



Proposal for carp management in Hess Lake

8-7-23

Prepared For: Progressive AE
Attn.: Tony Groves

Prepared by:
Carp Solutions LLC
www.carpsolutionsmn.com

Background

In 2022, Carp Solutions carried out a pilot carp management project on Hess Lake to estimate the carp population and biomass density and test box netting as a removal method. The carp population was estimated to be around 32,000 with a biomass density of about 250 kg/ha, well above the management threshold of 100 kg/ha. While difficulties were encountered for box netting, it did prove to be a viable option that when scaled up significantly could bring the carp population below the management threshold. However, smaller carp were found in the lake, indicating reproduction within the system. Before large scale removals, the reproduction should be studied and prevented in order to ensure that the population does not continue to grow. This proposal lays out the timing and cost for aging carp to understand carp reproduction and implanting and tracking radio telemetry tags to investigate the winter aggregations of carp.

Task 1: Aging

In order to provide information on the reproduction of the carp in Hess Lake, carp should be aged using their otoliths. A sample of 50 carp would be caught by boat electrofishing so that their otoliths could be removed for aging. Any carp collected with previously implanted PIT tags would be released back into the lake to aid in future population estimates. The otoliths would be removed onsite, and the length and weight of the carp they were removed from measured. This would take place over a two day period in the early fall. In the winter of 2023-2024, Carp Solutions would embed the otoliths in epoxy and section them to obtain their age from the annuli of the otolith as seen in the example in Figure 2. This age data will show the history of carp in the system and specifically their pattern of reproduction. If reproduction occurs in pulses, especially corresponding to harsher winters, this generally indicates that carp are primarily reproducing in peripheral waterbodies that winterkill frequently (Bajer et al. 2015). On the other hand, if carp reproduction is consistent, this indicates that micropredators in the system are incapable of controlling the in lake reproduction of carp. Disposal of carp carcasses will be needed either through the use of an onsite dumpster provided by Progressive AE or with the partnership of a local farmer for burial in a field.

Cost for aging: \$13,278



Figure 2: A section of an otolith from a carp from a lake in Minnesota.

Task 2: Implanting radio telemetry tags to test the Judas fish technique

To begin investigating removal techniques for carp, we propose implanting 20 carp with radio telemetry tags on the same trip as carp are collected for aging. Common carp tend to aggregate in large groups as water temperatures fall below 5°C (41°F) (Bajer et al. 2011). These aggregations can be targeted by open water seines in the late fall or early spring or if ice conditions allow, late winter. This method utilizes the "Judas fish" technique, where some carp (~ 20 in lake the size of Hess Lake) are implanted with a radiotelemetry tag. These carp can then be tracked to observe their behavior, especially when they aggregate heavily. The aggregations located in this way can then be netted with a seine net. However, seining may be of limited use if obstacles (large rocks, trees, etc.) are present in areas where carp aggregate as these obstacles can snag the net. Before employing this technique, it would be necessary to implant radio tags in 20 carp in Hess Lake in early fall and track them at least twice during the late fall-early spring to see if they form large aggregations in suitable areas to seine. We propose capturing carp with boat electrofishing and implanting radio tags in 20 carp during the same trip in which otoliths are collected from carp. Drs. Bajer or Hirt would travel out to perform these surgeries. We would then manually track the carp two times during the late fall-early spring (Task 3).

Cost for implanting radio tags: \$16,438

Task 3: Conducting radio telemetry to test the feasibility of the Judas Fish technique

After 20 radio tags are implanted, they need to be tracked manually using telemetry equipment. This should be done once in the late fall (roughly mid-late November and early-mid December) before ice forms, and once more after the ice melts or on the ice in late winter if there happens to be thick enough ice to drive a vehicle on.

Cost for tracking: \$15,500

After a site visit in July of 2023, it was determined that carp can most likely pass over the water control structure at the outlet of Hess Lake towards Brooks Lake. The carp can likely pass both ways, from Brooks Lake and the Muskegon River into Hess Lake, and out of Hess Lake into these waterbodies. In order to control the carp population in Hess Lake, this movement will need to be blocked to prevent migration of carp back into Hess Lake as removals are carried out. The area around the water control structure seems like a suitable place to construct a barrier. This barrier could either be a physical or electrical barrier. A physical barrier would require initial site engineering and constant monitoring and cleaning of floating debris to ensure it does not block water flow, but would require less long term maintenance costs. An electrical barrier would require less initial site engineering, other than the supply of electricity to the control unit, and less monitoring and cleaning of debris, but more long term maintenance costs,

as the electrodes need to be replaced every 5 years. With either barrier, it would be valuable to place PIT antennas on either side of the barrier to monitor its effectiveness, and the timing of carp migrations. It is possible that carp migration is limited in time, possibly a few months in the spring, meaning that either barrier would only need to be used during a portion of the year. Whether the barrier is physical or electrical, it is important to have this barrier operational before large scale removals occur in order to ensure the long term effectiveness of the removals.

Unless the aging analyses and radio telemetry tracking reveal that reproduction is occurring outside of Hess Lake in a major migration that can be blocked and targeted for removal, box netting should be tried in the future as a removal method. Larger scale box netting than occurred in 2022 as regards both the number of nets and the number of times the nets are pulled would be required over multiple years. This netting would need to be preceded by annually implanting carp with more PIT tags. PIT antennas around the bait would be used to fine tune the baiting amounts and timing along with guiding the tripping times for the nets. If the radio tagged carp reveal a significant winter aggregation, seining can be considered as an alternative or additional removal method.

Report

At the conclusion of the carp reproduction surveys, we will provide a written report with management recommendations. The report will be submitted by February 29, 2024, although data from the second tracking survey will likely not be included in this report since it will probably be conducted after this date. So the report will include all data collected to date, and then resubmitted after the data from the final survey is available.

Report Cost: \$1,000

Total cost for project: \$46,216

Detailed budget below

	Hours/D ays	People/ units	Rate per person/unit	Hourly/D aily rate	\$
Task 1: Aging Carp					
Electrofishing					
2 half days of boat					
electrofishing	8	2	100	200	1600
Carp Aging					
2 half days of otolith removal					
(50 Otoliths)	8	2	100	200	1600
Embedding, sectioning, and	16.5	1	100	200	3300

slide interpretation (~20 min/
fish)

Materials 200

Travel Costs

Round Trip Mileage from MN to

Hess Lake 1226 0.625 766

Time for travel round trip from

MN to Hess Lake 22 2 100 200 4400

Per Diem 4 2 64 128 512

Housing 3 2 150 300 900

Task 1 Total: \$13,278

**Task 2: Implanting Radio Tags
in carp**

Electrofishing and surgeries

2 half days of boat

electrofishing 8 2 100 200 1600

2 half days of radio tag

surgeries assistance 8 2 100 200 1600

Radio tag surgeries 2 days

(10/day is max) 16 1 180 180 2880

Radio tags 20 300 6000

Surgery supplies 200

Travel Costs

Time for flying round trip from

MN to Hess Lake 10 1 180 180 1800

Per Diem 4 3 64 192 768

Housing 3 3 150 450 1350

Rental car for Dr. Bajer 240 240

Task 2 Total: \$16,438

Task 3: Radiotelemetry

One tracking survey					
1 day of tracking	8	2	100	200	1600
Travel Costs					
Round Trip Mileage from MN to Hess Lake		1226	0.625		766
Time for travel round trip from MN to Hess Lake	22	2	100	200	4400
Per Diem	3	2	64	128	384
Housing	2	2	150	300	600
Second tracking trip					7750
Task 3 Total:					\$15,500
Report and analysis					\$1,000
TOTAL					\$46,216

Literature cited

Bajer, P. G., C. J. Chizinski, and P. W. Sorensen. 2011. "Using the Judas Technique to Locate and Remove Wintertime Aggregations of Invasive Common Carp." *Fisheries Management and Ecology* 18: 497–505.

Bajer, P.G., Cross, T.K., Lechelt, J.D., Chizinski, C.J., Weber, M.J. and Sorensen, P.W., 2015. Across-ecoregion analysis suggests a hierarchy of ecological filters that regulate recruitment of a globally invasive fish. *Diversity and Distributions*, 21(5), pp.500-510.