

Complete Report

Results of Lake Assessment in the Cold Springs, Blackhawk, Ronkoski Slough Lake Unit, Navigation Pool 9 of the upper Mississippi River, Fall 2011

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Purpose

The purpose of this work is to monitor the fall population length frequency and catch per unit effort of game fishes in the Cold Springs, Blackhawk, Ronkoski Slough (CS/BH/RON) Lake Unit which is located in Navigation Pool 9 of the upper Mississippi River. A secondary purpose is to estimate length and size distributions of other fishes caught incidentally.

Methods

The CS/BH/RON Lake Unit is located in Navigation Pool 9 of the upper Mississippi River (Figure 1). Each of the three separate areas is shown in Figures 2, 3 and 4. This lake unit has a total water surface area of 850 acres.

Sampling was done using an 18 foot-long welded aluminum flat-bottomed maxi-boom electro shocking boat using a two-anode-one-cathode system with a Wisconsin Control Box. Two booms extended 8 feet from the bow. Each boom was terminated with an anode which consisted of two stainless steel rings, 1m in diameter, equipped with eight 15cm by 1.6cm dropper cables. We used pulsed alternating current at 16 amps while volts varied from 170 to 240. A total of 86 randomly selected ~10 minute day-time runs were done during 14.36 hours of electro shocking (Figure 2 and Table 1) between September 20 and October 3, 2011. Starting points of random runs were selected using an ArcView GIS 3.3® software random point generating script and the Long Term Resource Monitoring Program (http://www.umesc.usgs.gov/data_library.html) 1998 bathymetric data (Rogala, 1997). Runs were randomly chosen from available aquatic locations that were between 0.3 and 2.0m deep. Once in the field, randomly selected runs that were too shallow or too deep or otherwise adverse to electro shocking were not done and replaced with another randomly selected run, or done within 50m of the initial run. All fish were counted, identified to species, measured by total length and returned to the river.

We calculated Proportional Size Structures for selected quality (PSS_Q) and preferred (PSS_P) game fishes as well as catch per effort for these size categories.

Statistical tests were done using SAS® (2002-2003) software for Windows version 9.13's General linear models (ANOVA) and were done at the alpha=0.05 level. For catch per effort calculations, tests were done on geometric means.

Findings

The mean daily ambient water temperatures during 2011 sampling was 17.2°C and generally increased over the six days of sampling. Water surface elevation measured at the Lansing, Iowa gage was 620.25ft, changed as much as 0.14 feet, and generally decreased over the sampling period (Table 1). This elevation was 0.21ft lower than the mean for these dates during the period of record from 1938 through 2011 (620.46). The mean daily flow in cubic feet per second taken from Dam 9 was 20,252. Flow fluctuated as much as 2,700 and generally decreased during the sampling period. This mean daily flow was 37% less than the mean flow on these dates (32,053 cfs) for the period of record of 1959 through 2011.

Electro Shocking Catch per Effort

A total of at least 38 fish species were recorded from 2203 fish captured during random electro shocking (Table 2). The most common was bluegill followed by largemouth bass, emerald shiner, yellow perch and smallmouth bass. Mean catch per hour for these four fish species was 66.41, 52.19, 14.29, 11.32, and 10.54, respectively. The mean catch per hour for all species combined was 209.95 (standard deviation = 145.08, n=63).

Length Distribution

The frequency distribution for total length in inches from random runs for bluegill, largemouth bass, yellow perch, smallmouth bass, sauger, rock bass and northern pike are given in Figures 5 through 11. The mean lengths of fish species where there were more than 29 individuals are given in Table 3. A total of 9.34 percent of the largemouth bass was larger than 14 inches. A total of 6.00 percent of bluegill was greater than 7 inches. A total of 43.70 percent of yellow perch was larger than 7 inches and 23.53 percent were larger than 8 inches.

We also calculated Proportional Size Structures (PSS) electro shocked for fish (Guy, et al., 2006) using values from (Gabelhouse, 1984) (Table 4). The PSS_Q and PSS_P by species are presented in Table 5. The “acceptable” value of PSS_Q for bluegill and rock bass is 40 to 60 and the “acceptable value of PSS_P is a minimum of 5 (Wisconsin Department of Natural Resources, 2010). Bluegill PSS_Q was 34.7, below the “acceptable” range. Also, bluegill (0.2) did not meet the acceptable PSS_P standard. The same was true for rock bass whose PSS_Q was 9.1 and had a PSS_P of 0.0. This suggests that bluegill and rock bass population size structure during fall 2011 sampling at CS/BH/RON were not “acceptable”.

No guidance is provided for other fish species where we calculated PSS_Q and PSS_P . The PSS_Q for freshwater drum, common carp and shorthead redhorse were relatively high, at greater than 75.0. The PSS_P for these fish species was 32.7, 61.3, and 90.6, respectively. Other game fish species, including largemouth bass, northern pike, sauger, smallmouth bass and yellow perch had moderate to low PSS_Q (14.8 to 26.5) and PSS_P values (1.8-7.4).

Comparisons of Random Electro Shocking Runs with Other Lake Units

Electro shocking data from randomly selected CS/BH/RON Lake Unit stations were compared to five other upper Mississippi River lake units sampled similarly in the fall of 2011. Catch per hour for all target fish combined in CS/BH/RON (151.21) differed only from Weaver (39.12) and was the same as Goose Island/Stoddard (189.18), Chippewa River/Big Lake (124.80), Ambro (129.36) and Harpers (85.12) (Table 6). Target species included black crappie, bluegill, largemouth bass, northern pike, smallmouth bass, pumpkinseed, white crappie, rock bass and yellow perch.

Similarly, we tested mean catch per hour for all fish combined among the four lake units sampled in 2011 where all fish shocked were netted and recorded (Table 7). CS/BH/RON (209.95) was statistically the same as all three other lake units.

We also tested mean catch per hour for selected individual species among six 2011 lake units (Table 8). CS/BH/RON Lake Unit had the same bluegill catch rate (66.41) as all other lake units except Weaver Bottoms, which had the lowest catch rate (9.18). The catch rate for largemouth bass at the CS/BH/RON Lake Unit (52.19) was the same as four other lake units and differed only from Goose Island/Stoddard which was the highest (99.85). The CS/BH/RON Lake Unit had the same catch rate of rock bass (5.89) as two other lake units and was higher than three others (0.00 to 0.19). CS/BH/RON and Goose Island/Stoddard lake units had the same smallmouth bass catch rates (10.54 and 5.64, respectively) and differed from four other units which had values of 0.00 to 2.20. CS/BH/RON yellow perch catch rate (11.32) differed only from two other lake units (43.3 and 28.6) and was the same as three other 2011 lake units.

We did a similar test of mean catch per hour for selected individual species among six 2011 lake units except we excluded any presumed young-of-the-year fish (i.e., age zero) (Table 9). Ranks of catch per effort were the same as was found using all sizes with two exceptions. All of the lake unit rankings for largemouth bass were different and two of the six units for yellow perch changed rankings. For the remaining three species tested, relative rank of lake units remained the same. This suggests that excluding putative age zero fish from this catch per effort analysis did not have an overwhelming effect on comparisons.

We compared mean total length of individual species caught with electro shocking among six 2011 lake units (Table 10). Mean total length of CS/BH/RON bluegill (5.5 inches) was larger than four other lake units (about 4.4 inches) and the same as one. Largemouth bass from CS/BH/RON (10.3 inches) was the same as one other lake unit and different from four. CS/BH/RON rock bass and smallmouth bass were the same size as all other lake units (about 4.9 and 7.0 inches, respectively). Mean length of CS/BH/RON yellow perch (6.9 inches) was the same as all other lake units.

We compared PSS from CS/BH/RON to other lake units from 2007 through 2011 where the number of stock sized game fish was greater than or equal to 30 (Table 11). For bluegill, 2011 CS/BH/RON ranked in the upper third for quality fish and in the lower third for preferred sized fish in 26 comparisons. For quality largemouth bass, 2011 CS/BH/RON ranked the lowest in 24 comparisons and the second lowest in preferred sized fish. For smallmouth bass, 2011 CS/BH/RON ranked the lowest for quality and preferred sized fish in six comparisons. For yellow perch, 2011 CS/BH/RON ranked average for quality fish and in the lower third for preferred sized fish in 10 comparisons.

Comparisons of Random Electro Shocking Runs Among Years

We compared mean total length among years within the CS/BH/RON lake unit. Mean total length of 2007 bluegill (4.6 inches) was significantly different from 2011 (5.5 inches) ($p=0.0002$). Largemouth bass mean length in 2007 was 9.0 inches, and was significantly different from 2011 (10.3 inches) ($p<0.0001$). Rock bass and yellow perch were statistically the same mean size between years.

Proportional size structure also differed between years where $n>29$ individuals. The 2007 bluegill PSS_Q was 20.2; in 2011 it was 34.3. The 2007 largemouth bass PSS_Q was 35.2; in 2011 it was 22.5.

Comparisons using Fixed Electro Shocking Runs

Five spatially fixed electro shocking runs were done in the Cold Springs area of the CS/BH/RON lake unit each year during 2007 and 2011 (Figure 4). A total of 17 fish species were caught among years totaling 770 fish (Table 12). Largemouth bass was the most common followed by bluegill, gizzard shad, golden shiner, bowfin and warmouth.

Catch per hour for all target fish combined in Cold Springs was 189.9 in 2011 and was 667.0 in 2007. These means differed statistically ($p=0.0174$). Target species included black crappie, bluegill, largemouth bass, northern pike, smallmouth bass, pumpkinseed, white crappie, rock bass and yellow perch. In addition, when all fish species were combined, these means between years differed as well ($p=0.0139$). This suggests that catch rates were significantly lower in 2011 than 2007.

We also compared mean total length for the lake unit among years within the CS/BH/RON lake unit. Mean total length of 2007 bluegill (4.0 inches) was significantly different from 2011 (5.0 inches). Largemouth bass mean length in 2007 was 6.9 inches, and was significantly different from 2011 (10.4 inches).

Similar to random runs, the 2007 bluegill PSS_Q (18.5) was smaller than the 2011 (26.2). Largemouth bass PSS_Q among year was about the same (about 19.0).

Conclusions

For species groups, the CS/BH/RON catch rates were similar to other 2011 lake units. For combined target fish species, the CS/BH/RON Lake Unit sampled in 2011 had a statistically different catch rate than one other 2011 Mississippi River lake units and was the same as the remaining four. For all species combined, this lake unit had the same catch rate as all the other units that were compared.

For individual game fish, the CS/BH/RON lake unit had mixed results when comparing catch rates to other 2011 lake units. For bluegill, largemouth bass, and yellow perch, CS/BH/RON was about the same as most other lake units. For rock bass and smallmouth bass, the CS/BH/RON lake unit was generally higher than most others.

Mean total lengths of both bluegill and largemouth bass was larger in 2011 than 2007. Both rock bass and yellow perch from 2011 had the same mean sizes as 2007. Proportional size structure of 2011 CS/BH/RON lake unit bluegill, and yellow perch generally ranked about average among all 2007-2011 lake units for quality and preferred sized fish. Largemouth and smallmouth bass in this lake unit ranked poorly among all lake units and years. Mean size of largemouth bass and bluegill increased in the sample from this lake unit between 2007 and 2011.

In Navigation Pool 9 of the Mississippi River bordering Iowa, Wisconsin fishing regulations limit harvest to 25 each of yellow perch, rock bass and crappie, with no size limit. Bluegill and pumpkinseed are limited to 25 in total with no size limit. White bass and yellow bass are also restricted to 25 in total and no size limit. Largemouth bass and smallmouth bass are limited to 5 in total with a 14 inch minimum size limit. Northern pike have a bag limit of 5 and no size limit. All these fish species have continuous open seasons.

Recommendations

1. Continue to monitoring backwater fish in Pool 9 and other pools.
2. Using additional data explore any longitudinal trends in mean total length or catch per effort along the Mississippi River bordering Wisconsin.

Literature Cited

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- Guy, Christopher S., Robert M. Neumann and David W. Willis. 2006. New Terminology for Proportional Stock Density (PSD) and Relative Stock Density (RSD): Proportional Size Structure (PSS). *Opinion: Fisheries Forum. Fisheries* 31(2): 86-87.
- SAS Institute Inc. 2002-2003. SAS® software for Windows version 9.13. SAS Institute Inc., Cary, NC, USA.
- Wisconsin Department of Natural Resources. 2010. *Fish Management Handbook 3605.9*. Wisconsin Department of Natural Resources, Madison, WI. 239 pp.
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FIGURE 1. LOCATION OF 34 WDNR LAKE UNITS, UPPER MISSISSIPPI RIVER.
 (based on 1989 Long Term Resource Monitoring Program Land/Water and Aquatic Area Coverage)

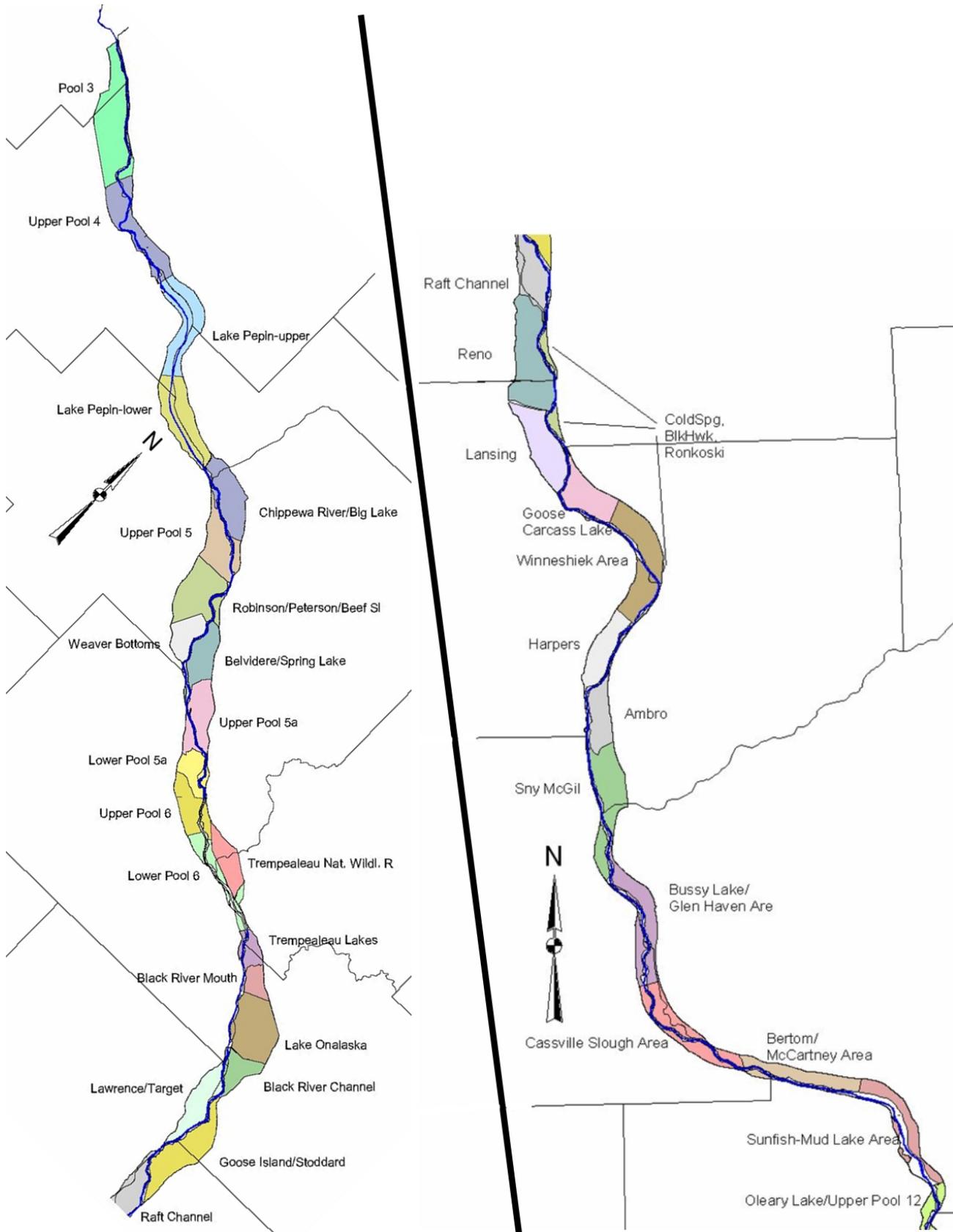


FIGURE 2. LOCATIONS OF FALL 2011 ELECTRO SHOCKING RUNS, THE RONKOSKI AREA OF THE CS/BH/RON LAKE UNIT INCLUDING STATION LENGTHS IN METERS AND STARTING AND ENDING COORDINATES (Z15N UTM NAD83). (2010 NAIP fotos).

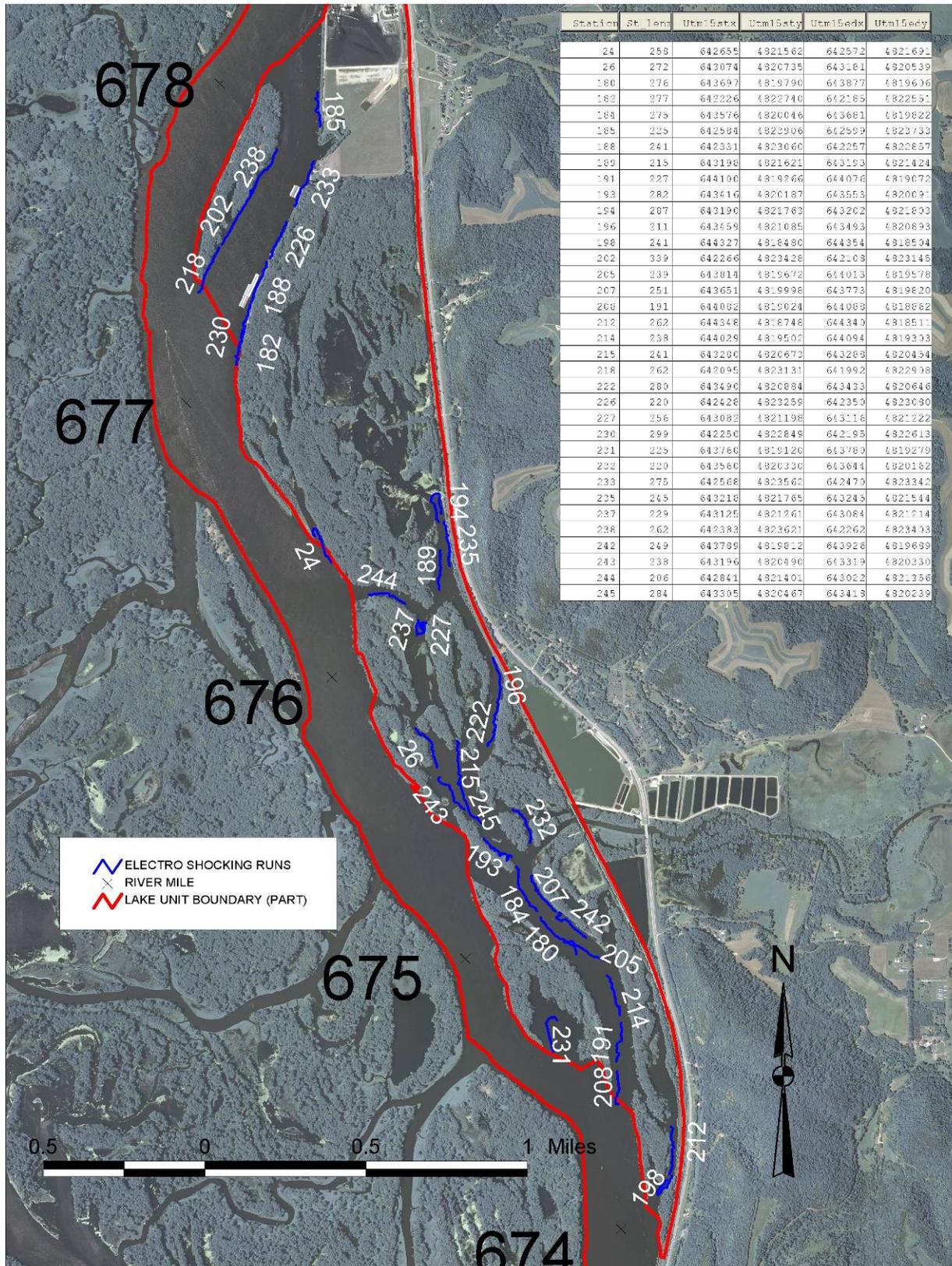


FIGURE 3. LOCATIONS OF FALL 2011 ELECTRO SHOCKING RUNS, THE BLACKHAWK AREA OF THE CS/BH/RON LAKE UNIT INCLUDING STATION LENGTHS IN METERS AND STARTING AND ENDING COORDINATES (Z15N UTM NAD83). (2010 NAIP fotos).

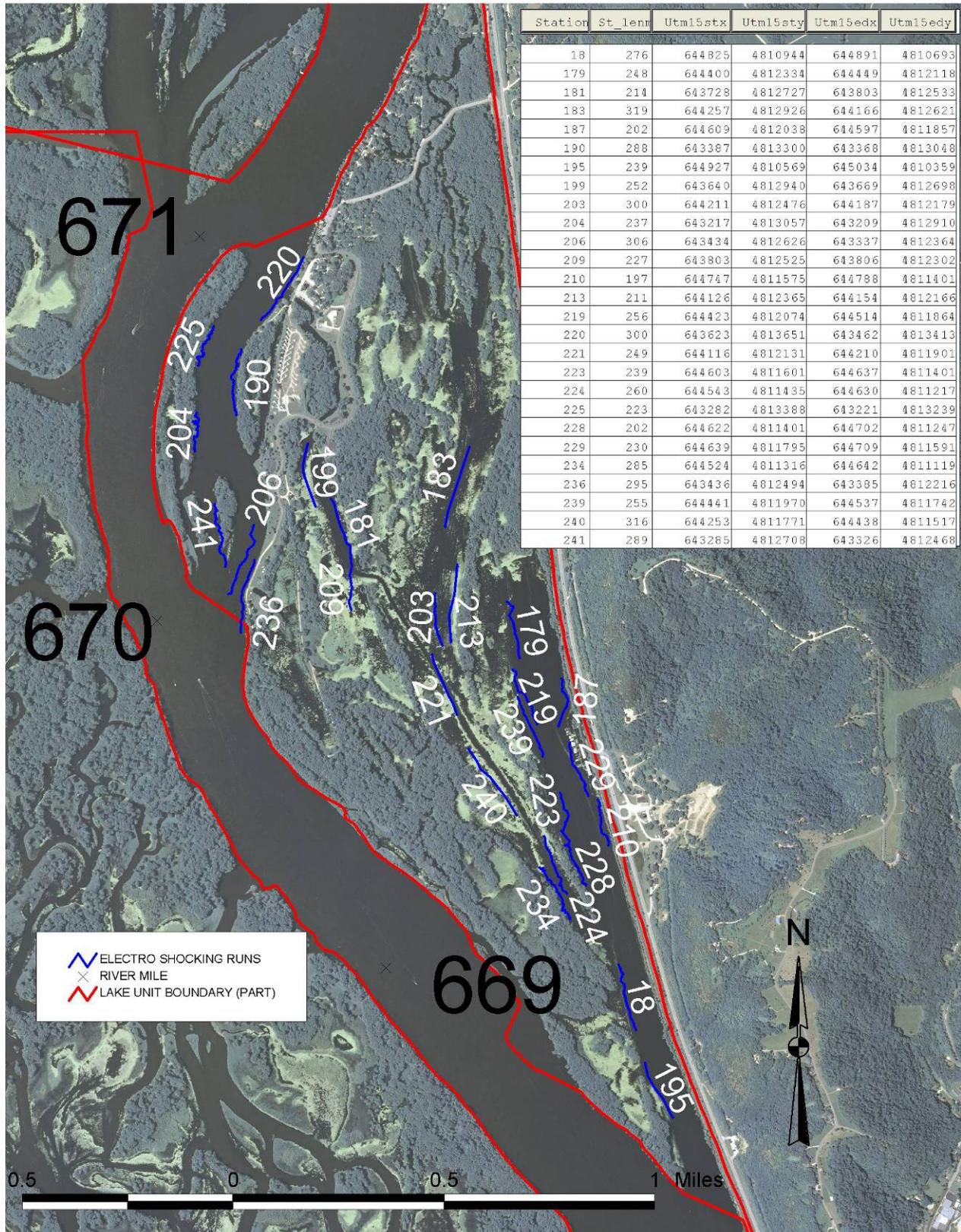


FIGURE 4. LOCATIONS OF FALL 2011 ELECTRO SHOCKING RUNS, THE COLD SPRINGS AREA OF THE CS/BH/RON LAKE UNIT INCLUDING STATION LENGTHS IN METERS AND STARTING AND ENDING COORDINATES (Z15N UTM NAD83). (2010 NAIP hotos).

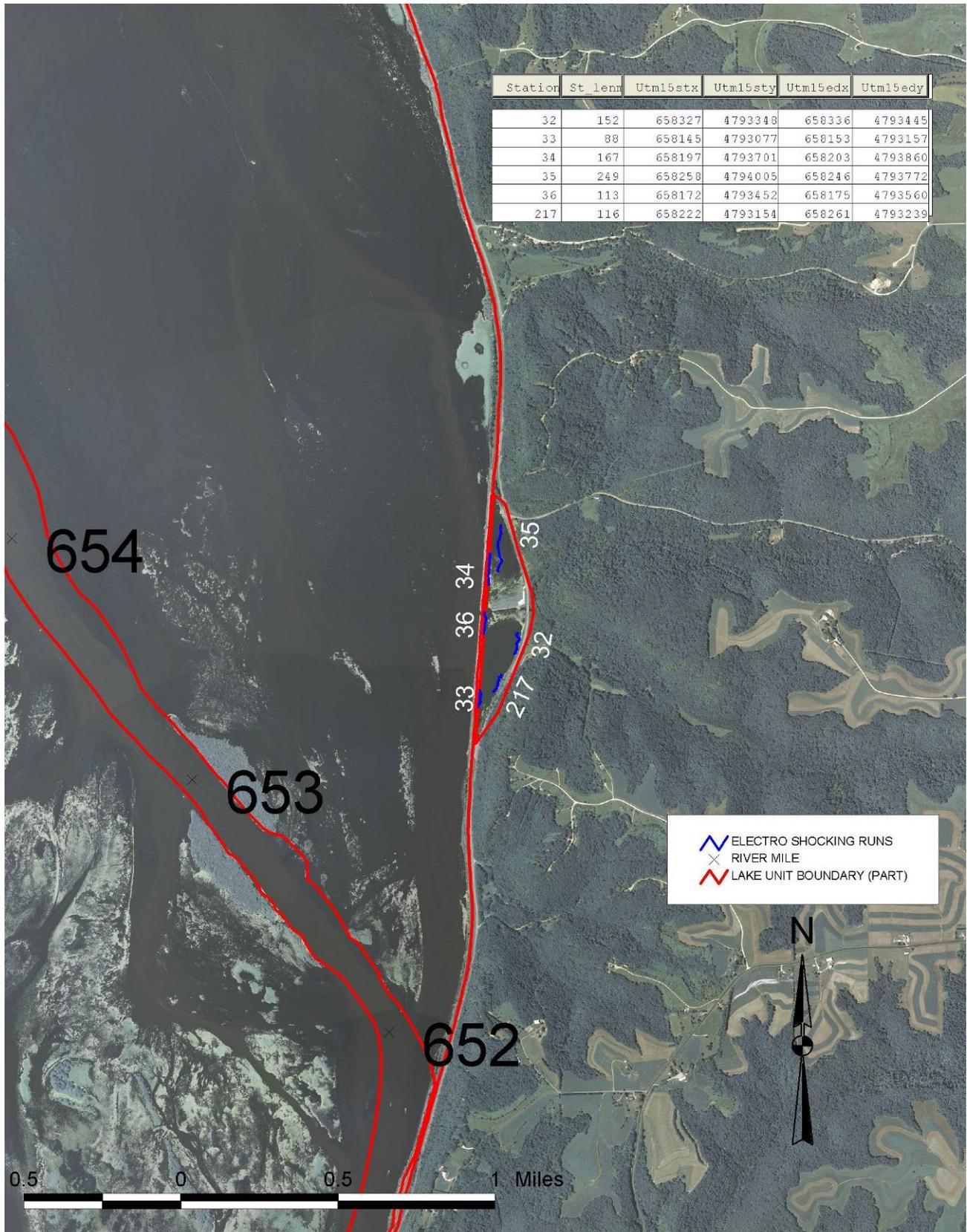


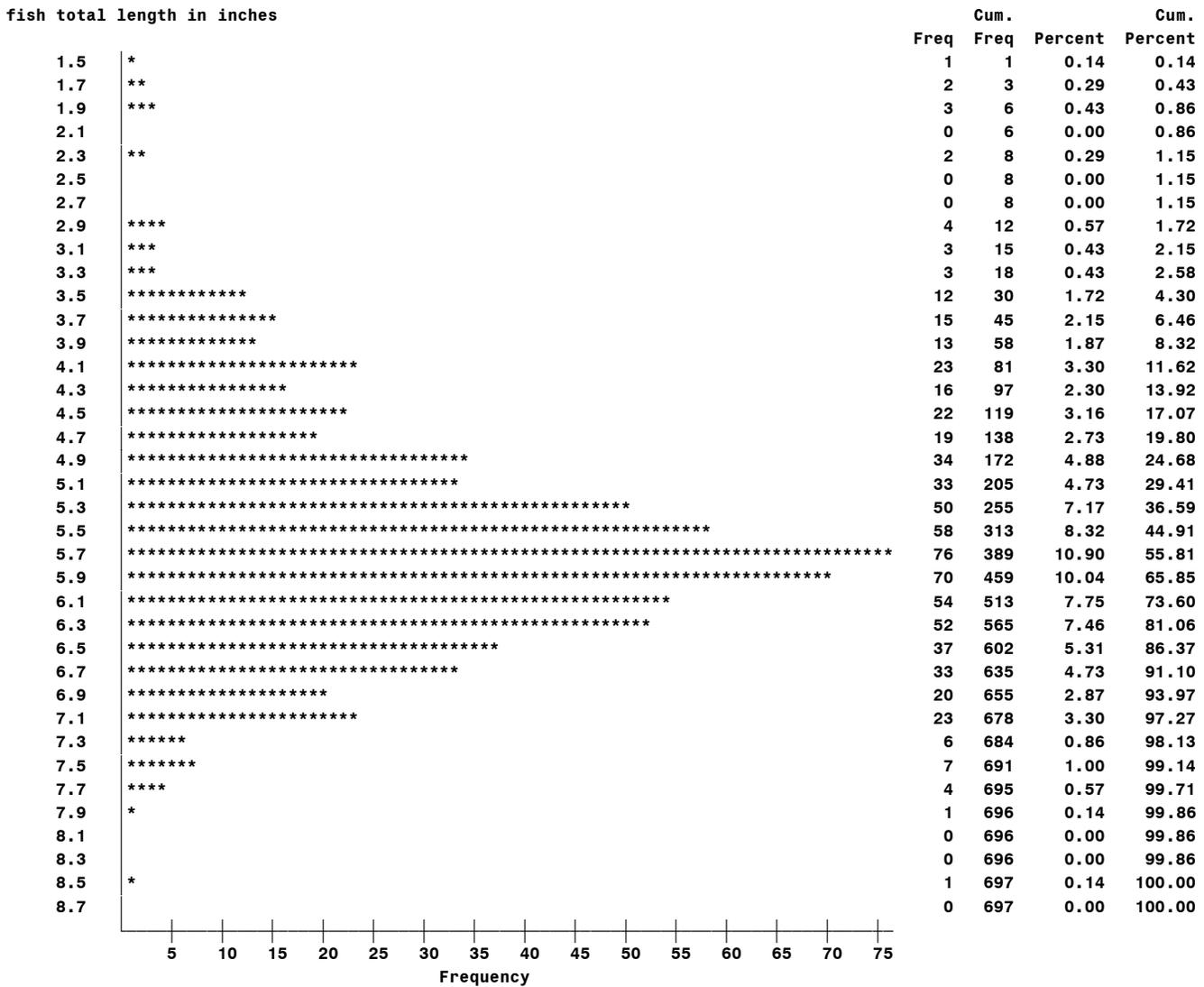
TABLE 1. MEAN TEMPERATURE, WATER SURFACE ELEVATION AND FLOW DURING FALL 20110 CS/BH/RON LAKE UNIT SAMPLING.

DATE	MEAN DAILY TEMPERATURE °C	WATER SURFACE ELEVATION (ft), LANSING, IA	FLOW (cfs) DAM 9
10/04/2011	16.2	620.28	20500
10/05/2011	16.0	620.29	21100
10/06/2011	17.0	620.28	21100
10/07/2011	17.1	620.25	20600
10/10/2011	19.3	620.20	19000
10/11/2011	18.7	620.15	18400
MEAN (by date, station)	17.2	620.25	20252

TABLE 2. RELATIVE ABUNDANCE, MEAN CATCH PER HR, ELECTRO SHOCKING, FALL 2011, CS/BH/RON LAKE UNIT. RANDOM RUNS.

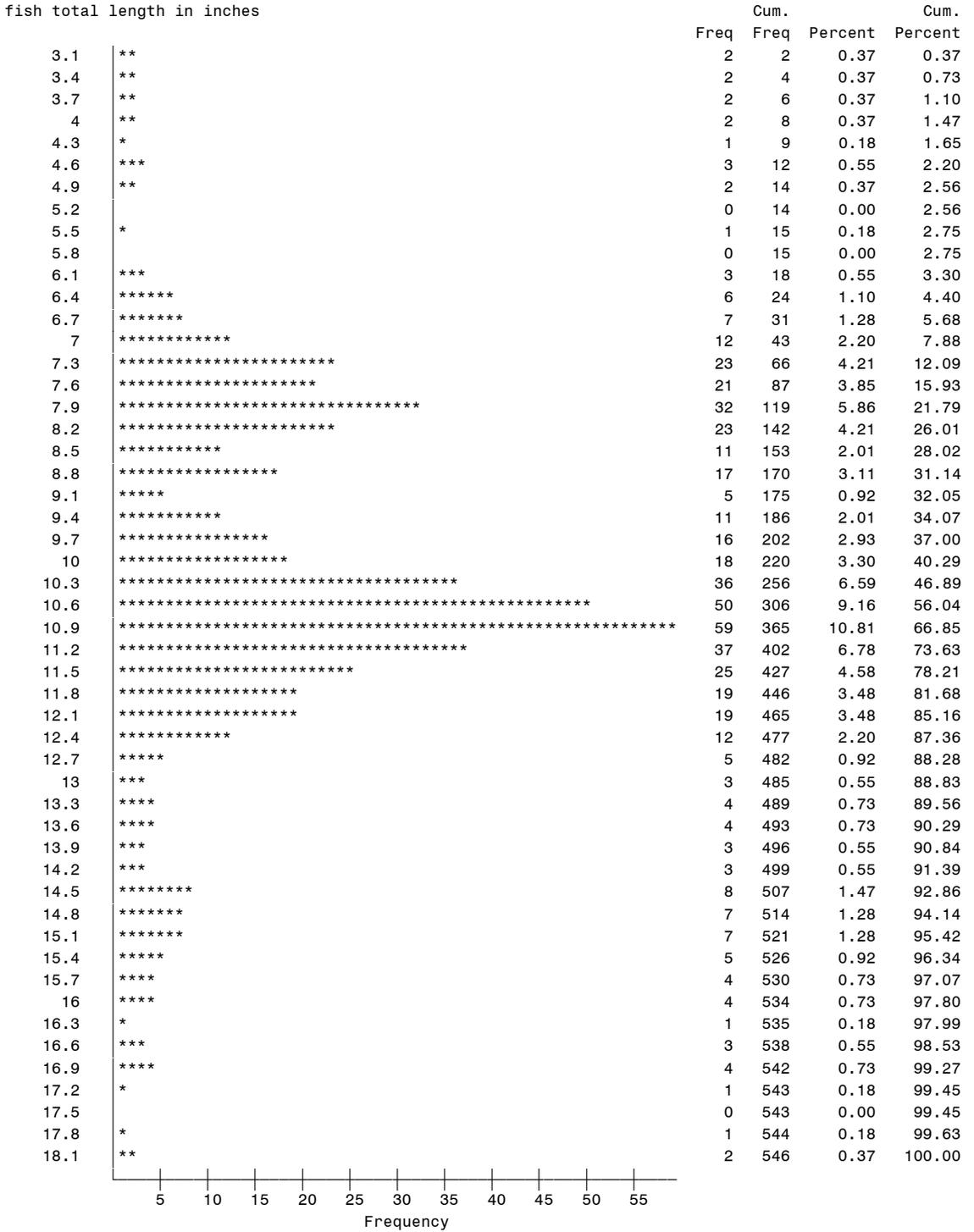
	SPECIES	FREQ.	PERCENT	MEAN PER HR	STANDARD DEV.	MIN.	MAX.	NO. OF RUNS	TOTAL HRS
1	black buffalo	1	0.05	0.10	0.75	0.00	5.99	63	10.44
2	black crappie	12	0.54	1.14	3.02	0.00	11.98	63	10.44
3	bluegill	700	31.77	66.41	74.93	0.00	295.08	63	10.44
4	bowfin	30	1.36	2.85	6.26	0.00	29.94	63	10.44
5	brook silverside	2	0.09	0.19	1.06	0.00	5.99	63	10.44
6	channel catfish	4	0.18	0.38	1.82	0.00	11.98	63	10.44
7	common carp	31	1.41	2.95	6.17	0.00	23.95	63	10.44
8	emerald shiner	150	6.81	14.29	30.72	0.00	143.71	63	10.44
9	flathead catfish	3	0.14	0.28	1.25	0.00	5.99	63	10.44
10	freshwater drum	49	2.22	4.66	9.82	0.00	59.88	63	10.44
11	gizzard shad	87	3.95	8.46	17.30	0.00	71.86	63	10.44
12	golden redhorse	34	1.54	3.22	6.42	0.00	35.93	63	10.44
13	goldeye	2	0.09	0.19	1.06	0.00	5.99	63	10.44
14	green sunfish	3	0.14	0.29	1.68	0.00	11.98	63	10.44
15	green sunfish x bluegill	1	0.05	0.10	0.75	0.00	5.99	63	10.44
16	highfin carpsucker	1	0.05	0.10	0.75	0.00	5.99	63	10.44
17	largemouth bass	546	24.78	52.19	66.13	0.00	275.45	63	10.44
18	logperch	8	0.36	0.76	2.01	0.00	5.99	63	10.44
19	longnose gar	8	0.36	0.76	2.74	0.00	17.96	63	10.44
20	mooneye	1	0.05	0.10	0.75	0.00	5.99	63	10.44
21	northern pike	35	1.59	3.44	4.69	0.00	17.96	63	10.44
22	pumpkinseed	2	0.09	0.19	1.06	0.00	5.99	63	10.44
23	quillback	5	0.23	0.48	1.95	0.00	11.98	63	10.44
24	river redhorse	1	0.05	0.10	0.75	0.00	5.99	63	10.44
25	rock bass	62	2.81	5.89	16.85	0.00	89.82	63	10.44
26	sauger	63	2.86	6.00	10.20	0.00	47.90	63	10.44
27	shiners m20-29 m31-33 m35-40	5	0.23	0.48	1.63	0.00	5.99	63	10.44
28	shorthead redhorse	34	1.54	3.25	6.65	0.00	35.93	63	10.44
29	shortnose gar	4	0.18	0.38	2.37	0.00	17.96	63	10.44
30	silver redhorse	20	0.91	1.93	4.66	0.00	23.95	63	10.44
31	smallmouth bass	111	5.04	10.54	22.83	0.00	107.78	63	10.44
32	spottail shiner	15	0.68	1.44	4.66	0.00	29.94	63	10.44
33	spotted sucker	15	0.68	1.43	5.13	0.00	29.94	63	10.44
34	walleye	26	1.18	2.48	5.13	0.00	23.95	63	10.44
35	warmouth	2	0.09	0.19	1.06	0.00	5.99	63	10.44
36	white bass	6	0.27	0.57	2.07	0.00	11.98	63	10.44
37	white crappie	1	0.05	0.10	0.75	0.00	5.99	63	10.44
38	white sucker	2	0.09	0.19	1.06	0.00	5.99	63	10.44
39	yellow bullhead	2	0.09	0.19	1.51	0.00	11.98	63	10.44
40	yellow perch	119	5.40	11.32	28.03	0.00	203.59	63	10.44
	ALL SPECIES	2203	100.00	209.95	145.08	11.98	610.78	63	10.44

FIGURE 5. FALL 2011 BLUEGILL LENGTH DISTRIBUTION (INCHES), CS/BH/RON LAKE UNIT, ELECTRO SHOCKING. RANDOM RUNS.



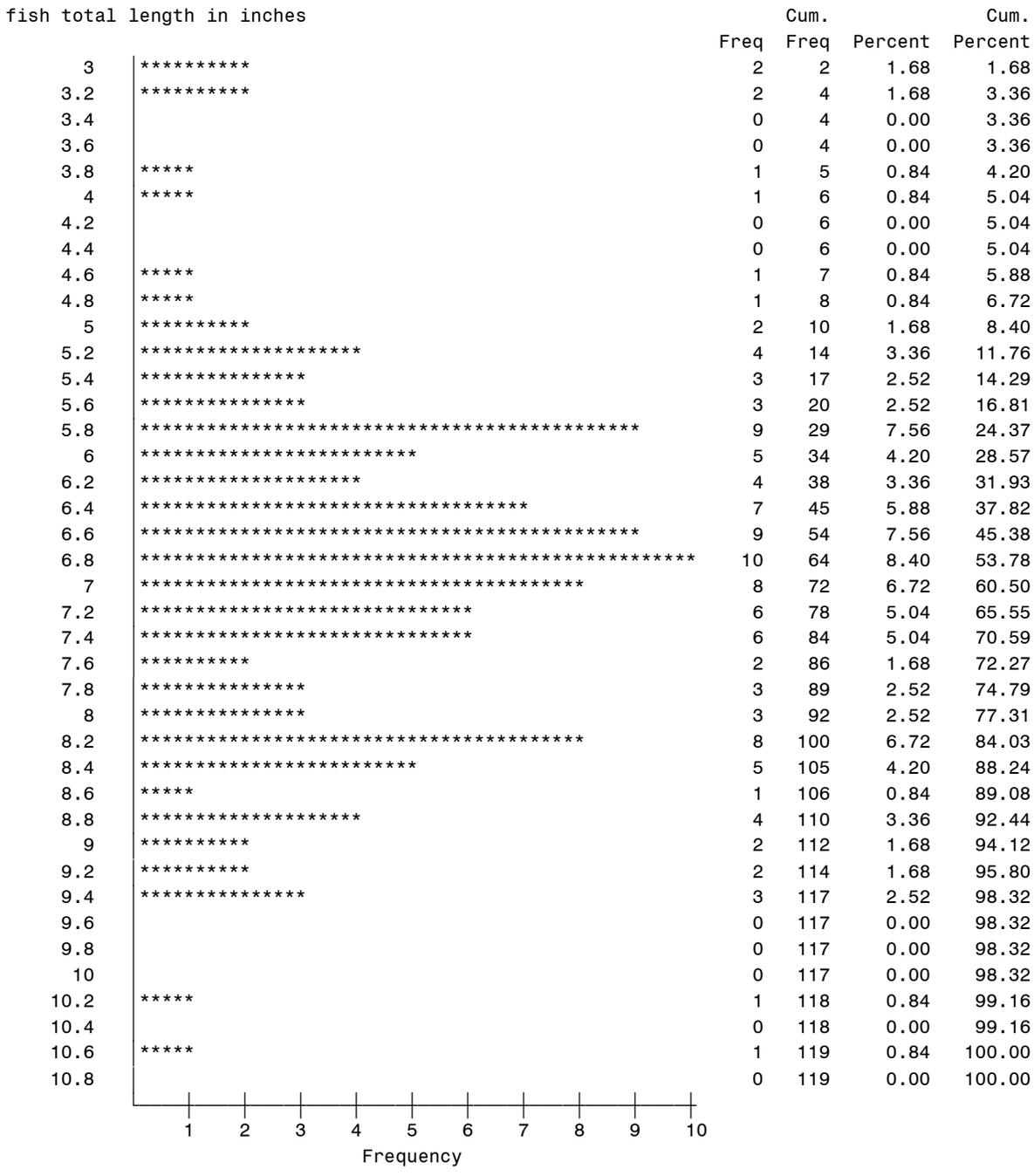
N	Mean	Std Dev	Minimum	Maximum
697	5.5594476	1.0332331	1.5750000	8.5040000

FIGURE 6. FALL 2011 LARGEMOUTH BASS LENGTH DISTRIBUTION (INCHES), CS/BH/RON LAKE UNIT, ELECTRO SHOCKING. RANDOM RUNS.



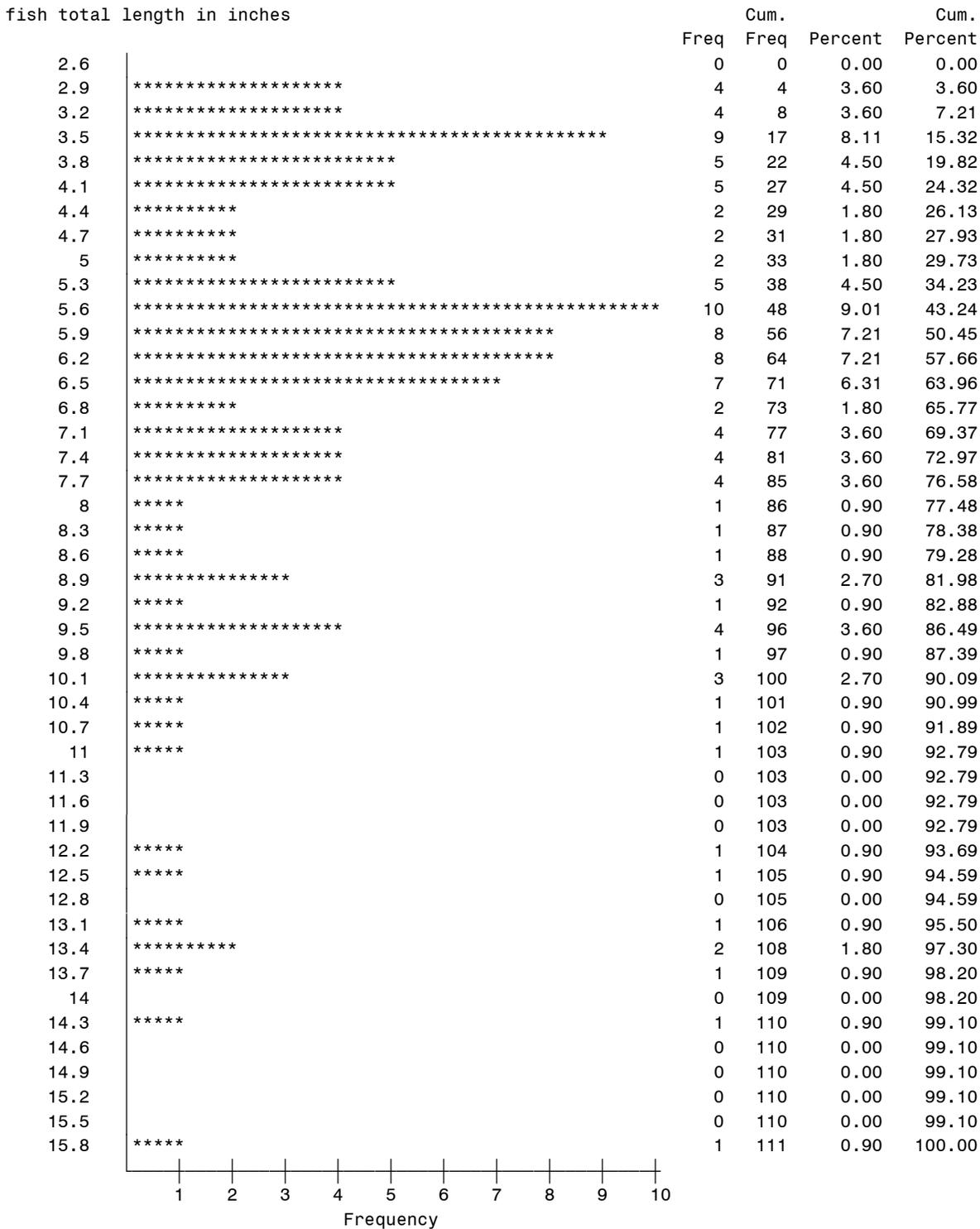
N	Mean	Std Dev	Minimum	Maximum
546	10.2918114	2.5464764	3.1500000	18.1500000

FIGURE 7. FALL 2011 YELLOW PERCH LENGTH DISTRIBUTION (INCHES), CS/BH/RON LAKE UNIT, ELECTRO SHOCKING. RANDOM RUNS.



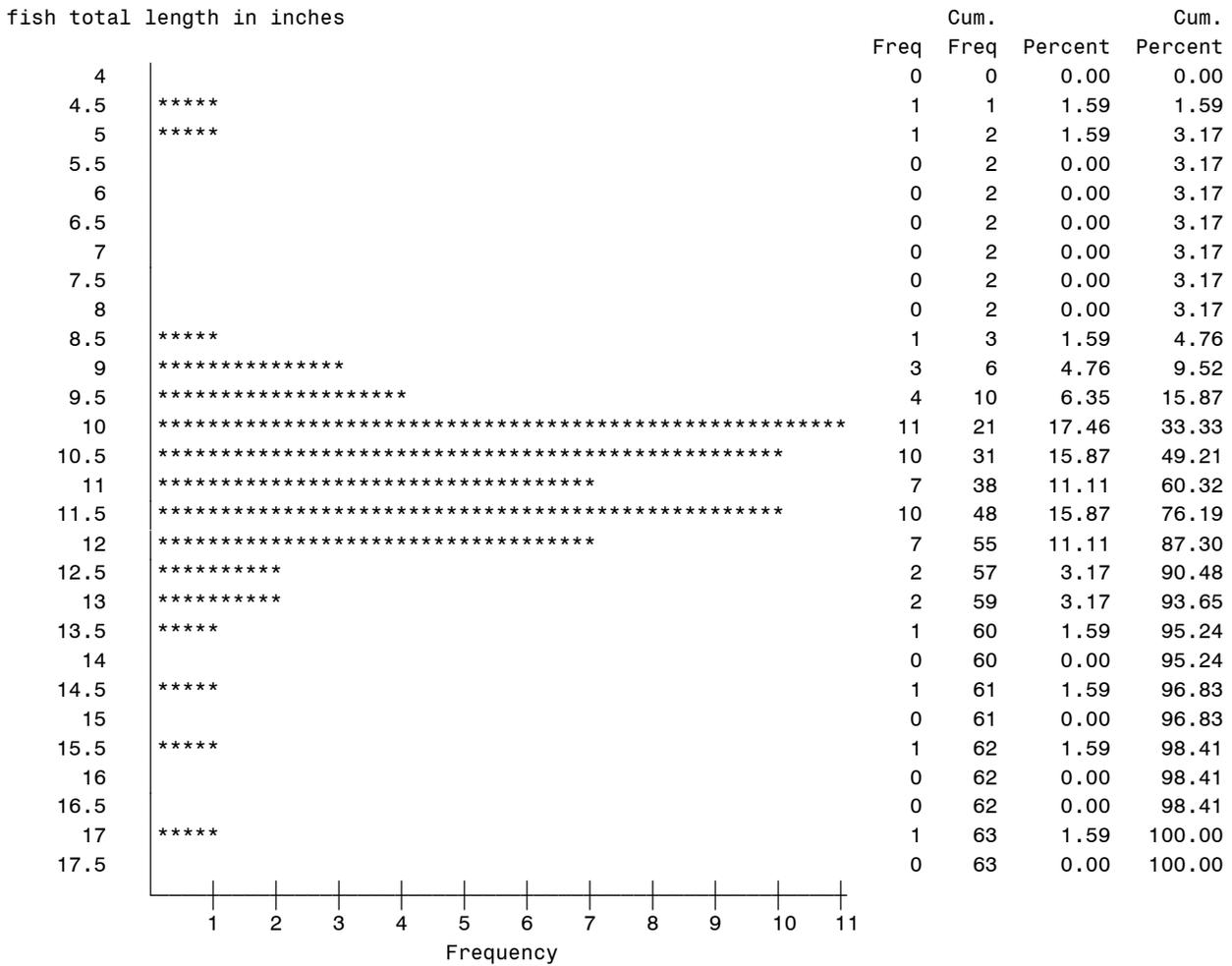
N	Mean	Std Dev	Minimum	Maximum
119	6.8603277	1.4556267	3.0310000	10.6300000

FIGURE 8. FALL 2011 SMALLMOUTH BASS LENGTH DISTRIBUTION (INCHES), CS/BH/RON LAKE UNIT, ELECTRO SHOCKING. RANDOM RUNS.



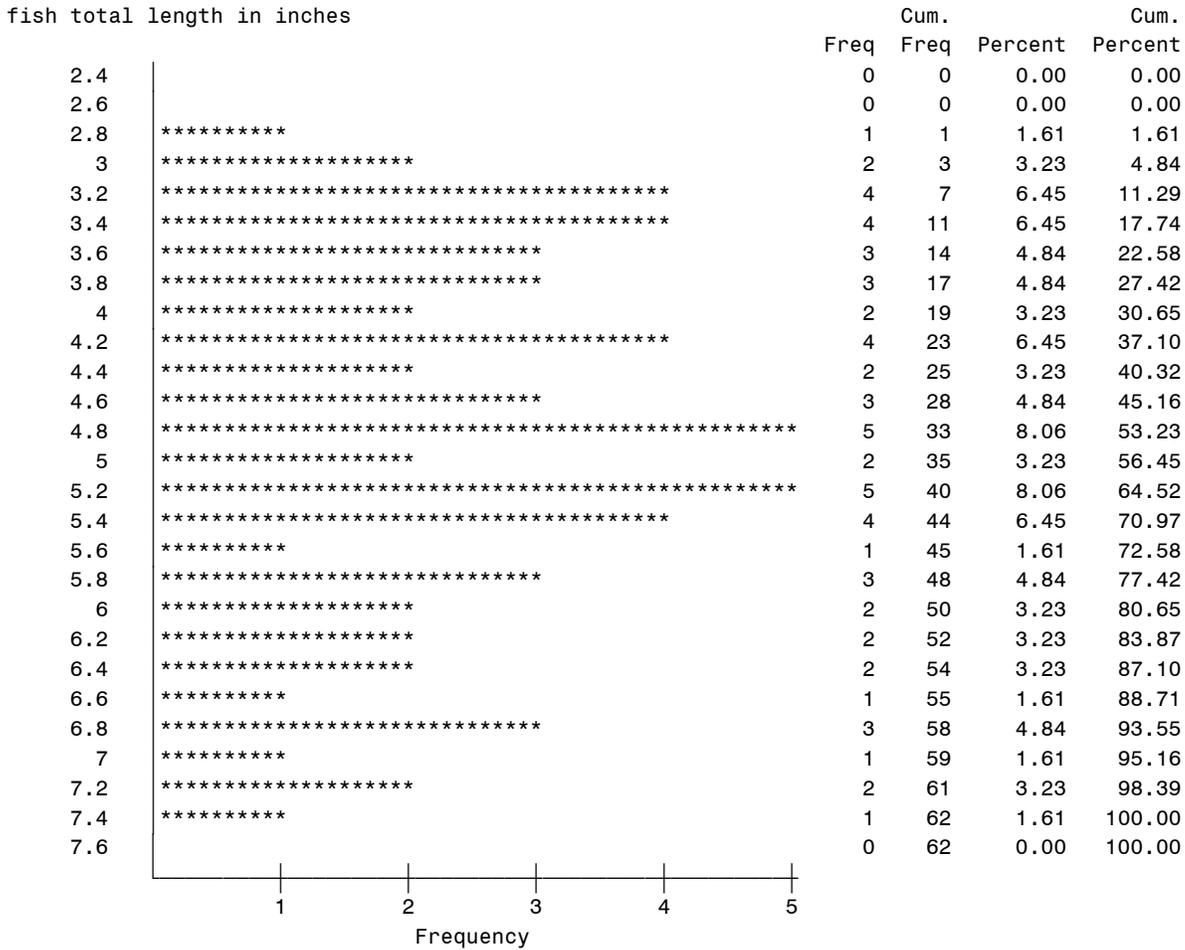
N	Mean	Std Dev	Minimum	Maximum
111	6.5879550	2.8172614	2.8740000	15.9060000

FIGURE 9. FALL 2011 SAUGER LENGTH DISTRIBUTION (INCHES), CS/BH/RON LAKE UNIT, ELECTRO SHOCKING. RANDOM RUNS.



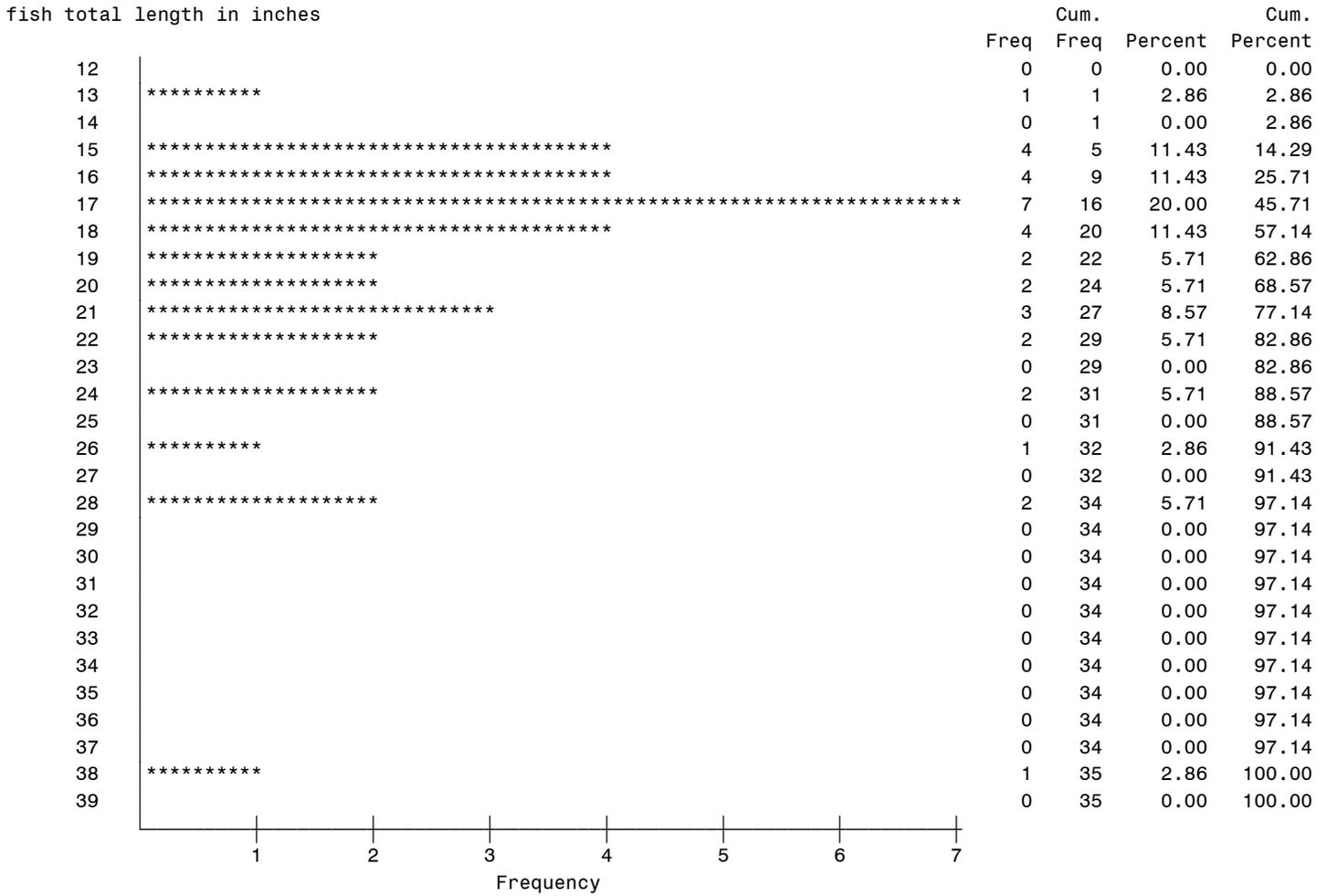
N	Mean	Std Dev	Minimum	Maximum
63	10.9024444	1.8739738	4.6460000	17.2440000

FIGURE 10. FALL 2011 ROCK BASS LENGTH DISTRIBUTION (INCHES), CS/BH/RON LAKE UNIT, ELECTRO SHOCKING. RANDOM RUNS.



N	Mean	Std Dev	Minimum	Maximum
62	4.8660161	1.2518551	2.7560000	7.4020000

FIGURE 11. FALL 2011 NORTHERN PIKE LENGTH DISTRIBUTION (INCHES), CS/BH/RON LAKE UNIT, ELECTRO SHOCKING. RANDOM RUNS.



N	Mean	Std Dev	Minimum	Maximum
35	19.4938286	4.8896971	13.4650000	38.4250000

TABLE 3. MEAN LENGTH IN INCHES FOR SELECTED SPECIES, FALL 2011, CS/BH/RON LAKE UNIT, FROM ELECTRO SHOCKING OF RANDOMLY SELECTED RUNS.

SPECIES	MEAN LENGTH	STANDARD DEV.	MIN.	MAX.	N
bluegill	5.56	1.03	1.58	8.50	697
common carp	21.26	4.78	13.98	31.50	31
emerald shiner	2.75	0.45	1.89	3.62	149
freshwater drum	14.46	2.00	9.88	20.28	49
gizzard shad	5.73	2.43	2.28	16.26	86
golden redhorse	12.86	3.69	6.02	18.94	34
largemouth bass	10.29	2.55	3.15	18.15	546
northern pike	19.49	4.89	13.47	38.43	35
rock bass	4.87	1.25	2.76	7.40	62
sauger	10.90	1.87	4.65	17.24	63
shorthead redhorse	14.73	3.18	3.70	17.72	34
smallmouth bass	6.59	2.82	2.87	15.91	111
yellow perch	6.86	1.46	3.03	10.63	119

TABLE 4. LIST OF STOCK SIZE, QUALITY SIZE (PSS_Q) AND PREFERRED SIZE (PSS_P) IN INCHES FOR SELECTED FISH SPECIES. RANDOMLY SELECTED ELECTRO SHOCKING RUNS.

FISH SPECIES	PSS SOURCE	STOCK	QUALITY	PREFERRED
black crappie	Gabelhouse (1984)	5.0	8.0	10.0
bluegill	Gabelhouse (1984)	3.0	6.0	8.0
common carp	Gabelhouse (1984)	11.0	16.0	21.0
freshwater drum	Gabelhouse (1984)	8.0	12.0	15.0
largemouth bass	Gabelhouse (1984)	8.0	12.0	15.0
northern pike	Gabelhouse (1984)	14.0	21.0	28.0
pumpkinseed	Gabelhouse (1984)	3.0	6.0	8.0
sauger	Gabelhouse (1984)	8.0	12.0	15.0
rock bass	Gabelhouse (1984)	4.0	7.0	9.0
shorthead redhorse	WDNR	6.0	10.0	13.0
smallmouth bass	Gabelhouse (1984)	7.0	11.0	14.0
walleye	Gabelhouse (1984)	10.0	15.0	20.0
warmouth	Gabelhouse (1984)	3.0	6.0	8.0
white crappie	Gabelhouse (1984)	5.0	8.0	10.0
yellow perch	Gabelhouse (1984)	5.0	8.0	10.0

TABLE 5. COMPARISON OF MEAN CATCH PER HOUR AND PSS FOR SELECTED SPECIES OF SELECTED SIZES IN CS/BH/RON LAKE UNIT. ELECTRO SHOCKING, FALL 2011, RANDOM RUNS.

SPECIES	MEAN CPH	STD. DEV. CPH	N	# OF STOCK	PSS _Q	PSS _P
BLUEGILL				685	34.74	0.15
QUALITY (≥ 6 INCHES)	22.63	22.60	63			
PREFERRED (≥ 8 INCHES)	0.10	0.75	63			
COMMON CARP				31	77.42	61.29
QUALITY (≥ 16 INCHES)	2.28	4.86	63			
PREFERRED (≥ 21 INCHES)	1.81	4.52	63			
FRESHWATER DRUM				49	95.92	32.65
QUALITY (≥ 12 INCHES)	4.47	9.86	63			
PREFERRED (≥ 15 INCHES)	1.52	3.56	63			
LARGEMOUTH BASS				430	22.79	7.44
QUALITY (≥ 12 INCHES)	9.39	19.52	63			
PREFERRED (≥ 15 INCHES)	3.14	10.48	63			
NORTHERN PIKE				34	26.47	5.88
QUALITY (≥ 21 INCHES)	0.85	2.35	63			
PREFERRED (≥ 28 INCHES)	0.18	1.01	63			
ROCK BASS				44	9.09	0.00
QUALITY (≥ 7 INCHES)	0.38	1.82	63			
PREFERRED (≥ 9 INCHES)	0.00	0.00	63			
SAUGER				61	14.75	3.28
QUALITY (≥ 12 INCHES)	0.86	2.60	63			
PREFERRED (≥ 15 INCHES)	0.19	1.06	63			
SHORTHEAD REDHORSE				32	100.00	90.63
QUALITY (≥ 10 INCHES)	3.06	6.47	63			
PREFERRED (≥ 13 INCHES)	2.78	6.20	63			
SMALLMOUTH BASS				38	23.68	5.26
QUALITY (≥ 11 INCHES)	0.86	2.37	63			
PREFERRED (≥ 14 INCHES)	0.19	1.06	63			
YELLOW PERCH				109	25.69	1.83
QUALITY (≥ 8 INCHES)	2.67	5.47	63			
PREFERRED (≥ 10 INCHES)	0.19	1.06	63			

TABLE 6. COMPARISON OF MEAN CATCH PER HOUR FROM ELECTRO SHOCKING AT RANDOMLY SELECTED LOCATIONS FOR ALL TARGET SPECIES COMBINED AMONG SIX FALL 2011 LAKE UNITS.

MEAN	STD. DEV.	N	LAKE UNIT	DIFFERENT (means with the same letter are not Sign. Different)		
189.18	149.98	86	2011 GOOSE ISLAND/STODDARD	A		
151.21	142.39	63	2011 COLD SPRG/BLKHWK/RONKOSKI	A	B	
124.80	114.05	30	2011 CHIPPEWA RIVER/BIG LK	A	B	
129.36	121.86	63	2011 AMBRO		B	C
85.12	95.71	42	2011 HARPERS		B	C
39.12	38.96	30	2011 WEAVER BOTTOMS			C
135.15	133.05	314	ALL			

TABLE 7. COMPARISON OF MEAN CATCH PER HOUR FROM ELECTRO SHOCKING AT RANDOMLY SELECTED LOCATIONS FOR ALL SPECIES COMBINED AMONG FOUR FALL 2011 LAKE UNITS.

MEAN	STD. DEV.	N	LAKE UNIT	DIFFERENT (means with the same letter are not Sign. Different)		
244.40	160.08	86	2011 GOOSE ISLAND/STODDARD	A		
209.95	145.08	63	2011 COLD SPRG/BLKHWK/RONKOSKI	A	B	
186.86	132.35	63	2011 AMBRO	A	B	
155.83	112.68	42	2011 HARPERS		B	
206.94	145.37	254	ALL			

TABLE 8. COMPARISON OF MEAN CATCH PER HOUR FROM ELECTRO SHOCKED RANDOMLY SELECTED STATIONS FOR SELECTED INDIVIDUAL SPECIES, AMONG SIX FALL 2011 LAKE UNITS. ALL FISH SIZES.

SPECIES	MEAN	STD. DEV.	N	LAKE UNIT	DIFFERENT (means with the same letter are not Sign. Different)	
BLUEGILL	76.51	88.65	63	AMBRO	A	
	74.71	93.49	42	HARPERS	A	
	66.41	74.93	63	COLD SPRG/BLKHWK/RONKOSKI	A	
	44.91	68.54	86	GOOSE ISLAND/STODDARD	A	
	28.74	41.29	30	CHIPPEWA RIVER/BIG LK	A	
	9.18	20.91	30	WEAVER BOTTOMS		B
LARGEMOUTH BASS	99.85	108.66	86	2011 GOOSE ISLAND/STODDARD	A	
	52.19	66.13	63	COLD SPRG/BLKHWK/RONKOSKI		B
	37.92	45.12	30	2011 CHIPPEWA RIVER/BIG LK		B
	33.47	46.89	63	2011 AMBRO		B
	22.16	21.28	30	2011 WEAVER BOTTOMS		B
	4.14	6.81	42	2011 HARPERS	C	
ROCK BASS	5.78	12.41	86	2011 GOOSE ISLAND/STODDARD	A	
	5.89	16.85	63	2011 COLD SPRG/BLKHWK/RONKOSKI	A	B
	0.60	1.83	30	2011 CHIPPEWA RIVER/BIG LK	A	B
	0.19	1.06	63	2011 AMBRO		C
	0.00		42	2011 HARPERS		C
	0.00		30	2011 WEAVER BOTTOMS		C
SMALLMOUTH BASS	10.54	22.83	63	2011 COLD SPRG/BLKHWK/RONKOSKI	A	
	5.64	10.92	86	2011 GOOSE ISLAND/STODDARD	A	
	2.20	6.94	30	2011 CHIPPEWA RIVER/BIG LK		B
	0.38	1.47	63	2011 AMBRO		B
	0.00		42	2011 HARPERS		B
	0.00		30	2011 WEAVER BOTTOMS		B
YELLOW PERCH	43.31	39.37	30	2011 CHIPPEWA RIVER/BIG LK	A	
	28.55	45.08	86	2011 GOOSE ISLAND/STODDARD	A	
	10.17	13.76	63	2011 AMBRO		B
	11.32	28.02	63	2011 COLD SPRG/BLKHWK/RONKOSKI	C	B
	4.39	7.19	30	2011 WEAVER BOTTOMS	C	B
	1.85	3.62	42	2011 HARPERS	C	

TABLE 9. COMPARISON OF MEAN CATCH PER HOUR FROM ELECTRO SHOCKED RANDOMLY SELECTED STATIONS FOR SELECTED INDIVIDUAL SPECIES, AMONG SIX FALL 2011 LAKE UNITS. ALL FISH SIZES EXCLUDING YOUNG-OF-THE-YEAR INDIVIDUALS BASED ON TOTAL LENGTH.

SPECIES	MEAN	STD. DEV.	N	LAKE UNIT	DIFFERENT (means with the same letter are not Sign. Different)	
BLUEGILL>2.5 INCHES	75.75	87.69	63	2011 AMBRO	A	
	73.85	92.24	42	2011 HARPERS	A	
	65.36	73.21	63	2011 COLD SPRG/BLKHWK/RONKOSKI	A	
	24.50	48.52	86	2011 GOOSE ISLAND/STODDARD		B
	14.17	31.31	30	2011 CHIPPEWA RIVER/BIG LK	C	B
	2.40	4.04	30	2011 WEAVER BOTTOMS	C	
LARGEMOUTH BASS>5.3 INCHES	50.87	64.92	63	2011 COLD SPRG/BLKHWK/RONKOSKI	A	
	32.70	46.63	63	2011 AMBRO	A	B
	14.55	21.10	86	2011 GOOSE ISLAND/STODDARD		B
	4.13	6.81	42	2011 HARPERS	C	
	3.99	8.22	30	2011 CHIPPEWA RIVER/BIG LK	C	
	1.00	2.76	30	2011 WEAVER BOTTOMS	C	
ROCK BASS>3.0	5.22	11.79	86	2011 GOOSE ISLAND/STODDARD	A	
	5.70	16.75	63	2011 COLD SPRG/BLKHWK/RONKOSKI	A	B
	0.60	1.83	30	2011 CHIPPEWA RIVER/BIG LK	C	B
	0.19	1.06	63	2011 AMBRO	C	B
	0.00	0.00	42	2011 HARPERS	C	
	0.00	0.00	30	2011 WEAVER BOTTOMS	C	
SMALLMOUTH BASS>5.2 INCHES	7.41	17.86	63	2011 COLD SPRG/BLKHWK/RONKOSKI	A	
	2.37	6.83	86	2011 GOOSE ISLAND/STODDARD	A	B
	0.40	2.19	30	2011 CHIPPEWA RIVER/BIG LK		B
	0.29	1.29	63	2011 AMBRO		B
	0.00	0.00	42	2011 HARPERS		B
	0.00	0.00	30	2011 WEAVER BOTTOMS		B
YELLOW PERCH>4.9 INCHES	27.74	26.43	30	2011 CHIPPEWA RIVER/BIG LK	A	
	21.58	41.08	86	2011 GOOSE ISLAND/STODDARD	A	B
	9.50	12.80	63	2011 AMBRO	C	B
	10.56	25.76	63	2011 COLD SPRG/BLKHWK/RONKOSKI	C	D
	2.99	5.16	30	2011 WEAVER BOTTOMS		D
	1.57	2.97	42	2011 HARPERS		D

TABLE 10. COMPARISON OF MEAN TOTAL LENGTH FOR SELECTED INDIVIDUAL SPECIES, AMONG SIX LAKE UNITS, ELECTRO SHOCKING, FALL 2011.

SPECIES	MEAN	STD. DEV.	N	LAKE UNIT	DIFFERENT (means with the same letter are not Sign. Different)	
BLUEGILL	5.53	1.06	742	2011 COLD SPRG/BLKHWK/RONKOSKI	A	
	5.36	1.31	805	2011 AMBRO	A	
	5.09	1.25	524	2011 HARPERS		B
	4.6	1.95	434	2011 CHIPPEWA RIVER/BIG LK	C	
	4.43	1.69	517	2011 WEAVER BOTTOMS	C	
	3.44	1.72	643	2011 GOOSE ISLAND/STODDARD		D
	4.8	1.65	3665	ALL		
LARGEMOUTH BASS	11.86	3.41	29	2011 HARPERS	A	
	11.12	3.48	352	2011 AMBRO	A	B
	10.3	2.58	595	2011 COLD SPRG/BLKHWK/RONKOSKI		B
	7.56	4.34	413	2011 WEAVER BOTTOMS	C	
	5.27	3.27	673	2011 CHIPPEWA RIVER/BIG LA		D
	4.36	2.94	1434	2011 GOOSE ISLAND/STODDARD		D
	6.67	4.17	3496	ALL		
ROCK BASS	5.46	1.44	46	2011 CHIPPEWA RIVER/BIG LA	A	
	4.90	1.53	23	2011 WEAVER BOTTOMS	A	
	4.87	1.25	62	2011 COLD SPRG/BLKHWK/RONKOSKI	A	
	4.72	1.41	83	2011 GOOSE ISLAND/STODDARD	A	
	4.04	0.42	2	2011 AMBRO	A	
	4.93	1.4	216	ALL		
SMALLMOUTH BASS	8.30	4.66	38	2011 WEAVER BOTTOMS	A	
	7.97	6.35	4	2011 AMBRO	A	
	7.17	4.44	81	2011 GOOSE ISLAND/STODDARD	A	
	6.77	4.66	98	2011 CHIPPEWA RIVER/BIG LA	A	
	6.59	2.82	111	2011 COLD SPRG/BLKHWK/RONKOSKI	A	
	7.00	4.10	332	ALL		
YELLOW PERCH	7.54	2.01	49	2011 WEAVER BOTTOMS	A	
	7.47	2.44	13	2011 HARPERS	A	B
	7.27	1.86	107	2011 AMBRO	A	B
	6.88	1.46	121	2011 COLD SPRG/BLKHWK/RONKOSKI	A	B
	6.48	1.94	498	2011 CHIPPEWA RIVER/BIG LA	A	B
	6.39	1.99	410	2011 GOOSE ISLAND/STODDARD		B
	6.61	1.94	1198	ALL		

TABLE 11. COMPARISON OF QUALITY AND PREFERRED PSS FOR SELECTED SPECIES FROM ALL 2007-2011 LAKE UNITS WHERE COUNT OF STOCK WAS GREATER THAN 29. FALL ELECTRO SHOCKING.

COM_NAME	LAKEUNIT	# OF STOCK	PSS_q	PSS_p
black crappie	2011 AMBRO	60	58.33	26.67
black crappie	2007 AMBRO	70	62.86	17.14
black crappie	2007 GOOSE ISLAND/STODDARD	37	64.86	32.43
black crappie	2007 HARPERS	32	65.63	25.00
black crappie	2007 UPPER POOL 5A	54	88.89	22.22
black crappie	2007 COLD SPRG/BLKHWK/RONK	34	97.06	32.35
bluegill	2010 BLACK RIVER MOUTH	228	5.70	0.00
bluegill	2008 LAKE ONALASKA	279	13.26	0.00
bluegill	2007 HARPERS	266	13.53	1.88
bluegill	2010 BLACK RIVER CHANNEL	574	14.63	0.17
bluegill	2008 BELVIDERE/SPRING LAKE	163	15.95	0.61
bluegill	2007 GOOSE ISLAND/STODDARD	664	16.57	0.45
bluegill	2008 ROBINSON/PETERSON/BEE	322	18.01	0.31
bluegill	2009 LANSING	180	18.89	1.11
bluegill	2007 COLD SPRG/BLKHWK/RONK	382	20.16	1.83
bluegill	2008 GOOSE CARCASS LAKE	238	20.59	1.68
bluegill	2010 CASSVILLE SLOUGH AREA	130	20.77	0.77
bluegill	2011 GOOSE ISLAND/STODDARD	304	21.71	0.00
bluegill	2011 HARPERS	512	24.02	0.59
bluegill	2011 WEAVER BOTTOMS	413	24.94	2.66
bluegill	2008 SNY MCGIL	176	25.00	0.00
bluegill	2009 LAWRENCE/TARGET	299	27.76	1.67
bluegill	2008 TREMPEALEAU LAKES	580	28.45	0.00
bluegill	2010 BUSSY LAKE/GLEN HAVEN	291	29.55	0.00
bluegill	2010 LOWER POOL 5A	263	30.42	1.14
bluegill	2011 AMBRO	787	32.02	2.29
bluegill	2011 COLD SPRG/BLKHWK/RONK	685	34.74	0.15
bluegill	2011 CHIPPEWA RIVER/BIG LA	305	36.72	2.30
bluegill	2007 UPPER POOL 5A	380	38.42	1.58
bluegill	2007 AMBRO	337	39.76	0.89
bluegill	2009 UPPER POOL 6	198	40.91	3.03
bluegill	2007 UPPER POOL 5	237	45.57	0.84
largemouth bass	2011 COLD SPRG/BLKHWK/RONK	430	22.79	7.44
largemouth bass	2007 COLD SPRG/BLKHWK/RONK	395	35.19	5.57
largemouth bass	2011 WEAVER BOTTOMS	184	37.50	17.39
largemouth bass	2011 GOOSE ISLAND/STODDARD	151	39.74	20.53
largemouth bass	2008 LAKE ONALASKA	117	41.88	11.97
largemouth bass	2007 GOOSE ISLAND/STODDARD	584	44.01	11.99
largemouth bass	2007 HARPERS	172	45.35	14.53
largemouth bass	2010 BLACK RIVER CHANNEL	301	45.85	17.94
largemouth bass	2010 CASSVILLE SLOUGH AREA	116	46.55	22.41
largemouth bass	2010 BUSSY LAKE/GLEN HAVEN	31	48.39	29.03
largemouth bass	2008 TREMPEALEAU LAKES	133	51.13	8.27

TABLE 11. (CONTINUED).

COM_NAME	LAKEUNIT	# OF STOCK	PSS_q	PSS_p
largemouth bass	2007 UPPER POOL 5	220	51.36	16.36
largemouth bass	2007 AMBRO	342	57.31	18.71
largemouth bass	2011 AMBRO	259	57.53	21.62
largemouth bass	2007 UPPER POOL 5A	271	58.30	22.88
largemouth bass	2011 CHIPPEWA RIVER/BIG LA	92	60.87	23.91
largemouth bass	2008 SNY MCGIL	229	63.32	20.09
largemouth bass	2010 LOWER POOL 5A	101	63.37	35.64
largemouth bass	2009 LAWRENCE/TARGET	164	70.73	18.29
largemouth bass	2008 ROBINSON/PETERSON/BEE	171	71.35	25.73
largemouth bass	2008 BELVIDERE/SPRING LAKE	128	73.44	25.78
largemouth bass	2009 UPPER POOL 6	166	78.92	24.70
largemouth bass	2008 GOOSE CARCASS LAKE	205	79.02	20.98
largemouth bass	2009 LANSING	108	83.33	22.22
northern pike	2011 CHIPPEWA RIVER/BIG LA	62	14.52	0.00
northern pike	2011 COLD SPRG/BLKHWK/RONK	34	26.47	5.88
northern pike	2010 LOWER POOL 5A	30	30.00	13.33
northern pike	2007 GOOSE ISLAND/STODDARD	33	57.58	15.15
pumpkinseed	2008 LAKE ONALASKA	49	12.24	0.00
pumpkinseed	2011 CHIPPEWA RIVER/BIG LA	43	30.23	0.00
rock bass	2011 COLD SPRG/BLKHWK/RONK	44	9.09	0.00
rock bass	2011 GOOSE ISLAND/STODDARD	54	11.11	0.00
rock bass	2011 CHIPPEWA RIVER/BIG LA	35	17.14	0.00
sauger	2010 CASSVILLE SLOUGH AREA	32	9.38	6.25
sauger	2011 COLD SPRG/BLKHWK/RONK	61	14.75	3.28
sauger	2011 AMBRO	35	77.14	8.57
smallmouth bass	2011 COLD SPRG/BLKHWK/RONK	38	23.68	5.26
smallmouth bass	2007 UPPER POOL 5	35	51.43	25.71
smallmouth bass	2007 GOOSE ISLAND/STODDARD	30	56.67	43.33
smallmouth bass	2011 GOOSE ISLAND/STODDARD	30	63.33	30.00
smallmouth bass	2011 CHIPPEWA RIVER/BIG LA	31	67.74	51.61
smallmouth bass	2008 ROBINSON/PETERSON/BEE	32	71.88	21.88
white crappie	2007 AMBRO	49	81.63	63.27
white crappie	2007 HARPERS	46	91.30	63.04
yellow perch	2009 LAWRENCE/TARGET	210	3.81	0.95
yellow perch	2009 UPPER POOL 6	64	9.38	0.00
yellow perch	2010 BLACK RIVER CHANNEL	185	14.59	2.16
yellow perch	2011 CHIPPEWA RIVER/BIG LA	381	24.41	6.30
yellow perch	2011 COLD SPRG/BLKHWK/RONK	109	25.69	1.83
yellow perch	2011 GOOSE ISLAND/STODDARD	307	28.34	4.89
yellow perch	2010 BUSSY LAKE/GLEN HAVEN	47	34.04	4.26
yellow perch	2008 LAKE ONALASKA	36	38.89	11.11
yellow perch	2011 AMBRO	100	40.00	5.00
yellow perch	2011 WEAVER BOTTOMS	42	47.62	9.52

TABLE 12. RELATIVE ABUNDANCE, MEAN CATCH PER HR, ELECTRO SHOCKING, FALL 2011 AND 2007, CS/BH/RON LAKE UNIT. FIXED RUNS.

SPECIES	2011						2007					
	FREQ.	PERCENT	MEAN PER HR	STND. DEV.	NO. OF RUNS	TOTAL HRS	FREQ.	PERCENT	MEAN PER HR	STND. DEV.	NO. OF RUNS	TOTAL HRS
1 black crappie	2	1.27	3.01	6.73	5	0.601	7	1.16	8.38	11.67	5	0.835
2 bluegill	45	28.48	87.20	66.72	5	0.601	231	38.18	276.65	303.52	5	0.835
3 bowfin	7	4.43	10.74	14.08	5	0.601	5	0.83	5.99	7.33	5	0.835
4 brown bullhead	4	2.53	5.61	5.38	5	0.601	1	0.17	1.20	2.68	5	0.835
5 common carp	1	0.63	1.71	3.82	5	0.601						
6 common shiner	7	4.43	10.74	14.08	5	0.601	1	0.17	1.20	2.68	5	0.835
7 freshwater drum	2	1.27	3.42	7.65	5	0.601						
8 gizzard shad	37	23.42	44.31	99.08	5	0.601	7	1.16	8.38	18.75	5	0.835
9 golden shiner	1	0.63	1.20	2.68	5	0.601	25	4.13	29.94	60.33	5	0.835
10 green sunfish							1	0.17	1.20	2.68	5	0.835
11 green sunfish x bluegill							1	0.17	1.20	2.68	5	0.835
12 largemouth bass	49	31.01	95.54	70.75	5	0.601	312	51.57	373.65	207.76	5	0.835
13 northern pike	1	0.63	1.20	2.68	5	0.601	1	0.17	1.20	2.68	5	0.835
14 pumpkinseed							4	0.66	4.79	7.81	5	0.835
15 spotted sucker	2	1.27	4.69	6.81	5	0.601						
16 walleye	1	0.63	1.71	3.82	5	0.601						
17 warmouth	4	2.53	10.67	19.43	5	0.601	7	1.16	8.38	13.12	5	0.835
18 yellow perch	2	1.27	3.01	6.73	5	0.601	2	0.33	2.40	5.36	5	0.835
ALL SPECIES	158	100.00	274.00	101.69	5	0.601	605	100.00	724.55	372.70	5	0.835