

MINNESOTA DEPARTMENT OF NATURAL RESOURCES



Mississippi River Smallmouth Bass Assessment Report

Spring Smallmouth Bass Assessment on the Mississippi River from Sartell to St. Cloud, MN

May 30, 2014

River Miles 926 to 932

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Little Falls Area Fisheries

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ABSTRACT

A special Smallmouth Bass assessment of the Mississippi River (M-1) from Sartell, MN (Sartell Dam) to St. Cloud, MN (St. Cloud Dam) was conducted May 30, 2014. Population data was gathered to compare to prior surveys and for purposes of monitoring Smallmouth Bass and other gamefish populations. Smallmouth Bass were targeted, although an attempt was made to capture all gamefish encountered during sampling. A total of 352 Smallmouth Bass were sampled in three electrofishing stations. Catch per unit of effort (CPUE) was 182.38/hour which was the second highest catch rate recorded on this stretch of the Mississippi River (historical range 41.28/hour to 184.65/hour). Other gamefish species sampled included Northern Pike, Muskellunge, Channel Catfish, Black Crappie, Bluegill and Walleye. Catch rates for Muskellunge and Channel Catfish were higher than observed in the past. Catch rates of all other species were within the range observed during previous assessments.

STUDY AREA

The Mississippi River from Sartell, MN to St. Cloud, MN covers approximately 6.03 miles and is influenced by three major watersheds, the Mississippi River-Sartell, Sauk River, and Mississippi River-St. Cloud Watersheds (Figure 1). Sartell Dam is a hydroelectric power generating facility owned by Eagle Creek Sartell Hydro, LLC at the upstream end of the study area, although ownership was under transition at the time of reporting. St. Cloud (Regis) Dam is at the downstream boundary of this river section and is a hydroelectric generating facility owned by the City of St. Cloud. In general, this section of the river contains pool, riffle and run type habitat with coarse substrate types from Sartell Dam downstream to below Sauk Rapids where it transitions to reservoir type habitat. Stream banks are fairly steep along this stretch and adjacent lands have predominately sandy-loam soils.

This section of the Mississippi River flows entirely through the Sartell, Sauk Rapids, and St. Cloud metropolitan corridor. Riparian lands along both banks are highly developed. Natural scenic quality is low although both banks and an island near State Highway 15 are fairly well vegetated and in a natural state. Where cover exists along the river, upland and bottomland forest types predominate. Invasive buckthorn was a common component of the riparian buffer. Bottomland forest consists of ash, box elder and silver maple while uplands are primarily landscaped residences, businesses and institutions featuring impervious surfaces, remnant or planted trees, and lawns. Parks along the river are also landscaped and provided little natural buffer.

Sampling during this assessment was directed in known Smallmouth Bass spawning areas from Sartell Dam to below Sauk Rapids. Spawning bass were captured in backwaters and other current breaks adjacent to riffles or runs. Stream geomorphology measurements obtained in 2008 identified the stream as having an F3 channel type in this stretch of the river. Substrate types in these areas were made up of sand, gravel, cobble and boulder.

The Sauk River is a major tributary that enters this stretch of the Mississippi River near river mile 930. The Sauk River drains approximately 666,646 acres of primarily agricultural lands. Dominant land cover types in the three major watersheds influencing the study area included cultivated crops (38.76%), pasture/hay (24.25%) and deciduous forest (13.46%) (Table 1). Land cover was also analyzed for all minor watersheds that were adjacent to the Mississippi River between Sartell Dam and St. Cloud Dam (Figure 2). Dominant NLCD 2011 land cover types in adjacent minor watersheds were cultivated crops (17.93%), pasture/hay (15.52%), developed, medium intensity (16.34%), developed, low intensity (11.70%) and deciduous forest (10.06%) (Table 2). Municipal development was significant on riparian lands while agricultural development dominated immediately outside metropolitan areas.

According to the Ecological Classification System (ECS) there were three ECS provinces within the major watersheds associated with the study area including, Prairie Parkland Province, Eastern Broadleaf Forest Province, and Laurentian Mixed Forest Province. ECS Sub-sections within adjacent major watersheds to the study area included Minnesota River Prairie, Hardwood Hills, Big Woods, Anoka Sandplain, and Mille Lacs Uplands. Pre-settlement vegetation types were predominately prairie, aspen-oak land, big woods-hardwoods, wet prairie, brush prairie, oak openings and barrens, conifer bogs and swamps, aspen-birch, and mixed hardwood and pine.

METHODS

Three daytime electrofishing runs were established in known Smallmouth Bass spawning areas in 1994 (Figure 3). These stations have been replicated in assessments completed in 1994 through 1997, in odd years from 2001 through 2007, and in 2010 and 2014. Timing of electrofishing corresponded with Smallmouth Bass spawning, generally when water temperature in the river approached 60° F. Smallmouth spawned mainly in tailwaters, around islands and backwater areas that had little or no flow. A Smith-Root GPP 5.0 boom shocker boat rigged with two spider array type anodes and hull cathode was used to sample fish. Previous assessments were conducted using a Coffelt VVP-2E boom shocker boat rigged with a single sphere type anode. An attempt was made to capture all gamefish encountered. Gamefish captured were identified, enumerated and measured, and a bony structure removed for age determination prior to release.

Mississippi River discharge information was obtained for the St. Cloud, MN USGS Gage Station #05270700 from the USGS Water Resources website.

RESULTS AND DISCUSSION

Gamefish Assessment

A total of seven different gamefish species were sampled in 1.93 hours of electrofishing effort at three stations combined on May 30, 2014 (Table 3). Species captured included Northern Pike, Muskellunge, Channel Catfish, Smallmouth Bass, Black Crappie, Bluegill and Walleye. Smallmouth Bass were the targeted species and were most abundant in the catch. A total of 352 Smallmouth were sampled in 2014 for a CPUE of 182.38/hour (Table 4) which was the second highest catch rate recorded on this stretch of the Mississippi River (previous range 41.28/hour to 184.65/hour). The mean catch rate observed on this stretch of the river was

90.24/hour. Mean total length of Smallmouth Bass captured in the 2014 assessment was 13.56 inches and individuals ranged from 4.17 inches to 18.70 inches (Table 5). Catch per unit of effort (CPUE) for Smallmouth Bass 18 inches and greater was 3.11/hour which was on the low end of the range (1.49/hour to 16.87/hour) observed in prior surveys (Figure 4). Smallmouth in the 15 and 16 inch groups were most prevalent in the catch and correspond to strong year classes produced in 2006 and 2007. Calculated PSD values for bass have historically been very high ranging from 70.58 in 1994 to 98.80 in 2003 (Figure 5). The PSD value calculated in 2014 was 84.24. PSD values were probably biased high due to sampling during spawning season where mature fish were dominant in the catch.

Scale samples were taken from a subsample of 102 Smallmouth Bass for age determination. Fish ages 1 through 8 were present in the subsample. Length at annulus formation is reported in Table 6. In general, Smallmouth exceeded quality and preferred size (11.0 and 13.8 inches) in their third and fifth years respectively, and attained memorable size (16.9 inches) by age 7. No Smallmouth Bass larger than 19.0 inches were sampled in 2014, however, in past assessments, trophy individuals that exceeded 19.0 inches were typically older than age 10. Age 4 individuals were most common in the aged subsample and may be indicative of a strong 2010 cohort. Lower than average flows during the summer of 2010 may account for the reproductive success observed. Length at annulus formation was similar to that seen on other sections of the Mississippi River and growth is normal to fast when compared to other Midwest Smallmouth Bass populations.

A total of three Walleye were captured during the 2014 assessment for a catch rate of 1.55/hour which was at the low end of the normal range of catch rates (0.0/hour in 1994 to 17.84/hour in 2003) recorded in previous assessments (Table 4). Walleye caught ranged from 17.64 inches to 25.00 inches and averaged 14.6 inches (Table 5). Walleye captured were not aged due to low sample size. Past surveys showed that growth rates were normal for all ages when compared to area means.

The Northern Pike catch rate (4.66/hour) was within the range observed in previous assessments (Table 4). Catch rates in prior surveys ranged from 1.41/hour in 2003 to 6.02/hour in 2007. Nine Northern Pike ranging from 10.2 inches to 31.7 inches were captured during the 2014 survey (Table 5). Ages 1, 5 and 6 were present in the catch (Table 6). Age 1 Northern Pike averaged 11.0 inches and age 5 pike averaged 27.5 inches in total length. One age 6 Northern Pike was 29.5 inches. Growth rates appeared normal when compared to area means.

A total of three Black Crappies were sampled during the 2014 assessment. Black Crappie ranged from 8.5 to 9.6 inches in total length and averaged 9.0 inches (Table 5).

Five Muskellunge were observed during the 2014 assessment for a catch rate of 2.59/hour (Table 4). Muskellunge sampled ranged from 28.1 to 42.0 inches in total length (Table 5). This was the highest catch rate observed on this stretch of the Mississippi River. A healthy, self-sustaining population of exists in the river and Muskellunge have been sampled in low numbers in five of eleven assessments. One 28.1 inch Muskellunge was determined to be age 4. Angler diaries have proven to be a better assessment tool for Muskellunge on the river than active electrofishing sampling methods.

Hydrology

Mississippi River discharge information was obtained from the USGS Water Resources website. Daily discharge has been monitored at St. Cloud, MN at Station #05270700 since 1987. Historical low and high flows measured at St. Cloud, MN were 909 cfs on August 17, 2006 and 46,900 on April 8, 1997 respectively. Discharge in 2014 did not follow typical patterns. Peak flows during spring started later due to delayed spring warmup and later ice-out, and were much higher than average. Discharge remained much higher than normal throughout summer due to frequent precipitation events. Fall flows were similar to the long term average in 2014 (Figure 6). Peak discharge was 27,000 cfs and occurred on June 19 and 20, 2014. Minimum flow was 2,900 cfs and was recorded on November 19, 2014. Discharge during the assessment was 14,300 cfs on May 30, 2014 and was high compared to flows during previous assessments. Smallmouth Bass recruitment in 2014 will probably be low due to sustained high flows during spawning and fry emergent periods.

Table 1. Land use in the Mississippi-Sartell, Sauk River, and Mississippi-St. Cloud major watersheds. Data from NLCD 2011 land use layer.

Land Cover Type	Total Acres	Percent
Open Water	81,321.48	3.99
Developed, Open Space	85,911.00	4.21
Developed, Low Intensity	42,011.47	2.06
Developed, Medium Intensity	23,845.78	1.17
Developed, High Intensity	7,046.63	0.35
Barren Land (Rock/Sand/Clay)	1,054.33	0.05
Deciduous Forest	274,472.06	13.46
Evergreen Forest	13,977.75	0.69
Mixed Forest	464.88	0.02
Shrub/Scrub	7,905.58	0.39
Grassland/Herbaceous	68,324.96	3.35
Pasture/Hay	494,598.15	24.25
Cultivated Crops	790,594.91	38.76
Woody Wetlands	22,708.83	1.11
Emergent Herbaceous Wetlands	125,543.64	6.15

Table 2. Land use in minor watersheds adjacent to the Mississippi River, Sartell to St. Cloud study area. Data from NLCD 2011 land use layer.

Land Cover Type	Total Acres	Percent
Open Water	1,774.55	3.32
Developed, Open Space	5,289.71	9.88
Developed, Low Intensity	6,259.44	11.70
Developed, Medium Intensity	8,743.90	16.34
Developed, High Intensity	3,159.35	5.90
Barren Land (Rock/Sand/Clay)	23.57	0.04
Deciduous Forest	5,383.89	10.06
Evergreen Forest	194.83	0.36
Mixed Forest	8.66	0.02
Shrub/Scrub	256.17	0.48
Grassland/Herbaceous	1,272.70	2.38
Pasture/Hay	8,303.50	15.52
Cultivated Crops	9,596.29	17.93
Woody Wetlands	371.78	0.69
Emergent Herbaceous Wetlands	2,879.51	5.38

Table 3. Electrofishing catch by station on the Mississippi River from Sartell to St. Cloud, MN, May 30, 2014.

Species	River Mile Effort (hours)	Station		
		EF1 930-931 0.72 hour	EF2 930 0.64 hour	EF3 929 0.66 hour
Northern Pike		2	0	7
Muskellunge		5	0	0
Channel Catfish		5	0	6
Smallmouth Bass		162	74	113
Bluegill		0	0	1
Black Crappie		0	0	3
Walleye		2	0	2

Table 4. Gamefish catch per unit effort (CPUE) history on the Mississippi River from Sartell to St. Cloud, MN.

Species	Catch Per Unit Effort (fish/hour)											
	2014*	2010	2007	2005	2003	2001	1999	1997	1996	1995	1994	Mean
Northern Pike	4.66	4.46	6.02	4.82	1.41	2.73	3.20	2.63	1.54	3.01	1.49	3.27
Muskellunge	2.59	0.99	0.00	0.00	0.00	0.39	0.36	0.00	0.77	0.00	0.00	0.46
Channel Catfish	5.70	2.48	0.40	1.61	0.94		0.36	0.00	0.00	0.75	0.00	1.22
Bluegill	0.52	0.00	0.80	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.16
Smallmouth Bass	182.38	184.65	105.62	94.38	77.90	51.56	41.28	95.39	53.08	57.14	49.25	90.24
Largemouth Bass	0.00	0.00	0.00	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.07
Black Crappie	1.55	2.97	8.43	0.80	2.35	8.98	3.91	0.00	0.00	0.75	0.00	2.70
Walleye	1.55	6.44	11.65	4.02	17.84	5.86	7.47	2.63	13.08	12.78	0.00	7.57
Total Effort (hours)	1.93	2.02	2.49	2.49	2.13	2.56	2.81	1.52	1.30	1.33	0.67	1.93

*A more efficient Smith-Root GPP-5.0 boom shocker was used in the 2014 assessment. Previous assessments were conducted using a Coffelt VVP-2E boom shocker.

Table 5. Length frequency distribution and mean length of gamefish species sampled on the Mississippi River from Sartell to St. Cloud, MN, May 30, 2014.

Length Group	BLC	CCF	MUE	NOP	SMB	WAE
4.0-4.4					3	
4.5-4.9						
5.0-5.4						
5.5-5.9						
6.0-6.4						
6.5-6.9						
7.0-7.4						
7.5-7.9					5	
8.0-8.4					3	
8.5-8.9	2				4	
9.0-9.4	1				1	
9.5-9.9					6	
10.0-10.4				1	21	
10.5-10.9				2	15	
11.0-11.4				1	9	
11.5-11.9					20	
12.0-12.4				1	27	
12.5-12.9					34	
13.0-13.4					31	
13.5-13.9					21	
14.0-14.9					30	
15.0-15.9		1			48	
16.0-16.9		1			43	
17.0-17.9					25	1
18.0-18.9					6	
19.0-19.9		1				
20.0-20.9						1
21.0+	0	8	4	4	0	1

Table 5 (continued). Length frequency distribution and mean length of gamefish species sampled on the Mississippi River from Sartell to St. Cloud, MN, May 30, 2014.

Length Group	BLC	CCF	MUE	NOP	SMB	WAE
< 21.0	3	3	0	5	352	2
21.0 – 21.9						
22.0 – 22.9						
23.0 – 23.9		2				
24.0 – 24.9		1		1		
25.0 – 25.9		2				1
26.0 – 26.9		1		1		
27.0 – 27.9		2				
28.0 – 28.9			1			
29.0 – 29.9				1		
30.0 – 30.9			1			
31.0 – 31.9				1		
32.0 – 32.9						
33.0 – 33.9						
34.0 – 34.9			1			
35.0 – 35.9						
36.0 – 36.9						
37.0 – 37.9						
38.0 – 38.9			1			
39.0 – 39.9						
40.0 – 40.9						
41.0 – 41.9						
42.0 – 42.9			1			
Mean Length (in)	9.02	23.09	34.43	18.57	13.56	21.09

Table 6. Mean length at age of capture for Smallmouth Bass and Northern Pike from the Mississippi River between Sartell, MN and St. Cloud, MN, May 30, 2014.

Smallmouth Bass		Year Class and Age								
		2013 Age 1	2012 Age 2	2011 Age 3	2010 Age 4	2009 Age 5	2008 Age 6	2007 Age 7	2006 Age 8	2005 Age 9
Mean Length at Age (in)			8.06	10.56	12.39	14.19	15.67	16.63	17.26	
N=		8	13	23	16	14	19	9		

Northern Pike		2013 Age 1	2012 Age 2	2011 Age 3	2010 Age 4	2009 Age 5	2008 Age 6
Mean Length at Age (in)		11.01				27.51	29.53
N=		5				3	1

Major Watersheds in the Sartell to St. Cloud Study Area

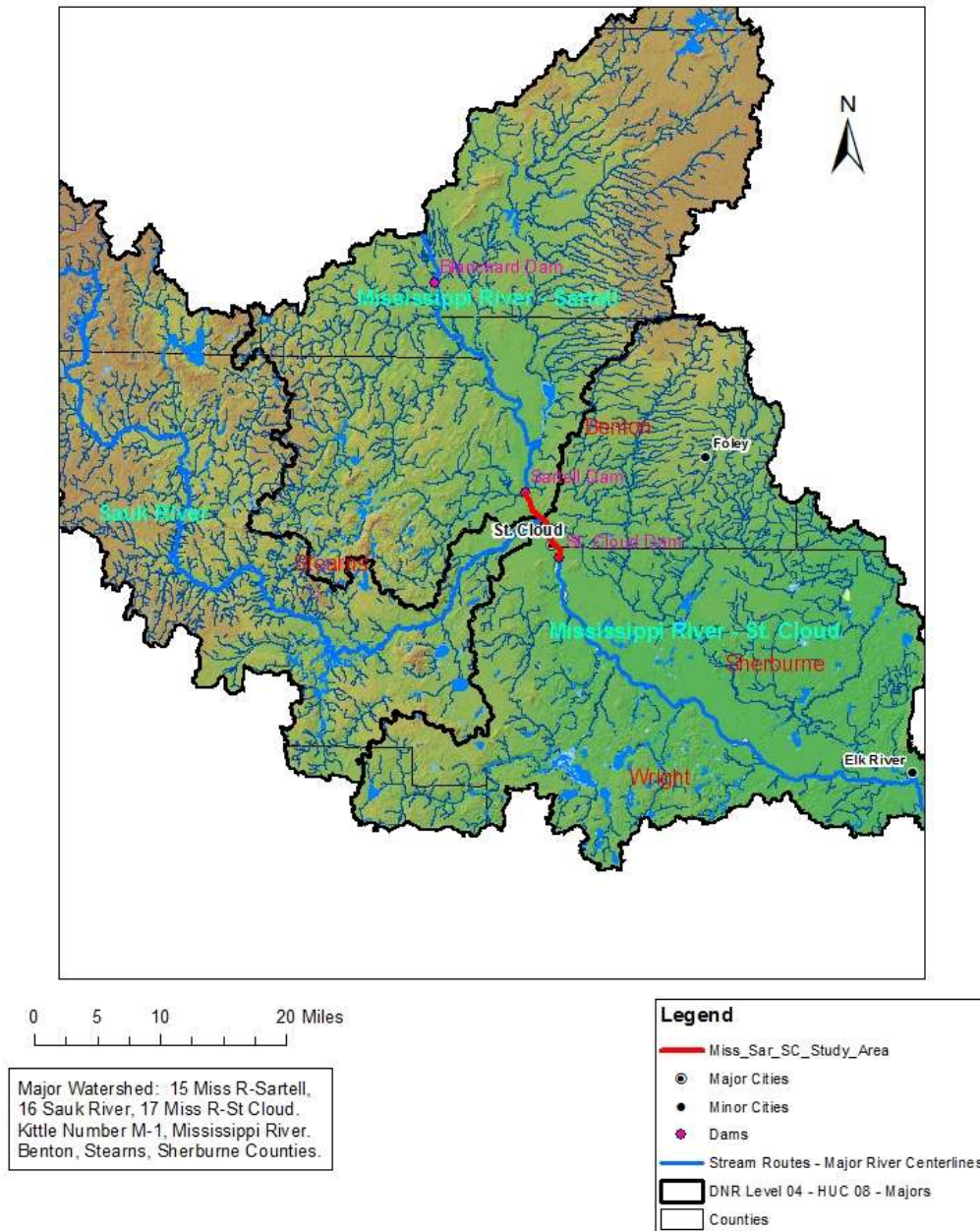


Figure 1. Mississippi-Sartell, Sauk River and Mississippi-St. Cloud Major Watersheds with 30 meter digital elevation model, area streams and rivers, and the Sartell to St. Cloud, MN study area.

NLCD 2011 Land Cover in Adjacent Minor Watersheds Sartell to St. Cloud Study Area

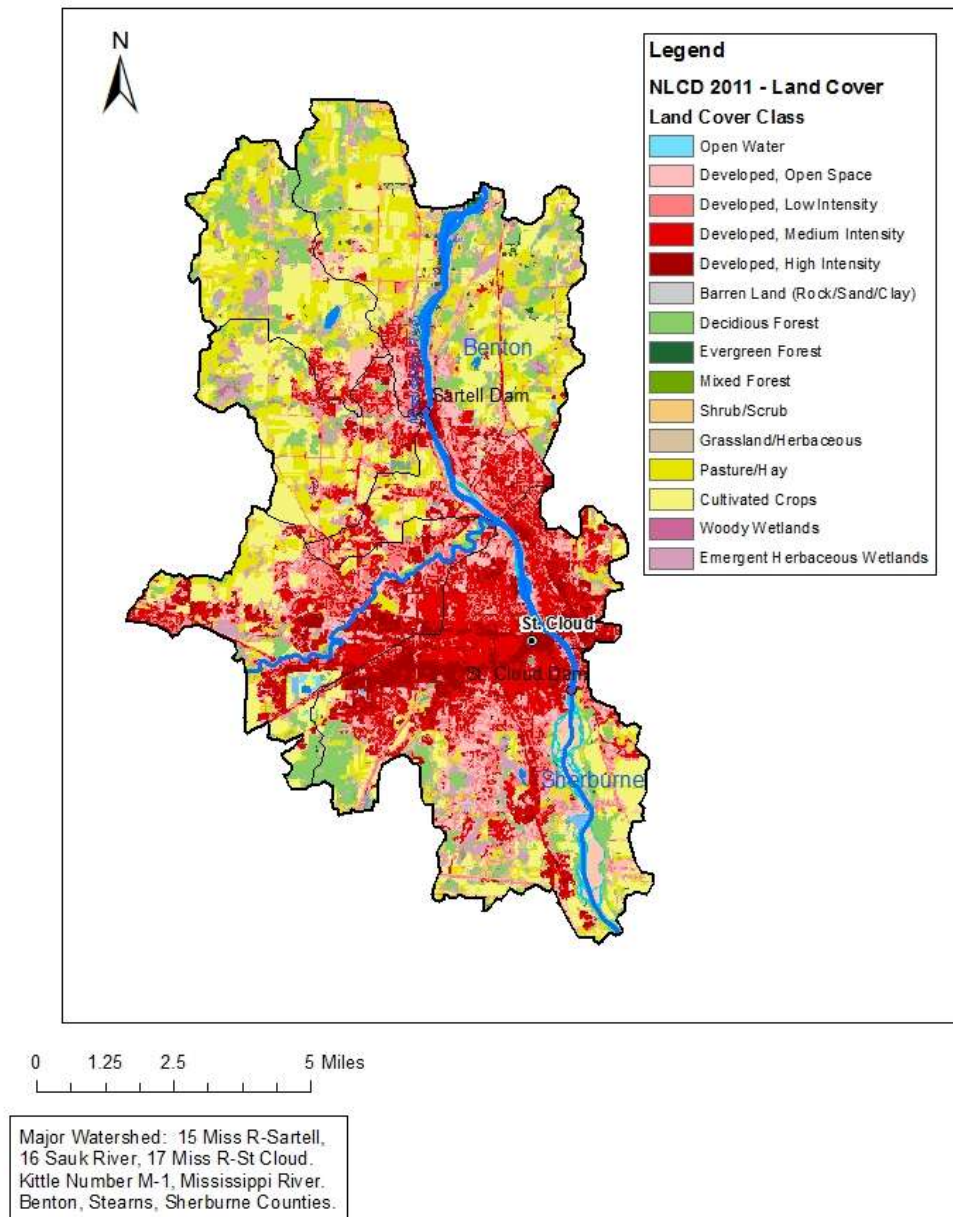
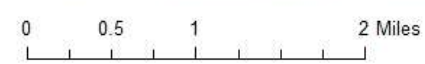
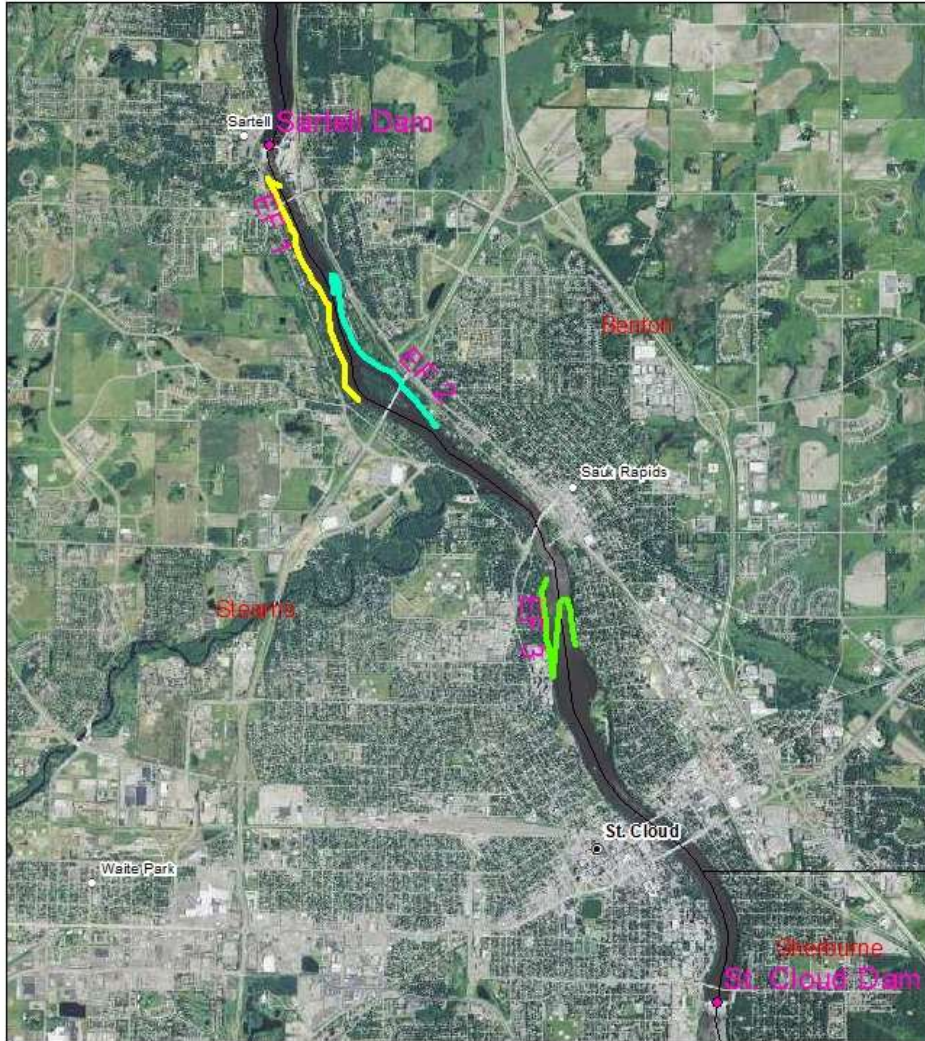


Figure 2. Mississippi River and adjacent minor watersheds from Sartell, MN to St. Cloud, MN showing NLCD 2011 Land Cover.

Electrofishing Stations - 2014



Major Watershed: 15 Miss R-Sartell,
 16 Sauk River, 17 Miss R-St Cloud.
 Kittle Number M-1, Mississippi River.
 Benton, Stearns, Sherburne Counties.

Legend

- Major Cities
- Minor Cities
- Small Cities
- ◆ Dams
- EF_1
- EF_2
- EF_3
- Counties

Figure 3. Electrofishing stations on the Mississippi River between Sartell, MN and St. Cloud, MN, May 30, 2014.

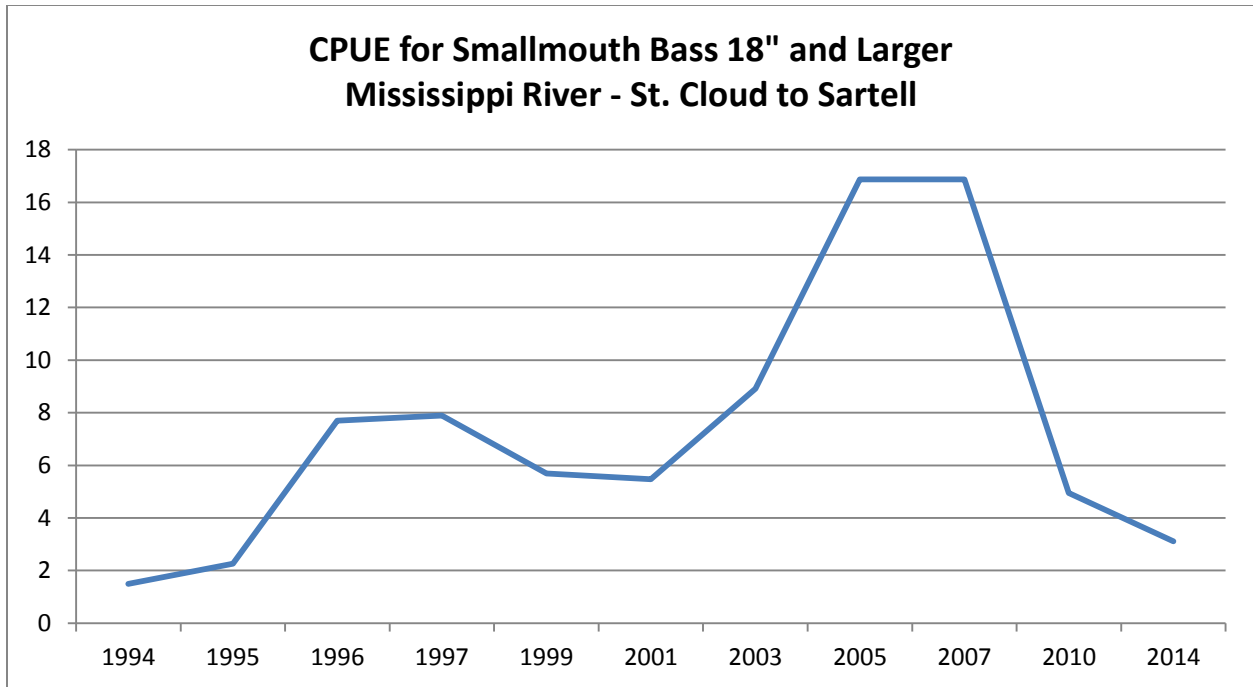


Figure 4. Catch per unit of effort history for Smallmouth Bass 18 inches and greater on the Mississippi River from Sartell, MN to St. Cloud, MN from 1994 through 2014.

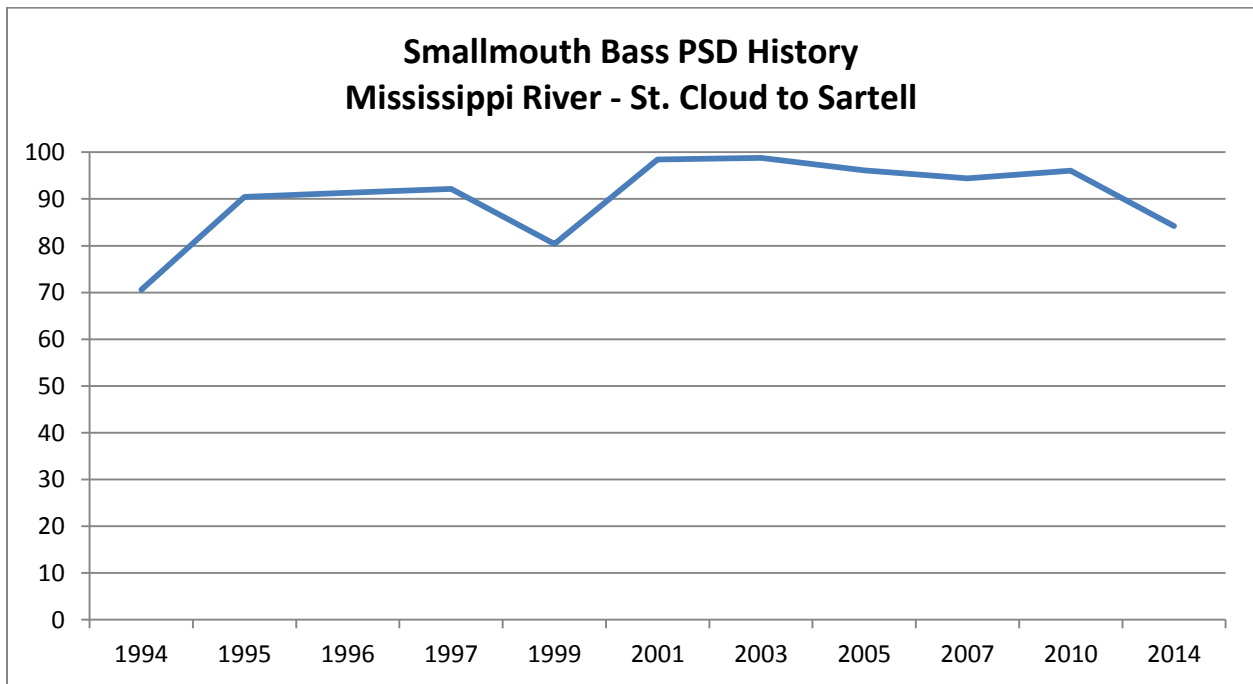


Figure 5. Smallmouth Bass calculated PSD value history for the Mississippi River from Sartell to St. Cloud, MN from 1994 through 2014.

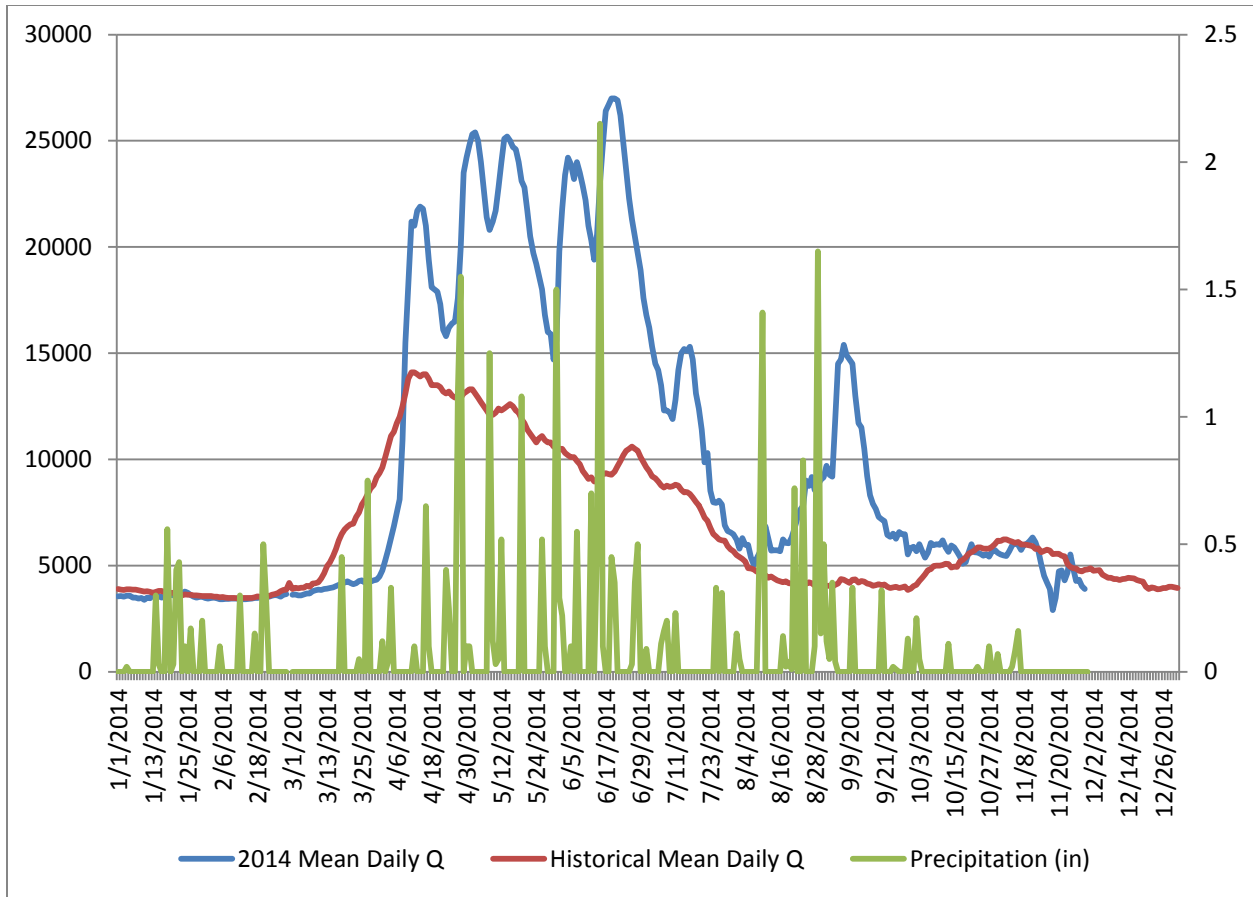


Figure 6. 2014 daily precipitation and mean daily discharge versus historical mean daily discharge for the period of record (1988 through 2014) on the Mississippi River at St. Cloud, MN USGS Gage Station #05270700.

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May 19 through May 20, 2010

River Miles 926 to 932

By: Steven M. Marod

Little Falls Area Fisheries

Minnesota Dept. of Natural Resources

Division of Fish and Wildlife

Central Region, Little Falls, MN

2014

Approved by: _____
Area Fisheries Supervisor

Date: _____

Approved by: _____
Regional Fisheries Supervisor

Date: _____