

## Common carp management in 2020 proposal and cost estimate

February 25, 2020

Prepared for:

Prepared for Bill Bartodziej, RWMWD

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### Objective 1. Electric carp barrier at outlet of West Vadnais Lake

The aim of this objective is to install a low-voltage electric barrier for carp at the outlet of West Vadnais Lake and test its performance using PIT technology for one year. The barrier will be designed and installed in April 2020. Two rows of electrodes will be placed across the stream and connected to a control unit on shore. RWMWD will arrange site preparation and power supply as needed.

Two PIT antennas will be installed near the barrier, one upstream and one downstream. The antennas will be connected to a reader box placed on shore. A solar panel will be used to provide power to the reader box throughout the year. RWMWD will supply a field box to house the equipment.

At least 100 carp will be tagged in West Vadnais Lake with PIT tags by conducting boat electrofishing surveys (2 days). These fish will be tagged shortly after ice out and will be used to determine what percentage of carp attempt to migrate through the barrier, when the migrations occur and whether the barrier is effective. The PIT system will be checked up to 5 times a month during the peak of migration season (April - June) and then up to two times a month through the rest of the year.

\*PIT systems with remote online data access would be \$1,500 more per site.

### Cost for Objective 1

Barrier design and rent	22000
Barrier install	1280
PIT antenna build and install	1500
PIT system monthly check and rental (300/month rental with monthly check, 9 months)	2700
Implanting carp with PIT tags, 2 days of electrofishing	4000
Cost of PIT tags	600
Overall Obj 1	32080

## Objective 2. Documenting movement of carp through Owasso Subwatershed

We will install 4 PIT antenna systems: one between Owasso and Wabasso near the existing barrier, one between Owasso and Victoria Ponds, one between Wabasso and Grass Lake and one between Grass and West Vadnais. The installs will occur in April. At each site we will install a single antenna (two antennas at Owasso/Wabasso one on each side of the barrier) connected to a data logger, batteries and solar panels. RWMWD and VLAMWO will provide appropriate sites for these systems, ideally in a sunny spot, protected from flooding and vandalism.

The PIT systems will continuously monitor carp migration at each site. Once migrations occur, we will attempt to capture the migrating fish using nets placed by the physical barriers. PIT systems will be in place between April 1 and June 30, 2020 and each will be checked on up to 6 occasions per month to ensure the systems are working, and to download the data. This period could be expended as needed.

\*PIT systems with remote online data access would be \$1,500 more per site.

Objective 2 (4 PIT systems)	
PIT antenna build and install, 4 sites	6000
PIT system monthly check and rental April - June (300/month per site rent + 10 checks \$400 each)	7600
Removal of carp around barriers and disposal, backpack EF (3 people, \$80/h each, 5 days)	9600
Overall Objective 2	23200

## Objective 3. Installation of physical barriers

Carp Solutions will assist as needed with installations of physical carp barriers in RWMWD. We will also provide one gas post-pounder.

Objective 3	
Installation of physical barriers (5 days, crew of 2, \$80/h, post pounder included)	6400

## Objective 4. Automated carp net in Phalen chain

We will conduct a demonstration project where a remotely controlled box net and automated programmable feeder will be installed in one location in the Phalen chain during August and September 2020. Carp Solutions will construct and install one 30' x 60' net equipped with

remotely controlled trigger mechanisms. We will also install one feeder and program it accordingly. RWMWD will take care of purchasing the bait and re-filling the feeder (~ once every 4 days) and maintaining the net in good order. Carp solutions will assist with carp removal and disposal on 3 occasions.

The net will be named "Curly" in reference to the most dedicated carp removal enthusiast in the chain of lakes - Curly.

Objective 4	
"Curly" net put together and install (2 people, 5 h, \$80.h)	800
Net and feeder rental (60 days, \$30/day)	1800
setting net, tripping net, carp removal, disposal - 3 times, \$1,500 each	4500
Net removal and cleanup	500
Overall Obj 4	7600

Data analysis, report, coordination \$2,000

Total Budget: \$71,280



## **2020 West Vadnais Lake Carp Management Report**

November 20, 2020

Prepared for: Vadnais Lakes Area Water Management Organization and  
Ramsey Washington Metro Watershed District

Prepared by:

Carp Solutions, LLC  
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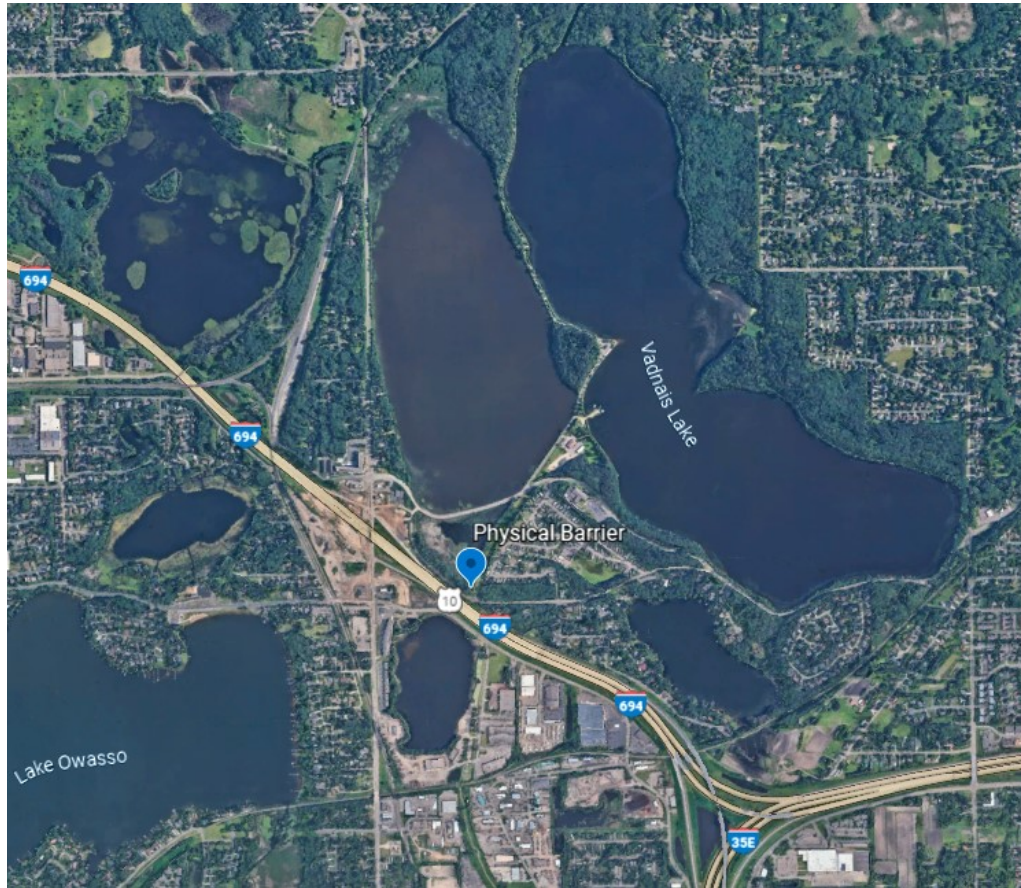
### **Summary**

Before the start of the 2020 season, the carp management plan for West Vadnais was to install an electric barrier in the outlet channel of the lake, mark 100 carp with Passive Integrated Transponder (PIT) tags in the lake, place a PIT antenna near the barrier, and conduct carp removals at the barrier in the spring. The combination of marking carp with PIT tags and removing carp at the barrier while checking for PIT tags would allow for a mark-recapture population estimate to be calculated. Additionally, the PIT antenna at the outlet and potentially at other locations on connected water bodies would show carp seasonal migration patterns, potentially leading to the construction of other barriers and spring removal at those barriers. Unfortunately, the COVID-19 pandemic forced a change in those plans. The electric barrier system became unavailable, so a simple ABS pipe physical barrier was installed instead. The installation of PIT antennas was postponed, with the possibility of continuing the effort in 2021. As the lake warmed up and the carp became active in the shallows of the lake, three electrofishing surveys were conducted in late April to mark carp. A total of 120 carp were caught in these surveys. Because one of them in a later survey was a recapture from a previous survey, only 119 carp were marked with a PIT tag and released. No significant aggregation of carp was seen at the barrier throughout the spring, so no migration removal was attempted. Instead, it was decided to use two box nets to examine the feasibility of removing carp using the box net method while also fulfilling the objective of obtaining a robust carp population and biomass density estimate. Over the course of seven removal attempts between 7/30 and 10/8, 356 carp were removed. A total of 21 marked carp were recaptured during these removals. Based on these recaptures, 18% of the carp population in West Vadnais was removed. The population is estimated to be around 1,950 carp, with a corresponding biomass density of 26 kg/ha.

### **Physical Barrier at lake outlet**

On April 8th, Carp Solutions and Ramsey Washington Metro Watershed District (RWMWD) staff installed a physical barrier at the outlet of West Vadnais lake (see map in

Figure 1). This physical barrier was constructed in a similar fashion to other barriers previously used in the Owasso subwatershed. Wood boards with holes drilled at regular intervals were used to space out ABS and galvanized metal pipes that were pounded 2 feet into the sediment. This barrier was extended up onto shore so that carp could not move around it during high water periods. A picture of this completed barrier appears in Figure 2. RWMWD staff cleared the barrier of debris to allow the water to flow freely and checked for aggregations of carp throughout the spring. No significant aggregations were noticed throughout the spring, so removal of carp at the barrier was not attempted by Carp Solutions.



**Figure 1: Location of the physical barrier at the outlet of West Vadnais Lake**



**Figure 2: Picture of the physical barrier at the outlet of West Vadnais**

### **Electrofishing surveys and marking of carp**

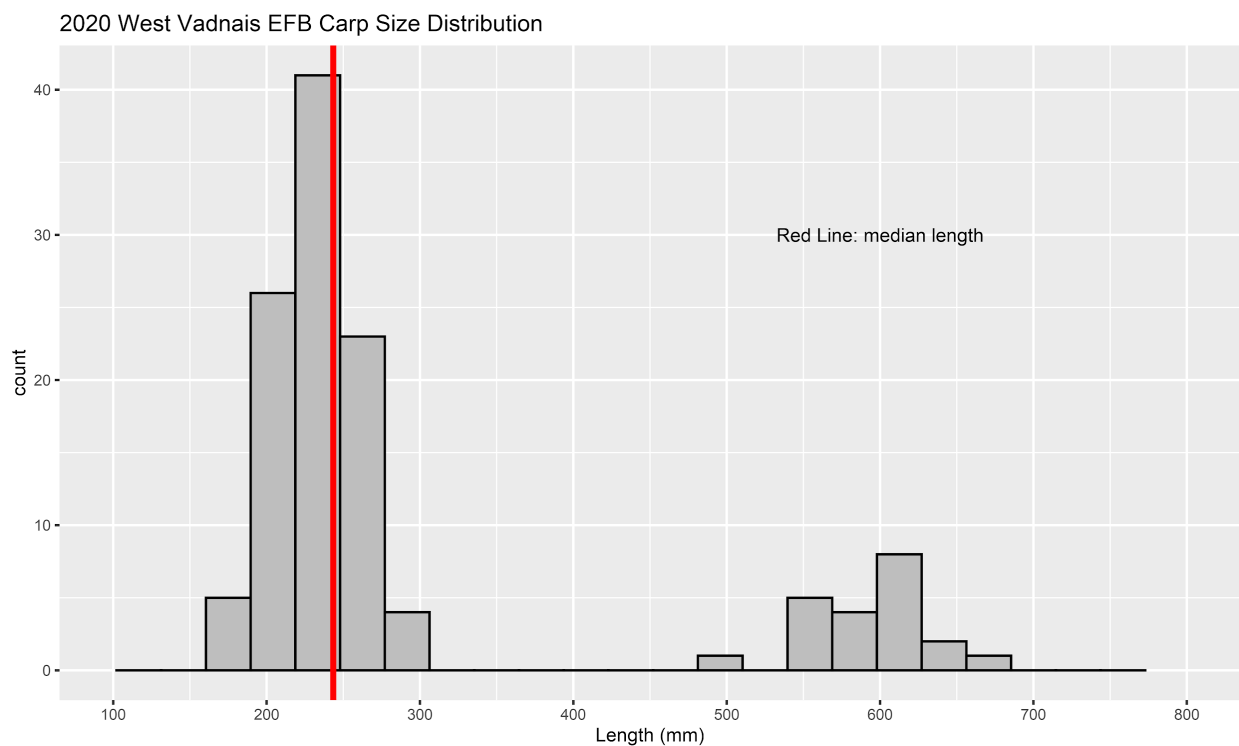
On 4/16, an electrofishing survey consisting of four 20 minute transects was conducted on West Vadnais. No carp were caught, and it was decided to wait until the water warmed slightly. By 4/22, the water had warmed to 10° C, and another survey was conducted. In this survey, and the following two surveys on 4/27 and 4/30, six 20 minute transects were completed. Because the objective was to mark carp and not to use the catch-per-unit-effort (CPUE) data alone to calculate a population estimate, the areas surveyed were not randomly selected, but instead likely areas for carp were selected and successful areas were focused on more heavily. In all three surveys, the water lily rhizomes on the north and south ends of the lake were the most successful. Only a few carp were caught among the trees on the east and west sides of the lake. All captured carp were measured, marked with a left pelvic fin clip and PIT tag, and released. Between the three days, 120 carp were caught. One of the carp caught on 4/30 was a recapture from 4/27. In total, 119 unique carp were marked with a fin clip and PIT tag.

The data from these surveys reveals some interesting characteristics of the carp population in West Vadnais Lake. The catch, average length and estimated average weight (calculated from the length data) are shown in Table 1. The length distribution of carp captured during these electrofishing surveys is shown in Figure 3. Because the length distribution is bimodal, with a large group of carp between 150-300 mm and a smaller group between 500-700, it seems that there are at least two distinct year classes of carp in West Vadnais. The larger, but less common group likely consists of older adults, while the smaller class likely consists of 2-3 year old carp. These different sized groups of carp were not caught evenly throughout the three surveys. Almost all of the large carp were caught in the first survey on 4/22 in the water lily rhizomes in the southwest corner of the lake. Transects in this area during the next two surveys were not as successful and did not capture as many larger carp. This uneven distribution of sizes of carp captured during electrofishing surveys is represented in the boxplot in Figure 4. This uneven distribution of carp catches and sizes affected the population

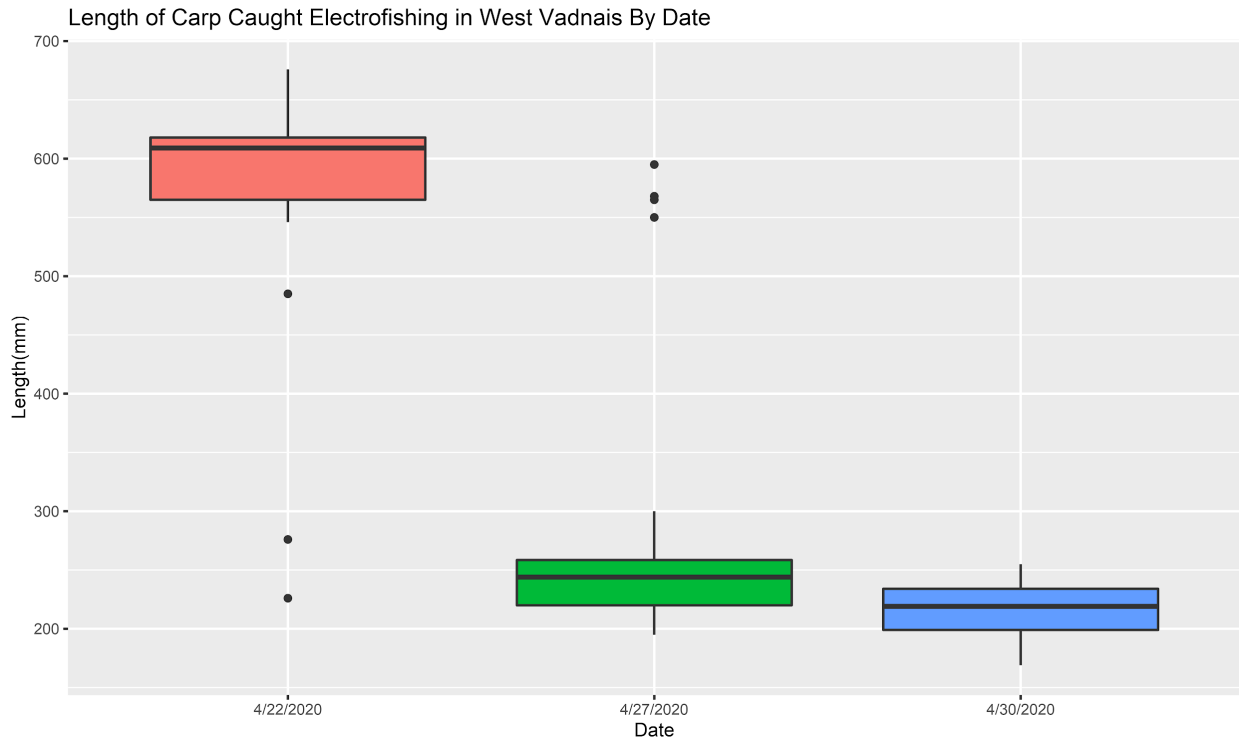
and biomass density estimates, causing the estimates from the three surveys to be very different.

**Table 1: Catch, mean length and estimated mean weight, from the three electrofishing surveys.**

Date	Catch	Avg. Length (mm)	Est. Avg. Weight (kg)
4/22/2020	19	564	2.39
4/27/2020	68	258	0.28
4/30/2020	33	217	0.17
Total:	120		
Average:	40	346	0.95



**Figure 3: size distribution of carp caught during spring electrofishing surveys. This histogram clearly shows a bimodal distribution of carp lengths.**



**Figure 4: Comparison of the sizes of carp captured in West Vadnais by electrofishing divided by date. The first survey primarily caught larger carp, while the second caught mostly small ones, and the final one only caught small ones.**

### Box Net Removals

Between 7/21 and 7/27, two 30 by 60 foot box nets were installed on the east side of West Vadnais Lake (see map in Figure 4). These two nets were positioned along the road on the east side of the lake for easy access. The nets were baited with cracked corn. RWMWD staff regularly checked and refilled the bait at both nets throughout the season. Both nets were first set and pulled on 7/30. Only 7 carp were caught in this first removal effort. In order to increase catch, a PIT antenna was installed around the bait at net 2. This antenna, which has a remote data access feature, allowed for lifting the nets when tagged carp were at the bait to catch more carp. Following that, six more attempts were made. Table 2 shows the results of the seven removal attempts, with catch, recapture, and average length of the carp captured. In total, 356 carp were captured and 21 of the 119 marked carp were recaptured. On few occasions, several tagged carp were present at the bait only minutes before the nets were lifted, but no tagged carp were caught in the net. This suggests that either the carp were spooked by us approaching the nets or that the carp aggregations at the bait are more dynamic in time and space – carp come and go in a more fluid fashion and activating the nets needs to be even more precise. Using larger nets might also help to cover larger area around the bait. Finally, some of the tagged carp were small (< 300 mm) and it is possible that they slipped through our nets. We recommend using smaller mesh nets for future removal efforts.

Of the 21 recaptures, all but two were released so that the tags would continue to be useful. One of these recaptures was recaptured again four days after it had been caught before. Including the release of these carp, 337 total carp were removed from West Vadnais in

2020. As shown in Table 3, the catch was relatively similar between the two nets, although more carp were caught in Net 2 (209) compared to Net 1 (147). Out of the 356 carp caught in box nets, 142 were measured. The size distribution of these carp appears in Figure 5. As with the length distribution from electrofishing in Figure 3, at least two distinct year classes are shown. Interestingly, as shown in Figure 6, the younger year class is much larger from the box nets than the electrofishing (200-300 mm from electrofishing vs. 350-500 mm from box netting).



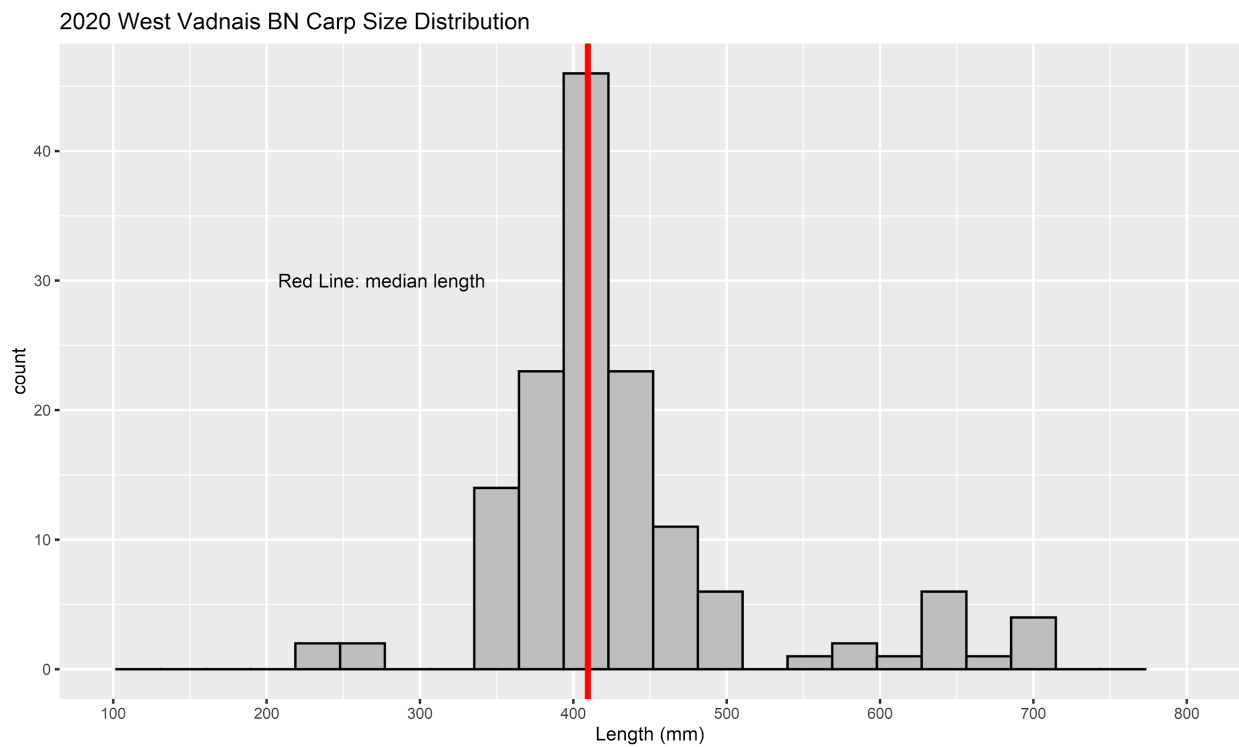
**Figure 4: Map of the two 30 by 60 nets in West Vadnais**

**Table 2: Box netting results by date from West Vadnais Lake. No carp were measured on 9/16**

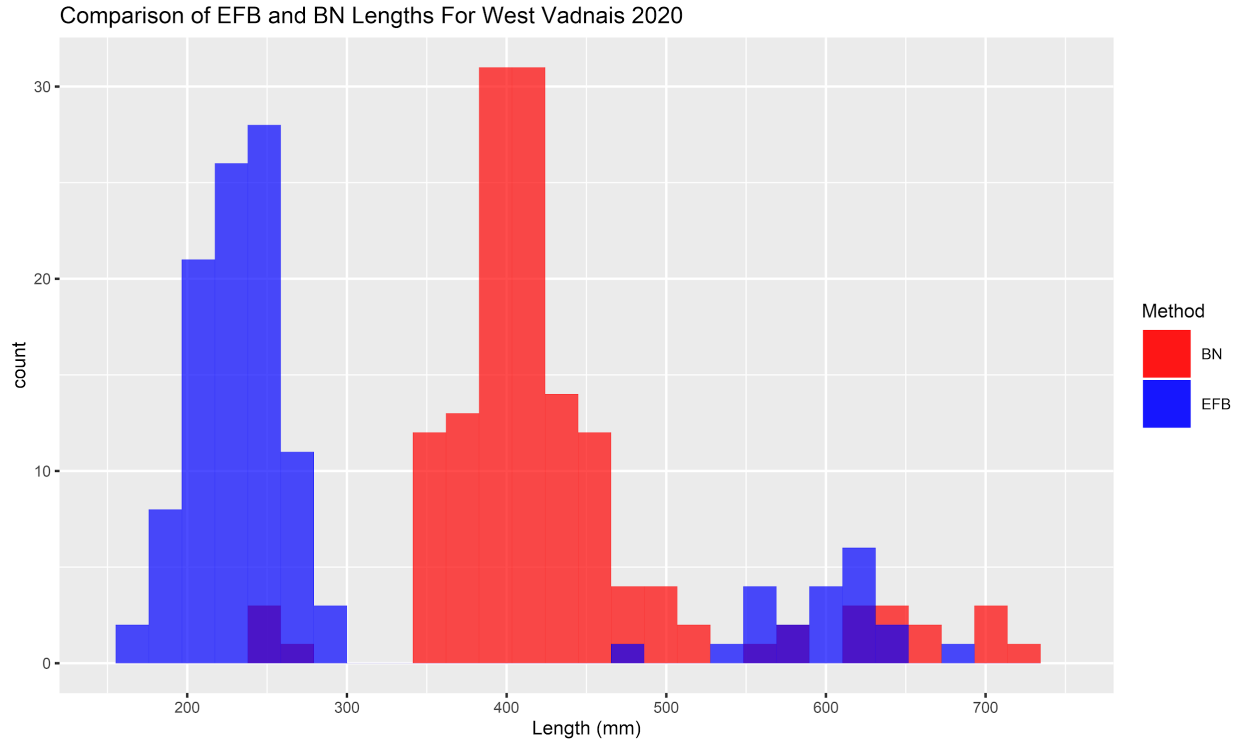
Date	Catch	Recaptures	Average Length (mm)
7/30/2020	7	0	399
8/7/2020	110	6	398
8/11/2020	13	1	396
8/18/2020	44	1	487
8/28/2020	6	0	438
9/16/2020	152	12	NA
10/8/2020	24	1	429
Total:	356	21	
Average:	51	3	425

**Table 3: Box Net catch by site (corresponding to the map in Figure 4) and date.**

	Site	
Date	1	2
7/30/2020	2	5
8/7/2020	1	109
8/11/2020	4	9
8/18/2020	8	36
8/28/2020	5	1
9/16/2020	110	42
10/8/2020	17	7
Total:	147	209
Average:	21	30



**Figure 5: Size distribution of the 142 sampled carp from box netting**



**Figure 6: Overlaid lengths from electrofishing (blue) and box netting (red). This figure shows at least two distinct age classes that grew dramatically from electrofishing in late April until box-netting in late summer.**

### Population and Biomass Density Estimates

From the number of carp marked, recaptured, and caught in box netting, a number of inferences can be made about the carp population. First, the percentage of the population removed can be estimated from the number of recaptures compared to the number marked. Out of the 119 carp marked, 21 were recaptured. This equates to 17.6% of the carp population removed by box netting in 2020. The population estimate from this recapture rate is 1,946 (95% CI: 1,250-2,643). Factoring in the size of the lake and the estimated average weight of the carp, the biomass density of the carp in the lake is 26 kilograms per hectare. Counting the 337 carp that were removed, the population point estimate falls to 1,590 carp and a biomass density of 22 kg/ha.

While these estimates are below the ecological threshold of 100 kg/ha, certain aspects of this population give cause for concern. First, the distinct young year class means that further reproduction in this system could greatly increase the population in this lake or possibly other connected lakes. Second, the rapid growth of this young year class between electrofishing in April and box netting starting in Late July means that the biomass density could increase dramatically because of growth of carp in the lake without any additional reproduction or migration. This rapid growth is shown in Figure 6, with an overlaid histogram showing the differences in distributions between the spring and summer/fall. The young year class grew from around 250 mm to 400 mm. The estimated weight of these carp nearly quadrupled from 0.25 kg to 0.93 kg during this time. This rapid gain in biomass by a group of carp could increase the biomass significantly. Lastly, while examining carp captured in box nets in late summer, we

did observe a handful (<10) of carp that appeared to be age-0. Those carp were ~ 150 mm in length. Thus, it is possible that there is another year class of juvenile carp in West Vadnais Lake. While carp biomass is currently low, it should be monitored in the future.

### **Management Recommendations**

Presence of juvenile/subadult carp in West Vadnais shows that this system could function as a nursery for other lakes, thus we still recommend the installation of the electric deterrence system at the lake's outlet.

The abundance and growth rate of juvenile and subadult carp in West Vadnais should be monitored, possibly using boat electrofishing and reduced (possibly using baited nets) if needed. If baited nets were to be used, more than 2 nets are recommended to target the population more aggressively. Smaller mesh nets should be considered. We expect the biomass to increase given the rapid growth of individual carp observed in 2020.

Other fish species abundance should be assessed. For example, we observed large schools of black bullheads while electrofishing. It is possible that bullheads also contribute to poor water clarity and general lack of vegetation in West Vadnais.

We recommend additional surveys for juvenile carp in adjacent lakes (including Grass Lake) to determine if those systems might also function as carp nurseries. If needed, PIT antennas could be installed between these lakes to monitor carp movement.



## **Proposal for 2021 Common Carp Management**

March 23, 2021

Prepared for:

Bill Bartodziej, RWMWD

Dawn Tanner, VLAWMO

Prepared by:

Carp Solutions, LLC

### **Objective 1: Electric carp barrier at outlet of West Vadnais Lake**

After the COVID-19 pandemic put the plan to install an electric barrier at the outlet of West Vadnais Lake on hold in 2020, a physical pipe barrier was constructed. The aim of this objective is to replace this barrier with the originally planned low-voltage electric barrier for carp at the outlet of West Vadnais Lake and test its performance using Passive Integrated Transponder (PIT) technology for one year. The barrier will be designed and installed in April 2021. Two rows of electrodes will be placed across the stream and connected to a control unit on shore. RWMWD will arrange site preparation and power supply as needed.

Two PIT antennas will be installed near the barrier, one upstream and one downstream. The antennas will be connected to a reader box placed on shore. RWMWD will supply two field boxes to house the equipment. This system will not have the ability to check data online.

The PIT system will be checked once a week during the peak of migration season (April - June) and then once a month through the rest of the year. Because this system will be checked so frequently in the spring, the monthly rental fee goes from \$300 to \$500.

Cost for Objective 1:

Barrier design and rent	\$22,000
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Barrier install	\$1,280
PIT antenna build and install	\$1,500
PIT system monthly check and rental (\$500/month rental April-June, \$300/month July-October)	\$2,700
Overall Objective 1	<b>\$27,480</b>

## **Objective 2: Removal of carp near pipe barriers in Owasso subwatershed**

Because removal of carp at pipe barriers has proved to be a cost effective management strategy in the Owasso subwatershed, we propose continuing that in 2021. As in previous years, this work would be in coordination with RWMWD staff, with at least two RWMWD staff and two Carp Solutions each time. Carp Solutions will bring and operate a backpack electrofishing unit, dip nets, and euthansia equipment. In order to more effectively remove carp at the pipe barriers, we propose adding PIT antennas with remote access at locations that carp were successfully removed in previous years. These antennas would be placed at the barriers on the side of the barrier that carp have been observed congregating. Because large numbers of PIT tags have already been implanted in several lakes in the Owasso subwatershed, no new electrofishing is needed to implant additional PIT tags. We propose installing a PIT antenna system on the Owasso Lake side of the current barrier at the Owasso Lake outlet, where it flows into Wabasso Lake. The other PIT antenna system would be installed in Owasso Lake inlet. These antennas would be installed in late April and run through June (2 months). These systems will allow us to monitor carp movement in real time so that we can react quickly (e.g. deploy people in early morning before fish leave or people disturb them).

Cost for Objective 2:

Removal at barriers with backpack (5 days, 2 people, 6 hr per removal)	\$4,800
Carp disposal (2 hr per removal, 2 people, 5 days)	\$1,600
2 PIT antenna systems for spring migrations (2 months) including design, build, installation, data monitoring and analysis, data updates to client (\$2,500 each)	\$5,000
Objective 2 Total	<b>\$11,400</b>

### **Objective 3: Construction of barrier between West Vadnais Lake and Grass Lake, monitoring, and removal of carp**

In order to remove as many carp as possible from Grass Lake, we propose building a physical pipe barrier in the channel between Grass and West Vadnais Lakes. This barrier would use the same general design as the current physical barriers in the Owasso Subwatershed and the outlet of West Vadnais, namely 1.5" ABS pipes pounded into the sediment and spaced out in drilled 2x4 boards. A full barrier will be installed at the culvert and a partially open barrier will be installed ~ 100 feet down the channel towards Grass Lake which will be used to temporarily block the carp between the two barriers so that they can be removed by a crew with a backpack electrofishing unit. We would also install a PIT antenna system at the barrier to track the movement of carp around this barrier to inform us when and how many migrate and when to remove them. This PIT antenna system would be checked daily online and once a month on site, and run from April 1 - June 30. Because carp in both Grass and West Vadnais Lake were implanted with PIT tags in 2020, the movement of carp from both systems can be tracked.

Cost for Objective 3:

Barrier drill, build and install (8 hr 2 people)	\$1,280
Barrier materials ~ 200 pipes, misc	\$1,200
1 PIT antenna system for spring migrations (2 months) including design, build, installation, data monitoring and analysis, data updates to client	\$2,500
Removal at barrier with backpack (3 days, 2 people, 4 hours)	\$1,920
Carp Disposal (2 hr per removal, 2 people, 3 days)	\$960
Objective 3 Total	<b>\$7,860</b>

### **Objective 4: Removal at US 61 Barrier**

We will provide a crew of 2 for 8 hours of carp removal with a backpack electrofisher and hand nets at the US HWY 61 barrier. This will be planned as two 4-hour days including travel and setup.

Cost for Objective 4:

Removal at barriers with backpack (2 days, 2 people, 4 h each time)	\$1,280
Carp disposal (2 h each time, 2 people, 2 days)	\$640
Objective 4 total	<b>\$1,920</b>

## Objective 5: Carp population management in Bennett Lake

Box netting proved to be an effective removal strategy for carp in Bennett Lake in 2020. Thus, we recommend continuing and expanding this effort in 2021. In order to maximize catch in box nets, we propose using a PIT antenna in one of the nets to optimize the time at which the nets are tripped. To use this antenna, carp need to be implanted with PIT tags before netting. If an accurate population estimate is desired, carp could be captured by boat electrofishing and implanted with PIT tags. However, if the main focus of management in this lake is removal, we recommend tagging a sample of 50 carp from the first box net pull. The cost of electrofishing could thus be transferred to add an additional box net pull and remove more carp overall. This sample would be split as evenly as possible between the nets. Because this method biases the marking, these marked carp would not be able to be used to estimate the population in the lake. In June, two 30'x60' box nets will be installed at Bennett Lake. RWMWD staff will be responsible for baiting these nets with cracked corn and continually removing aquatic vegetation from within the nets. These two nets will be pulled 5 times before being removed from the lake.

### Cost of Objective 5:

Box net install (4 people, 4 h)	\$1,280
50 PIT Tags	\$85
Setting net, tripping net, carp removal, disposal - 5 times, \$1,500 each	\$7,500
1 PIT antenna system for the summer including design, build, installation, data monitoring and analysis, data updates to client	\$2,500
Box net uninstall (4 people, 4 h)	\$1,280
Objective 5 Total	<b>\$12,645</b>

Data analysis, report, coordination \$2,000

Total Budget: \$63,305