2024 Pleasant Lake System Carp Management Report

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Summary

This report covers Carp Solutions' work to manage the common carp population in Pleasant Lake and its connected water bodies in North Oaks, MN in 2024. Backpack electrofishing and some new technology was employed to remove 601 carp migrating up from Pleasant Lake at the barrier at the inlet to Deep Lake. Of these carp, 13 had Passive Integrated Transponder (PIT) tags implanted by Carp Solutions during boat electrofishing surveys, ten from 2019 and three from 2022. Based on the mark-recapture method, the estimated pre-removal carp population (as of fall 2022) in Pleasant Lake was 1,577 (90% CI: 929-2,224) with an estimated biomass density of 44.1 kg/ha (90% CI: 26.0-62.1 kg/ha). After removals in 2023 and 2024, the estimated carp population was lowered to 592 with an estimated biomass density was lowered to 16.5 kg/ha. Additionally, a new potential spawning migration route (Pleasant Lake culvert) was explored using a PIT antenna system, where 7 unique tags were detected. We recommend continuing spring removals at the current Deep Lake site and exploring removal options at the new Pleasant Lake culvert site. Periodic boat electrofishing surveys of the carp population in Pleasant Lake are also recommended.

Methods and Results

Background

In 2019, Carp Solutions conducted boat electrofishing surveys on Pleasant Lake to estimate the carp biomass density and implant PIT tags into the captured carp in order to track their suspected migration through Deep Lake towards Wilkinson Lake. A total of 78 carp were captured, implanted with PIT tags, and released. The data from these surveys indicated that carp biomass density in Pleasant Lake was 273 kg/ha, well above the management threshold of 100 kg/ha. In 2020 and 2021, a PIT antenna was installed in the connecting channel between Deep and Wilkinson Lakes to track the spring migration of carp. In 2020, 71% of the carp tagged in Pleasant Lake in 2019 were detected at this antenna. The following year, 53% of the

tagged carp were detected. This indicated that most of the carp in Pleasant Lake migrated up towards Wilkinson Lake in the spring. Based on this data, a removal of this migration of carp from Pleasant Lake through Deep Lake into Wilkinson Lake was recommended. In the spring of 2022, a barrier was constructed at the PIT antenna site from the previous two years (Figure 1) and 670 carp were removed from this channel, along with an additional 250-300 (minimum estimate based on carcass count) that died of hypoxia in the section below the permanent barrier at the outlet of Wilkinson Lake. The exact number of these carp was unknown, with the estimate being based off of the 246 dead carp that were counted. It is possible that this number was much higher. A follow up summer boat electrofishing survey was conducted in Pleasant Lake, finding a substantially reduced biomass density of 48.9 kg/ha. Based on this success, it was decided to conduct removals in the Deep Lake channel again in the spring of 2023. These removals resulted in 384 carp being removed from the system with ten recaptured PIT tags. During the fall of 2023, it was decided to move the removal site to the inlet to the outlet of Deep Lake to ease removal efforts and increase removal efficiency (Figure 1). Also, during the fall of 2023, five radio tags were implanted in carp captured from boat electrofishing on Pleasant Lake. These were implanted for future tracking efforts.

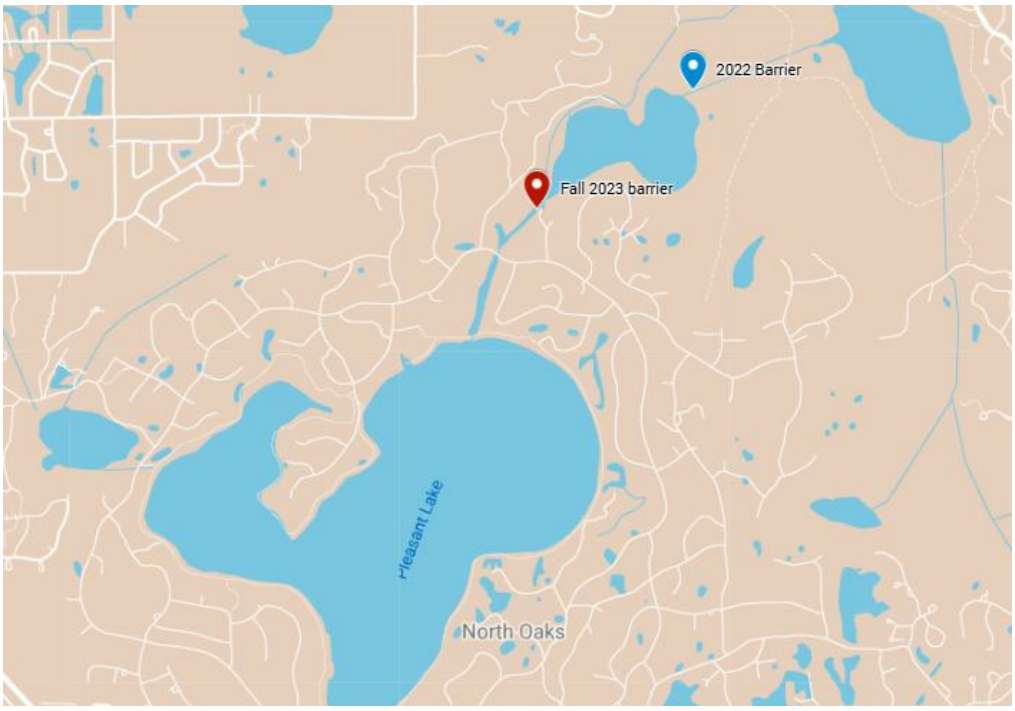

Figure 1: The location of the old and new barriers relative to Pleasant and Deep Lakes

Preparation for removal

Work on the Deep Lake removal site began on March 1st for the 2024 spring removal season. A PIT antenna system was installed in order to help indicate when a removal should be conducted at the site. On March 1st, the barrier was closed in anticipation of the annual spring migration of common carp. This consisted of closing the downstream portion of the trap with ABS pipes and installing a gate on March 15th. This gate could be closed remotely to reduce carp from spooking out of the trap when it was being closed. In addition to this, a C.A.T.C.H

(cellular autonomous tracking and control hub) was incorporated with the gate. This device can monitor carp abundance remotely, notify the user of high carp numbers, and close the gate remotely either autonomously, once a certain number of tags have been detected, or upon receiving a command from the user. This allowed for remote closing of the barrier gate without having to be onsite during peak PIT antenna activity. A remote camera was also installed for further monitoring of the number of carp in the trap at a given time.

Removals

The first PIT tagged carp was detected at the Deep Lake barrier on April 2nd. The first removal occurred on April 11th. Over the course of the removal season, a total of 25 unique PIT tagged carp were detected at the site before the PIT antenna system was uninstalled on June 3rd. Of the 25 tags detected, 13 (52%) were removed. Ten (76.9%) of these tags were originally implanted in 2019 and 3 (23.1%) in 2022. There was a total of 12 removals that occurred over the course of the season during which 601 carp were taken out of the system (Table 1). With a recapture ratio of 1 tag per 46 captured carp and the total carp detected (25 tags), the estimated spawning run in 2024 consisted of 1,150 carp. Based on the percentage of detected tags removed, an estimated 52% of the run was removed. As in previous years, PIT detections occurred in pulses, largely due to variable spring weather (Figure 2). The average length of the sample of 153 measured carp was 32.5 inches (Figure 3). Using the mark-recapture method based on the 2022 tags recaptured, the estimated carp population in the fall of 2022 in Pleasant Lake was 1,577 (90% CI: 929-2,224). The estimated biomass of carp in the lake was 44.1 kg/ha (90% CI: 26.0-62.1 kg/ha). After 985 carp including 4 of the 7 (57%) carp implanted with PIT tags in 2022 were removed in 2023 and 2024, the estimated carp population in June 2024 was 592 carp with a biomass density of 16.5 kg/ha. It is important to note that this estimate is based off of the very small sample of only 7 carp implanted with PIT tags in 2022. Also, none of the five carp that were implanted with radio tags in 2023 were recaptured in the trap.

Table 1. Summary of each removal event by date.

Ifyj	Hfyhm	UNY Wjhfux
946647579	6;	6
946847579	9>	6
946:47579	7:	6
947847579	89	8
947:47579	7	5
:4747579	7	5
:4;47579	8	5
:4<47579	69	5
:4>47579	6;:	9
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Ytyfq	;56	68

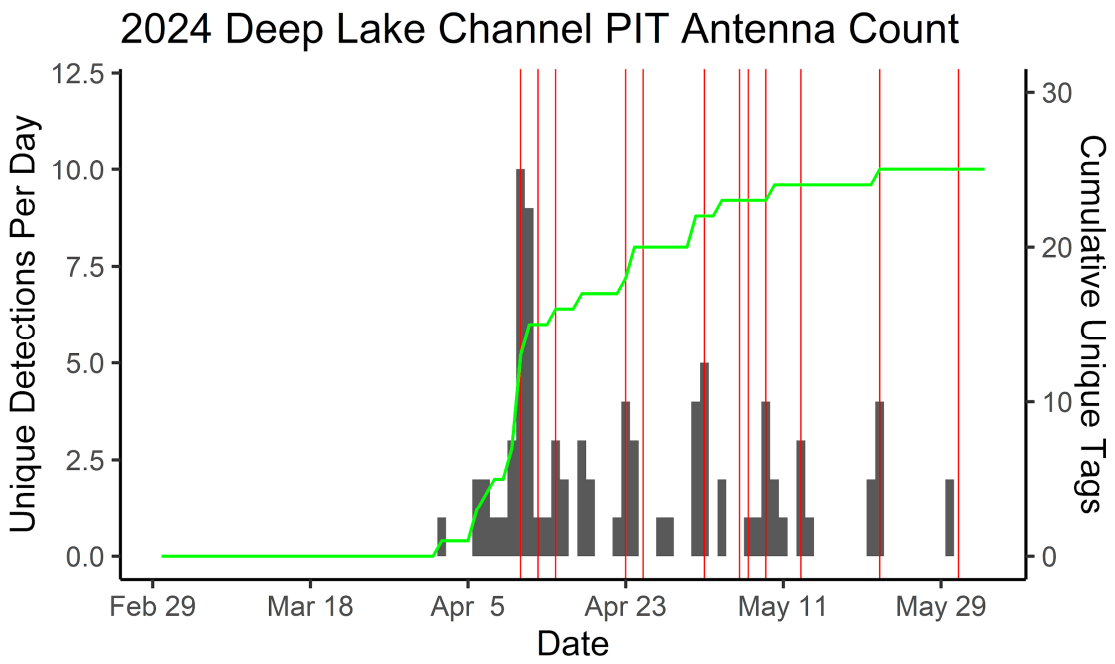

Figure 2: Number of tagged carp detected per day below the barrier when the PIT antenna was installed. The red lines indicate removal days. The green line indicates the cumulative number of unique tags detected through the season.

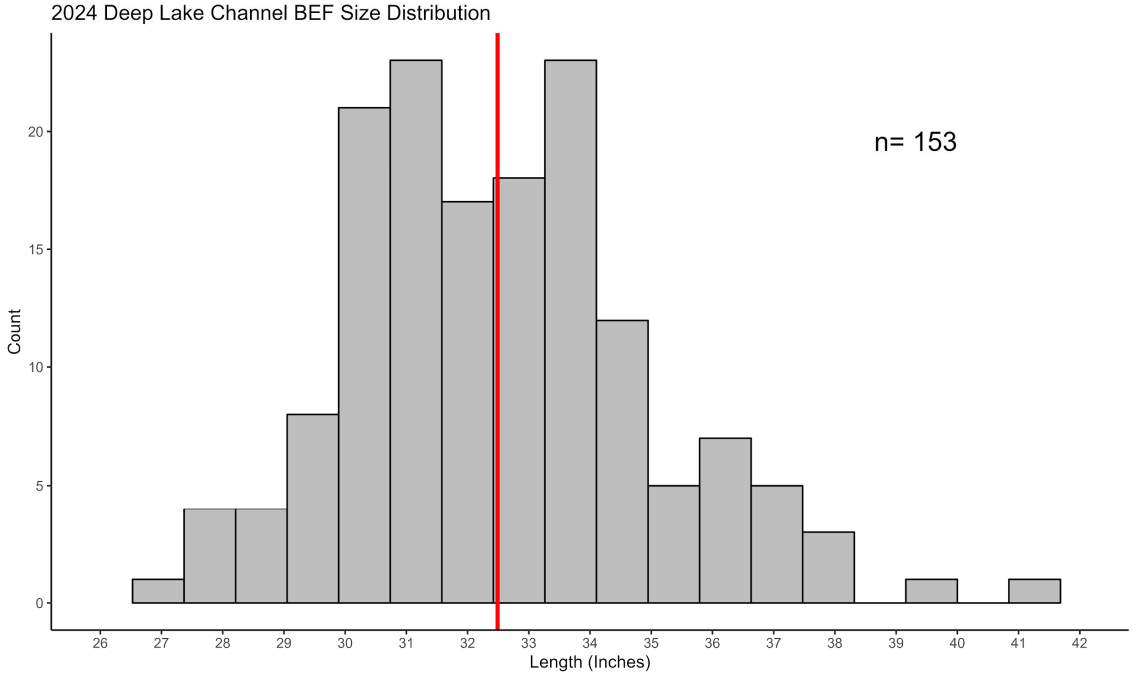

Figure 3: A histogram of the size distribution of carp (n=153). The red line indicates the mean length of 32.5 inches.

Pleasant Lake Culvert

During the removal season of 2024 an additional potential spawning run location was discovered (Figure 4). It was decided to install a PIT antenna system at the location to determine if there were any carp attempting to move through the culvert to spawn. The PIT system was installed on May 9th. The system was left to record detections until July 3rd, when it was uninstalled. During this time a total of 7 unique PIT tagged carp were detected (Figure 5). Since no removals were conducted at this site and therefore no recapture rate was determined, the number of carp that attempted to move into this pond cannot be estimated.

Figure 4. Location of the new Pleasant Culvert PIT system.

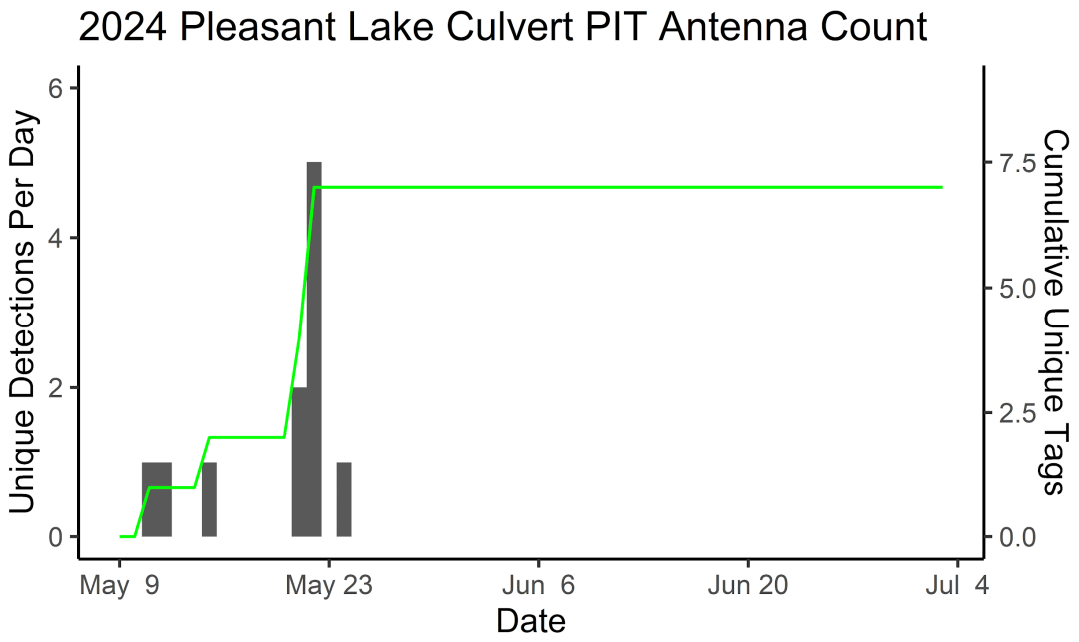

Figure 5. Number of uniquely tagged carp detected per day at Pleasant Culvert PIT site. The green line indicates the cumulative number of unique tags detected throughout the season.

Discussion

Deep Lake Barrier

Spring removal of carp from the Pleasant Lake system was quite successful in 2024 when a total of 601 carp, weighing approximately 9,140 lbs, were removed. From the PIT antenna data, these 601 carp were estimated to represent 52% of the spring spawning run. As in 2022 and 2023, the carp were very large, with an average weight of 15.2 lbs. Unlike in 2022 and 2023, the carp aggregations at the barrier were more sporadic. This could be due to the new site location or the early end of the 2023-2024 winter or the unpredictable weather. Nonetheless, spawning aggregations moving towards Wilkinson Lake have proven easy to capture, with a total of 1,655 carp weighing an estimated 28,742 lbs being actively removed in 2022-2024. In 2022, an additional 250-300 carp were estimated to have died of hypoxia in the pond below the permanent physical barrier at the outlet of Wilkinson Lake, adding an additional biomass of between 4,700-5,500 lbs of carp removed from the population in the Pleasant Lake system. So, the two removal sites have both been productive sites to remove spring migrations of carp.

Removal efficiency has increased with the introduction of new technology as well as the refinement of old technology. The PIT systems and remote cameras continue to be an invaluable asset for monitoring the formation, timing, and size of carp aggregations at barriers. For the removals themselves, we implemented some newly developed technology to trap the carp within the barriers by adapting our C.A.T.C.H system. The gate system tested the previous year proved effective this year in allowing for a reliable method of closing the trap without someone needing to travel to the site. This hands-off method of securing the trap has also lowered the likelihood of spooking carp out of the trap prior to closure. Removal using the backpack electrofishing units and dip nets have continued to be used. The relocation of the site has allowed for easier disposal of the carp due to its proximity to the boat launch on Deep Lake. A portion of the side wall of the barrier has been designed to allow for the temporary removal of the top portion of the wall. This allows for a boat to be anchored on the outside of the trap, where captured carp can be dropped off and then brought to shore for processing. These improvements at the new location have lowered the set up and reset time for removals. Overall, the technological improvements increase our ability to capture and remove the aggregations of the large numbers of abnormally large carp in this system.

Pleasant Lake Culvert:

In addition to the established spawning run that goes through Deep Lake and attempts to enter Wilkinson Lake, a new potential run was discovered in 2024. This run attempts to enter a small pond near Pleasant Lake through a culvert. In order to determine to what extent carp use this route a PIT antenna system was deployed on the lake side of the culvert. While monitoring the site for activity, a temporary barrier was constructed to prevent any carp from spawning in the pond. This barrier was built out of ABS pipes in a similar way to the barrier along the main spring migration path. This site was successful in discovering an additional spawning route for the carp within Pleasant Lake. During the period the PIT antenna system was deployed 7 unique tags were detected. Compared to the main run of carp that consisted of 25 unique tags, it does appear to be a smaller portion of the population. However, due to its deployment later in the removal season, May 9th, there may have been more carp visiting

earlier in the season. Interestingly, two of the tags detected at this new site also appeared at the other Deep Lake barrier site. Both tags were first detected on the Deep Lake PIT system earlier in the spring before then being detected at the Pleasant Culvert site. One of these carp visited both sites within the same day. This indicates that at least a portion of the spawning run has started to explore alternative options to complete their spawning activities. Fortunately, this route was discovered before any noticeable recruitment events could occur. This is likely due to low water levels that did not allow carp movement into the pond. Carp should only be able utilize this route during exceptionally high-water periods. Due to no removals being attempted a true spawning run estimate for this site cannot be determined.

Management Recommendations

Based on our data from the 2024 season, we recommend the continuation of carp removals in the Pleasant Lake system. With the use of the barrier built at the end of 2023, we hope to continue to remove large portions of the spawning run.

Based on the number of detections seen at the newly explored Pleasant Lake culvert site, it is recommended that these carp be targeted for removal as well. We recommend the use of a block net that could be raised to capture carp against shore and the barrier constructed in the spring of 2024. To guide the removals here, we recommend the use of a PIT antenna system near the culvert.

As carp removals continue in the Pleasant Lake system, it is important to continue to survey the carp population in the lake. We recommend a set of boat electrofishing surveys every two to three years to monitor the progress of the removals by periodically estimating the carp population, ensure that there are no carp recruiting into the population in Pleasant Lake, and implanting more PIT and possibly radio tags for tracking seasonal movements of the carp in the system. As in 2019 and 2022, we recommend three separate days of boat electrofishing surveys during July-September of 2025 to accomplish this. Additionally, we recommend that a PIT antenna be installed in the channel between Pleasant and Charley Lakes in 2025 to track any additional migration of carp into Charley Lake.

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.