

## **2022 Cross Lake Carp Management Report**

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Cross Lake & Snake River

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### **Summary**

During the summer of 2022, Carp Solutions conducted three boat electrofishing surveys on Cross Lake to estimate common carp (*Cyprinus carpio*) abundance and biomass density. The mean catch rate of carp across the three surveys was relatively low (3.92/h) however, their mean length and weight were high (747 mm, 5.2 kg). Based on the mean catch per hour and mean weight, we estimated that Cross Lake was inhabited by approximately 8,150 carp whose biomass density was 113.7 kg/ha. The biomass was relatively low and it slightly exceeded the recommended management threshold for carp populations (100 kg/ha).

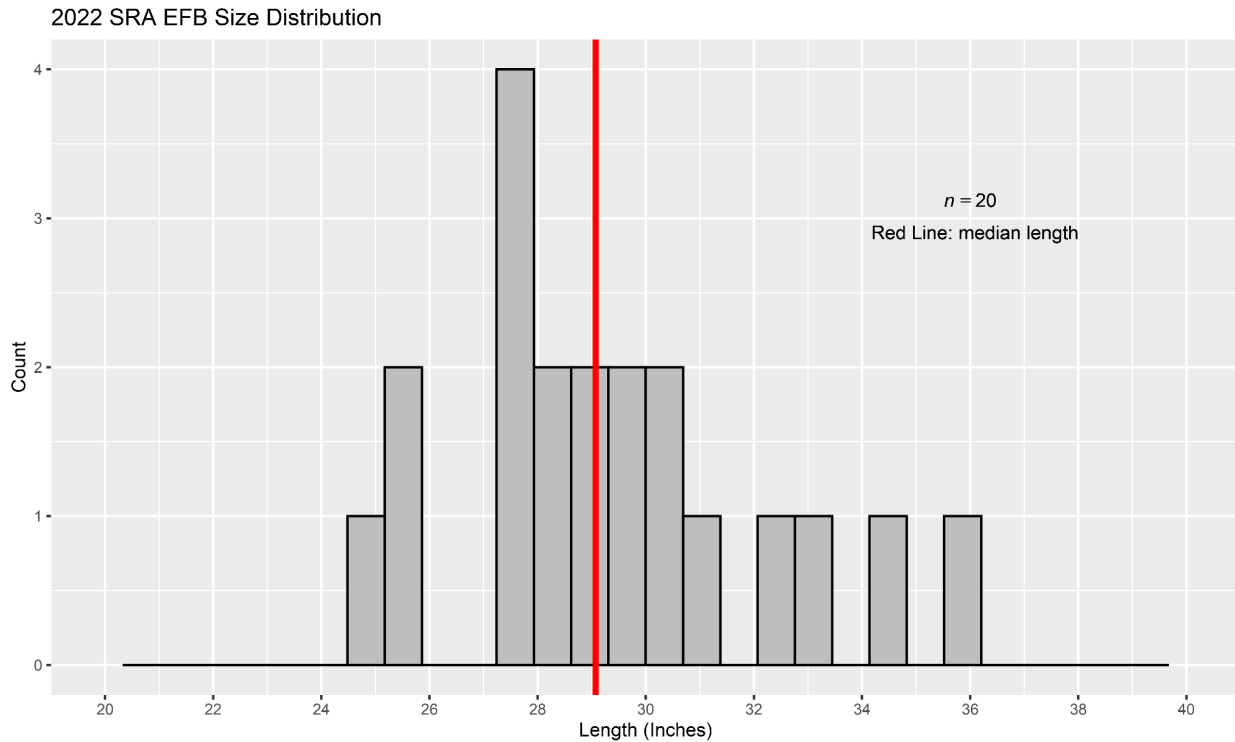
### **Methods and Results**

Carp Solutions performed three boat electrofishing surveys on Cross Lake on August 22, September 1, and September 14 of 2022. Each survey consisted of five transects, each lasting approximately one hour (twenty minutes effective electrofishing time). The transects were conducted along the shore in littoral areas of the lake. When the electric field was applied, stunned fish would float to the surface of the water and carp were collected using dip nets. Other species were identified and noted, but not netted. All collected carp were counted, measured for length, and released back into the water. The length distribution of the carp can be seen in Figure 1.

Between the three electrofishing surveys, twenty carp were collected and measured. Other species observed but not netted included walleye, largemouth bass, smallmouth bass, white bass, black crappie, white crappie, yellow perch, bluegill, green

sunfish, silver redhorse, shorthead redhorse, river redhorse, golden shiner, other various shiners not identified to species, minnows, freshwater drum, northern pike, bowfin, white sucker, quillback, black bullhead, channel catfish, muskellunge, and chestnut lamprey.

The catch-per-unit-effort (CPUE; the number of carp captured per one hour of electrofishing time) was calculated from each survey and used to estimate the abundance and biomass of carp using relationships developed by Bajer and Sorensen (2012). The mean CPUE across the three survey days was 3.98 carp/h, while the mean carp length and weight were 747 mm (29.4 in) and 5.2 kg (11.4 lbs), respectively. Using these values, we estimated the biomass density for common carp in Cross Lake to be 113.7 kg/ha. We estimated the population in the lake to be approximately 8,150 carp. These estimates are shown in Table 1, along with a breakdown of each boat electrofishing survey.



**Figure 1:** Distribution of length (inches) of collected common carp. The vertical red line indicates median length.

**Table 1:** Data for the three boat electrofishing surveys on Cross Lake in the summer of 2022. CPUE stands for catch per unit effort, in units of carp captured per hour of electrofishing.

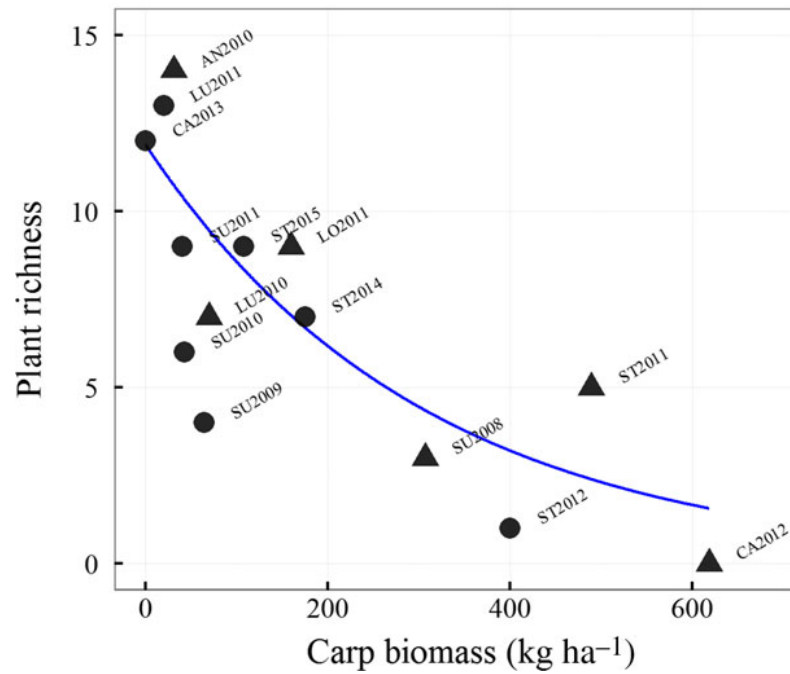
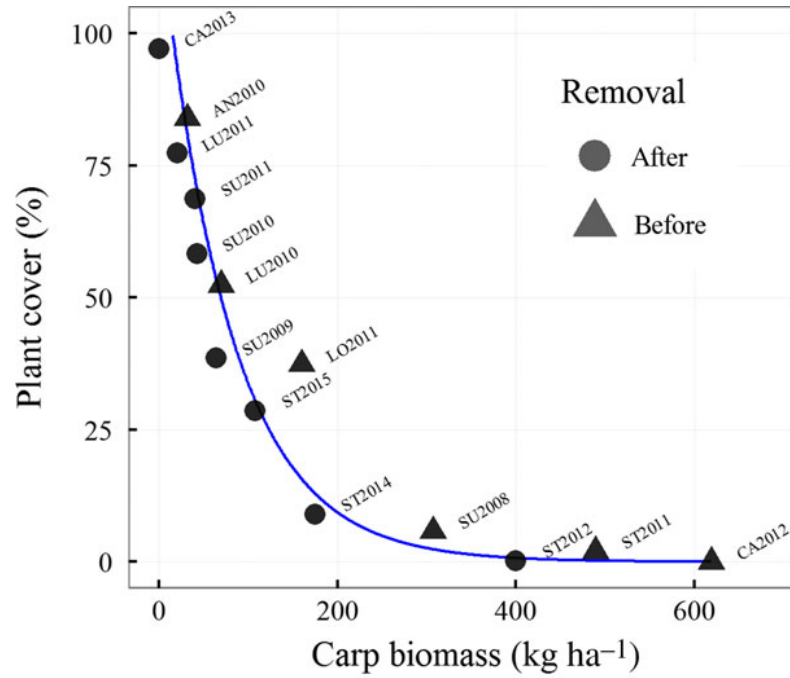
Date	Carp Caught	Time electrofishing (min)	CPUE	Avg. Length (in)	Population Estimate	Biomass Density Estimate (kg/ha)
8/22/2022	2	111	1.19	28.3	3,238	40.4
9/1/2022	8	102	4.76	29.5	9,540	134.4
9/14/2022	10	100	5.97	29.6	11,673	165.1
Average	7	104	3.98	29.4	8,150	113.7
Total	20	313				

### **Discussion and management recommendations**

The estimated common carp biomass density for Cross Lake was 113.7 kg/ha. This is a relatively moderate level, given that carp biomass in lakes across the Midwest often range between 20 kg/ha and 600 kg/ha (Figure 2). It has been shown that carp biomass densities in excess of 200 kg/ha typically have strong, negative effects on lake habitat and water quality (Fig. 2), while biomass densities below 100 kg/ha have only negligible effect on lakes. For management purposes, 100 kg/ha is often used as an acceptable level of carp biomass.

Carp biomass in Cross Lake appears to be slightly exceeding 100 kg/ha. In practical terms, reduction of carp biomass from 113.7 kg/ha to 100 kg/ha may not have a substantial effect on the lake ecology. If further carp management/removal is pursued, we recommend that only the most cost-effective approaches are considered. For example, targeting carp spawning migrations is often cost-effective for moderate to low-biomass populations. However, we are not aware if such migrations occur in Cross Lake. If our estimates are accurate, approximately 700 carp would need to be removed to reduce carp biomass in Cross Lake to 100 kg/ha. However, all biomass estimates are associated with uncertainty, thus this number is approximate and should be verified using mark-recapture analyses once/if removal occurs.

If additional carp removal is conducted, it is expected to have a lasting effect. Most of the collected carp were large and ranged in length between 25" and 36". This suggests that the population is dominated by relatively old individuals and that no significant production of young carp has occurred in recent years. Thus, removal of adults is unlikely to be associated with increased production of young carp. However, further studies may be needed to confirm this hypothesis, as we did not conduct aging analyses of captured carp.



**Figure 2.** Relationship between common carp biomass and aquatic macrophyte cover in the littoral (top) and plant richness (bottom) in small Minnesota lakes. From Bajer et al. 2016.

## **Citations**

Bajer, P. G., & Sorensen, P. W. (2012). Using boat electrofishing to estimate the abundance of invasive common carp in small Midwestern lakes. *North American Journal of Fisheries Management*, 32(5), 817-822.

Bajer, P.G., Beck, M.W., Cross, T.K., Koch, J.D., Bartodziej, W.M. and Sorensen, P.W., 2016. Biological invasion by a benthivorous fish reduced the cover and species richness of aquatic plants in most lakes of a large North American ecoregion. *Global Change Biology*, 22(12), pp.3937-3947.