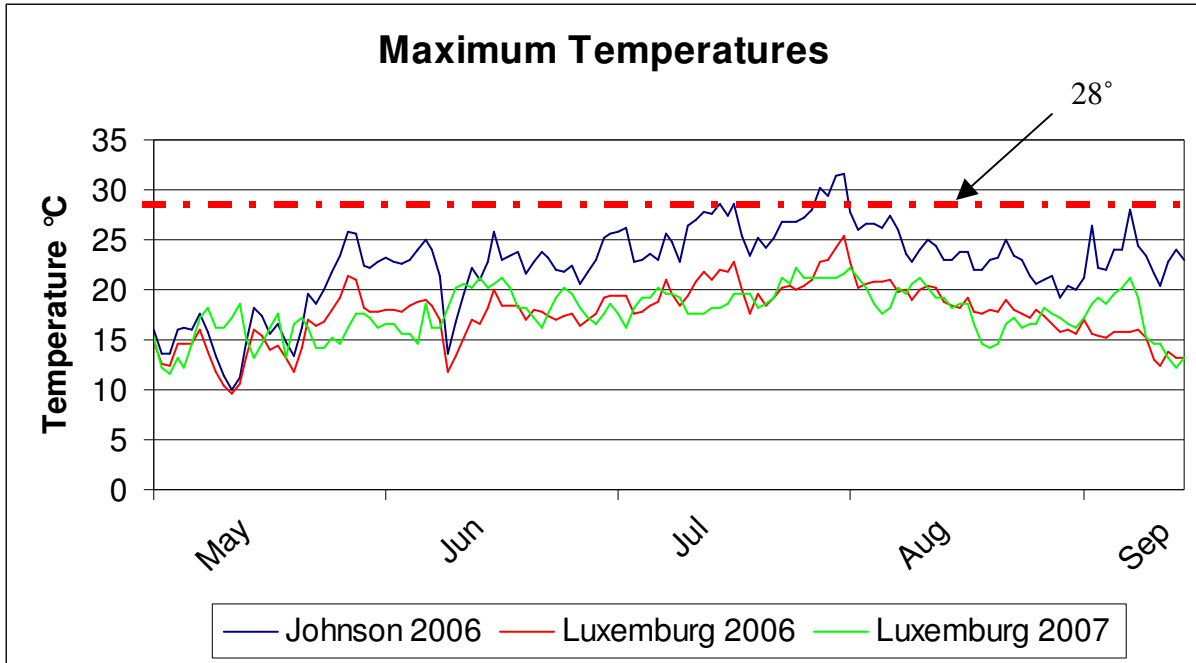


Figure 2. Maximum and mean daily temperatures (Celsius) recorded from remote temperature loggers in the Johnson Creek watershed at County Road 7, St. Augusta MN (2006), and Luxemburg Creek near Luxemburg MN (2006-2007).

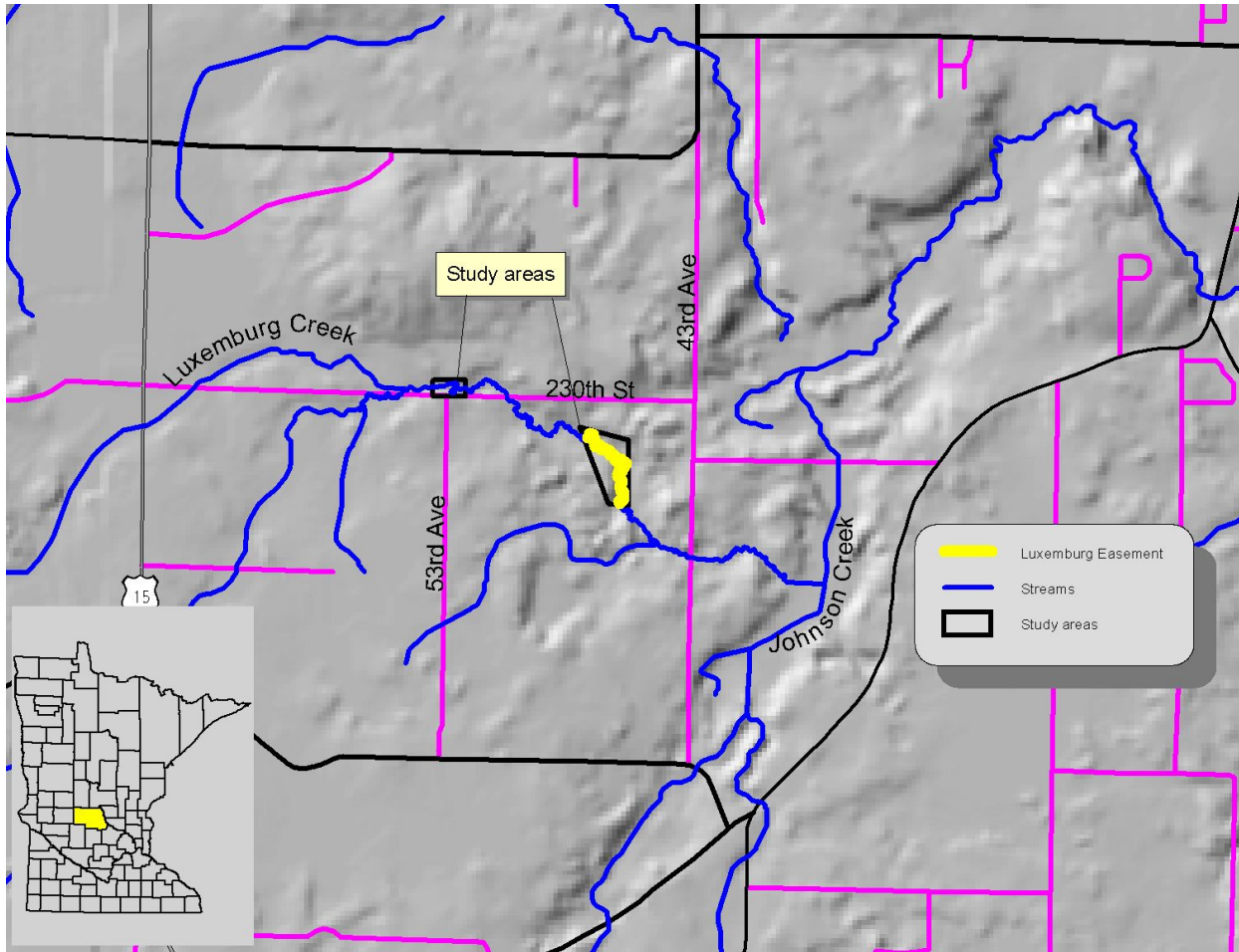


Figure 3. Location of electrofishing sampling areas on Luxemburg Creek in the Johnson Creek watershed near St. Augusta MN, 2007.

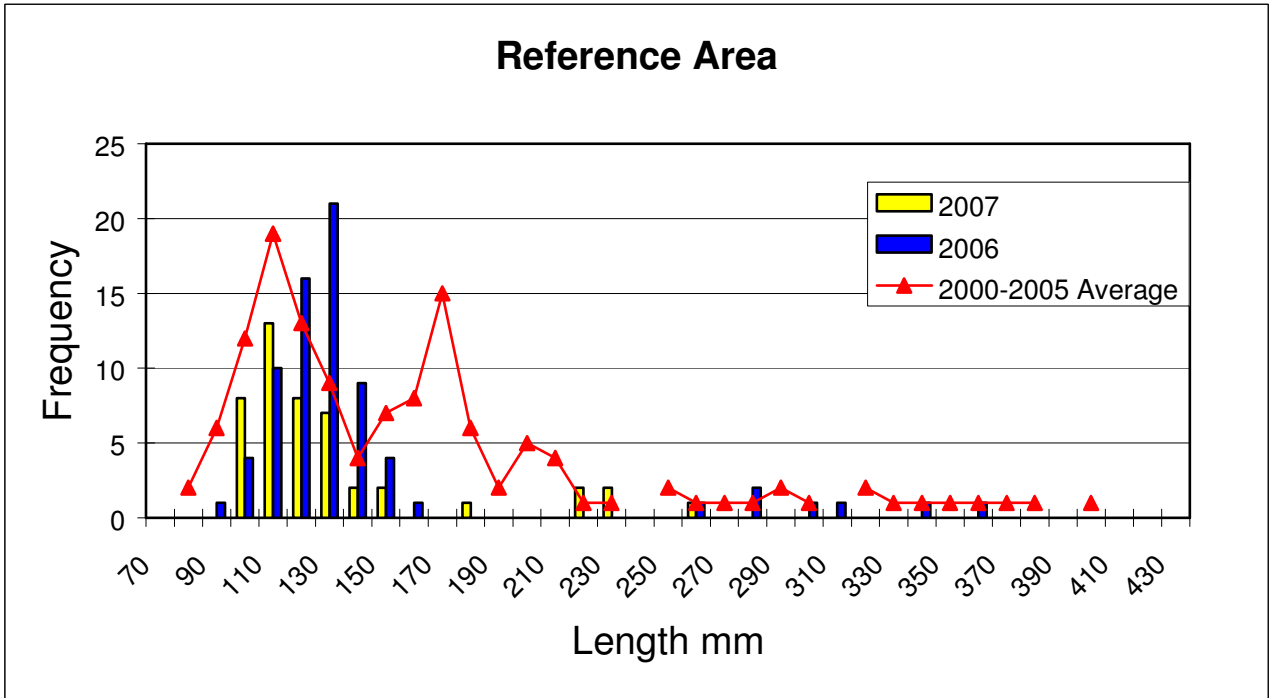
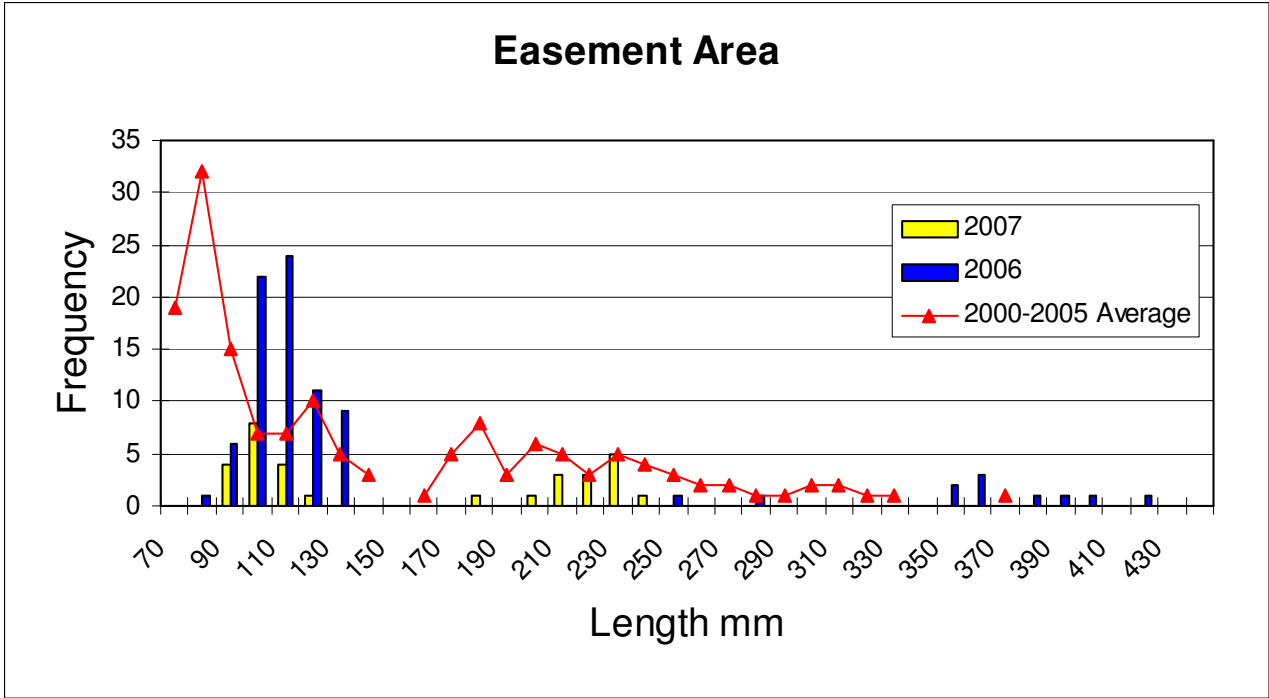


Figure 4. Length (mm) frequency of brown trout captured by electrofishing in easement and reference reaches on Luxemburg Creek, MN 2000-2007.

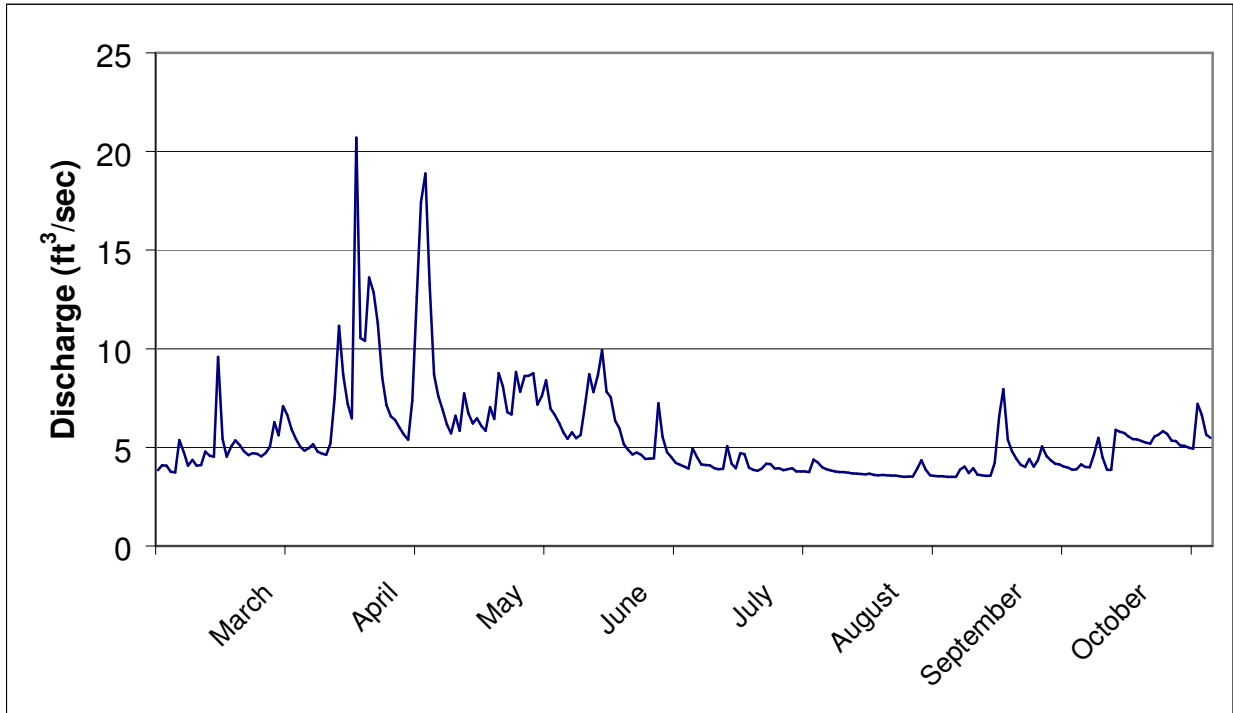


Figure 5. Average hourly discharge recorded from Luxemburg Creek 2002-2007.

Table 1. Land use within the Johnson Creek watershed, near St. Augusta MN (Based on 1990 data).

Land use	<i>Entire watershed</i>		<i>Johnson above Luxemburg</i>		<i>Luxemburg</i>	
	Acres	Percent	Acres	Percent	Acres	Percent
<b>Agricultural</b>	18,390	49.54	5,943	63.72	3,901	48.91
<b>Grassland/pasture</b>	8,189	22.06	1,297	13.91	1,705	21.38
<b>Forest</b>	6,155	16.58	958	10.28	1,387	17.39
<b>Residential</b>	1,562	4.21	259	2.78	290	4.24
<b>Grassland/shrub</b>	1,452	3.91	305	3.27	348	4.24
<b>Wetland</b>	931	2.51	237	2.54	338	3.64
<b>Lakes</b>	396	1.07	317	3.40	1	0.01
<b>Gravel pits</b>	45	0.12	9	0.10	6	0.07
<b>Total</b>	37,120		9,326		7,976	

Table 2. Temperature monitor statistics for loggers placed within the Johnson Creek watershed, near St. Augusta MN, April through November 2006-2007.

	2006	2006	2007
	<i>Johnson @ CR 7</i>	<i>Luxemburg @ Logger</i>	<i>Luxemburg @ Logger</i>
<b>Total Readings</b>	3,533	4,991	4,229
<b>N hours &gt; 20° C</b>	1,786	231	228
<b>N hours &gt; 22° C</b>	1,043	47	7
<b>N hours &gt; 26° C</b>	185	0	0
<b>N hours consecutive&gt;28°C</b>	13	0	0
<b>Minimum ° C</b>	6.0	5.7	5.1
<b>Average ° C</b>	19.0	15.4	15.0
<b>Maximum ° C</b>	31.5	25.5	22.2

Table 3. Length frequency of brown trout captured by electrofishing on Luxemburg Creek, MN 2000-2007 in reference and easement reaches.

Length	<i>Easement Area</i>								<i>Reference Area</i>							
	2000	2001	2002	2003	2004	2005	2006	2007	2000	2001	2002	2003	2004	2005	2006	2007
70	19															
80	32								2							
90	27			3			1	3	10				2		1	2
100	16	1	2	7	9		6	9	25		1		10		4	10
110	6		1	16	13	1	22	12	37			1	19		10	9
120	12			7	23	1	24	13	6			3	30		16	9
130	1			5	13	1	11	4	10	1			18		21	8
140				2	8	1	9	1	1	5		1	12		9	
150										14			1		4	2
160	1	1							2	15					1	
170	5									15						
180	10	6							6	6						1
190	1	7			1			1	4	1	1					
200	2	11							6	4						
210	2	13		1				1	4							
220	5	4		1				6	1	1				1		2
230		10		1				4	1	1			2			2
240		8			1			3								
250		3							1		3					
260		2			3		1			3			1	1	1	1
270				2								1		2		
280	1									2	1	1		1	2	
290	1						1				2					
300			2						1		3	1			1	
310	2	4	1												1	
320			1								2					
330		1	1						1		2					
340												1			1	
350											1					
360							2						1		1	
370				1			3				1					
380												1				
390							1									
400							1				1					
410							1									
420																
430							1									
<b>Sum</b>	143	71	8	46	71	4	151	84	118	68	18	10	96	5	53	73
<b>Mean length</b>	123	219	234	132	127	124	160	151	174	129	289	220	126	259	200	142
<b>Std deviation</b>	58.9	36.0	109	55.6	33.8	11.5	50.8	85.9	93.0	45.3	67.7	105	34.1	22.5	61.3	55.2



Table 4. Species composition from electrofishing on Luxemburg Creek 2007.

<i>Species</i>	<i>Easement Area</i>	<i>Reference Area</i>	<i>Total</i>
Black bullhead		1	1
Blacknose dace	5		5
Black Crappie	1		1
Brown trout	57	46	103
Central mudminnow	3		3
Creek chub	9		9
Hybrid sunfish	1		1
Mottled sculpin	4		4
White sucker	3	2	5
Totals	83	48	131

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

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**Johnson Creek Watershed  
(Johnson and Luxemburg Creeks)  
2007**

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Author Date

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Area Fisheries Supervisor Date

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Regional Fisheries Supervisor Date

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