

2020 THREATENED AND ENDANGERED FISH SURVEY OF EAST LOON LAKE AND WEST LOON LAKE LAKE COUNTY, ILLINOIS

**PREPARED BY THE
LAKE COUNTY HEALTH DEPARTMENT**

Ecological Services

ENVIRONMENTAL HEALTH SERVICES

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Libertyville, Illinois 60048

In 2020 the Lake County Health Department-Ecological Services (LCHD-ES) conducted threatened and endangered fish surveys on East Loon Lake and West Loon Lake. The purpose of this survey is to evaluate the effectiveness of active in-lake management in accordance with the Loon Lakes Management Association's (LLMA) authorization for the incidental take of the State threatened Banded Killifish (*Fundulus diaphanus*), the State threatened Starhead Topminnow (*Fundulus dispar*), State threatened Blackchin Shiner (*Notropis heterodon*), the State endangered Blacknose Shiner (*Notropis heterolepis*), the State endangered Pugnose Shiner (*Notropis anogenus*), the State threatened Iowa Darter (*Etheostoma exile*), and the State threatened Mudpuppy (*Necturus maculosus*) in pursuant of the Illinois Endangered Species Protection Act (520 ILCS 10/5.5).

The lakes are managed by the Loon Lakes Management Association (LLMA) and are used for boating, fishing, swimming, and aesthetics. LLMA receives funding through the Special Service Area Eight (SSA8) tax district. The money is used for management and protection of the lakes and the surrounding watershed. There is a memorandum of agreement between LLMA and the Lake County Health Department-Environmental Services (LCHD-ES) that stipulates specific requirements of the association. Any management that uses SSA8 money has to go through an Illinois Department of Natural Resources (IDNR) consultation. As part of the consultation process, LLMA was asked to conduct a survey on the endangered and threatened fish within the lake and also create a five year conservation plan outlining the anticipated management. A fish study was completed in 2009 by EA Engineering, Science, and Technology and the conservation plan was written in 2010 by Hey and Associates. The Illinois Department of Natural Resources (IDNR) issued the three year Incidental Take Authorization (ITA) in April 2012. Activities that have been funded through the SSA8 include aquatic plant management, boat launches, shoreline stabilization, and dredging. The IDNR identified aquatic plant management of the exotic invasive plant Eurasian Watermilfoil as the lake management activity that is most likely to directly impact the listed species. The Illinois Endangered Species Act (ESA) prohibits the "take" of listed species through direct harm or habitat destruction. Current Eurasian Watermilfoil control measures include 2-4D herbicide applications on East Loon Lake and mechanical harvesting on both East Loon Lake and West Loon Lake. If after three years of active in lake management no adverse impacts to the listed species of concern are recorded, the IDNR may work with LLMA to extend the ITA for a greater length of time (i.e. 5 years, 10 years, etc). LLMA did not apply aquatic herbicide in 2020.

LAKE COUNTY HEALTH DEPARTMENT ENVIRONMENTAL SERVICES

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LAKE FACTS

Lake Name:	East Loon Lake
Historical Name:	Loon Lake
Nearest Municipality:	Village of Antioch
Location:	T46N, R10E, Sections 16 and 21
Elevation:	772.15 feet mean sea level
Major Tributaries:	Sun Lake Drain and West Loon Lake
Watershed:	Fox River
Sub-watershed:	Sequoit Creek
Receiving Waterbody:	Lake Marie – Fox River Chain O Lakes
Surface Area:	178.4 acres
Shoreline Length:	5.65 miles
Maximum Depth:	24.05 feet
Average Depth:	6.8 feet
Lake Volume:	1146.10 acre-feet
Lake Type:	Glacial
Watershed Area:	5258.9 acres
Major Watershed Land Uses:	Single Family, Public and Private Open Space, Forest and Grassland, and Agriculture
Bottom Ownership:	LCFPD, Private
Management Entities:	Loon Lakes Management Association
Current and Historical Uses:	Fishing, hunting, swimming, and boating
Description of Access:	Private; Public may access through West Loon Lake for a fee

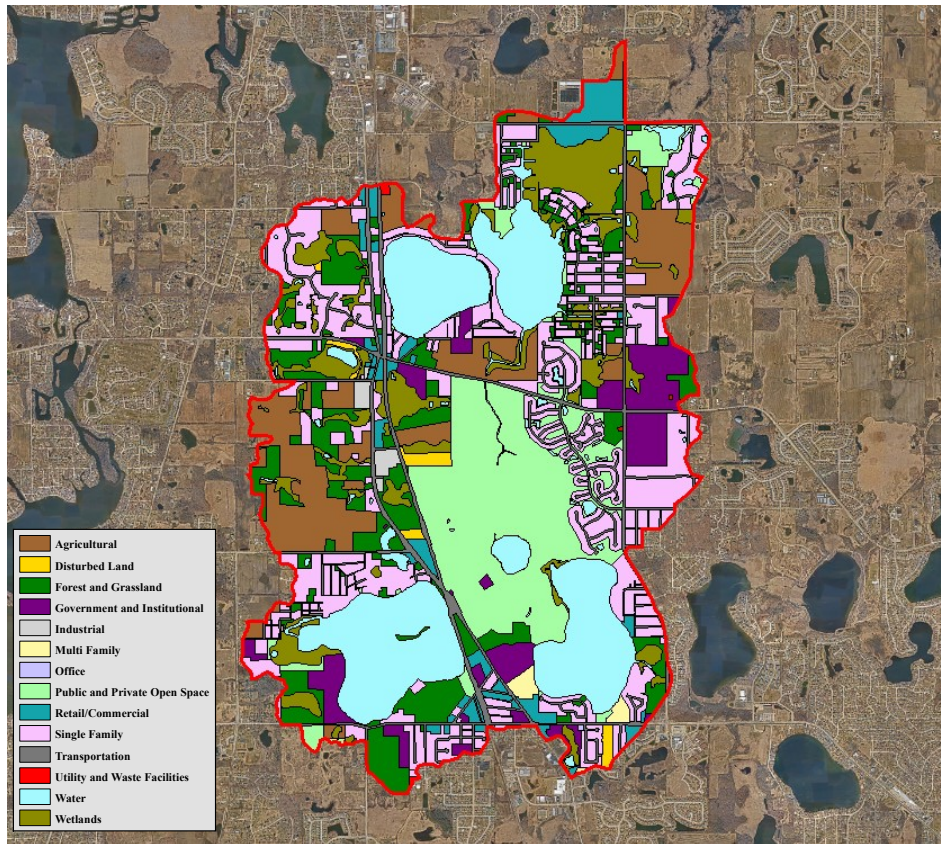
LAKE FACTS

Lake Name:	West Loon Lake
Historical Name:	Loon Lake
Nearest Municipality:	Antioch
Location:	T46N, R10E, Section 20 and 21
Elevation:	772.7 feet mean sea level
Major Tributaries:	None
Watershed:	Fox River
Sub-watershed:	Sequoit Creek
Receiving Waterbody:	East Loon Lake
Surface Area:	166.2 acres
Shoreline Length:	2.41 miles
Maximum Depth:	38.65 feet
Average Depth:	14.8 feet
Lake Volume:	2459.99 acre-feet
Lake Type:	Glacial
Watershed Area:	1135.8 acres
Major Watershed Land Uses:	Single family, forest and grassland, and agriculture
Bottom Ownership:	LCFPD, private
Management Entities:	Loon Lakes Management Association
Current and Historical Uses:	Fishing, hunting, swimming, and boating
Description of Access:	Private (public may access for a fee)

LAKE BACKGROUND

East Loon Lake and West Loon Lake are listed as ADID (advanced identification) wetlands by the U.S. Environmental Protection Agency and an Illinois Natural Areas Inventory (INAI) by the state of Illinois. This indicates that the lake and surrounding natural environments have potential to have high quality aquatic resources based on water quality and hydrology values. East Loon Lake and West Loon Lake are 188-acre and 166-acre glacial lakes, respectively, located in unincorporated Lake County. East Loon Lake is near the bottom of the Sequoia Creek Watershed and receives inputs from the Sun Lake Drain and from a channel that connects West Loon Lake. The Sun Lake Drain includes Cedar Lake, Deep Lake, and Sun Lake. East Loon Lake drains north by Sequoia Creek into Lake Marie and eventually to the Fox River (Figure 1).

FIGURE 1. EAST AND WEST LOON LAKE WATERSHED



THREATENED AND ENDANGERED FISH SURVEY

- 2009 EA Engineering , Science, and Technology Survey of State-Listed Fishes from East and West Loon Lakes.
- 2012 Lake County Health Department Ecological Services submitted a Threatened and Endangered Fish Survey (1).
- 2013 Lake County Health Department Ecological Services submitted a Threatened and Endangered Fish Survey (2).
- 2014 Integrated Lakes Management (ILM) submitted a Threatened and Endangered Fish Survey (3).
- 2017 Deuchler Environmental Inc. submitted a Threatened and Endangered Fish Survey.
- 2020 Lake County Health submitted a Threatened and Endangered Fish Survey.

METHODS AND MATERIALS

The fish survey of East and West Loon Lake was conducted using two gear types; a 30-foot long bag seine with 1/8-inch mesh and a mechanical weed harvester. Two 30-foot seine hauls were conducted at each location ranging in depth from 1 to 3 feet on West Loon Lake and 1 to 4 feet on East Loon Lake. Seining locations were kept consistent with the 2009 T&E fish survey conducted by EA Engineering, Science, and Technology to allow for comparisons of populations over time. There are 5 seine locations on East Loon Lake and 7 seine locations on West Loon Lake. These locations were selected based on the preferred habitat of the target species: low turbidity, diverse abundant aquatic vegetation, and sand, gravel substrates.

Concurrent with the 2009, 2012 and 2013 incidental take survey during mechanical aquatic plant harvesting was assessed. A 10-foot straight seine with 1/8 inch mesh was placed on the grate in the aquatic plant collection area of the harvester to reduce the loss of catch in the sample. All aquatic plants that were harvested during each run were examined for fish. There were six observed harvest routes on East Loon Lake varying in distance from 556 to 1062 feet and in duration 15 to 25 minutes. Three harvest routes were analyzed on West Loon Lake with distances ranging from 774 to 1373 feet and 15 and 30 minutes in duration. All adult fish collected by both gear types were identified to species. Catch per unit effort (CPUE) was calculated for each site and run to measure relative abundance.

In an effort to empirically measure fish population diversity Margalef's index was calculated. The index allows for comparisons to be made among sample sites and lakes. Margalef's index does not take into account species richness, by assuming that all species are equal. The higher the index values the greater diversity of species present.

Seine catch per unit effort was calculated using the estimated 30 foot long seine hauls and length of the seine.

Catch per unit effort for the seine was expressed as:

$$N/A$$

Where N= number of fish sampled

A= estimated area (m²)(distance x seine length sampled)

Catch per unit effort for the aquatic plant harvester was expressed as:

$$N/d$$

Where N=number of fish captured

d=distance harvested (m²)(distance harvested x harvester cutting width)

RESULTS

Efforts to characterize the fish species of concern present in East Loon Lake and West Loon Lake were conducted by separately analyzing the catch of the different sampling gear (seine and harvester). Large adult fish are usually captured by electro-fishing, and were analyzed by the IDNR 2012 fish supplemental survey. Seines are designed to capture smaller adult species, such as the fish species of concern, and all young of the year fish. Similar to seines, the aquatic plant harvester picks up smaller fish species as larger fish may avoid or swim away from the harvester.

RESULTS

EAST LOON SEINE

The use of a 10-m bag seine resulted in the capture of 208 individuals in a total estimated area of 1000 m² (Table). This equals a catch per unit effort of 0.21 fish/m² sampled. Sixteen species were collected using this gear. Bluegill were the most abundant species representing 60.6% of the total catch. Other common species included Largemouth Bass, Pumpkinseed and Banded Killifish which accounted for 8.7%, 8.2% and 5.3% of the total catch, respectively. The five seine locations resulted in a 0.03 fish/m² catch per unit effort, for species of concern. A total of 19 T&E individuals were collected, including Banded Killifish (11) Starhead Topminnow (7) and the Iowa Darter (1), Table 1). The East Loon Lake seining value for Margalef index was 6.47. Seine locations 4 and 3 had the most diverse fish populations with Margalef index values of 3.79 and 3.89, respectively. Seine locations 4 and 5 had the most T&E individuals, 5 and 8, respectively. Seine locations 4 and 3 had dense diverse aquatic plant communities with low Eurasian Watermilfoil populations, while seine location 1 had lowest density and diversity of the aquatic plant and fish community. This was a significant change from 2017 when eighty-five T&E individuals from four species were collected. Aquatic plant density was observed to be much lower in East Loon Lake during the 2020 survey.

Table 1. East Loon Lake Seine 2020

<u>Fish Data</u>	<u>1ES</u>	<u>2ES</u>	<u>3ES</u>	<u>4ES</u>	<u>5ES</u>	<u>Lake</u>
Total # of Individuals	10	47	51	90	10	208
Area Sampled (m ²)	200	200	200	200	200	1000
Catch per Unit Effort	0.05	0.24	0.26	0.45	0.05	0.21
Total # of Species	4	8	5	8	4	16
Total # of T&E Species	0	2	1	2	2	3
Total # of T&E Individuals	0	4	2	5	8	19
Catch per Unit Effort of T&E	0.00	0.02	0.01	0.03	0.04	0.03
Margalef Index	3.00	4.19	2.34	3.58	3.00	6.47

EAST LOON HARVESTER

Aquatic plant harvesting conducted by the LLMA resulted in the capture of 7 individuals from a total estimated harvested area of 1551.7 m² on East Loon Lake (Table 2). The total distance harvested was 1018 ft. This equals a catch per unit effort of 0.01 fish/ m² harvested. One bluegill was collected by the harvester. The Margalef index was 0 for the East Loon Lake harvester. LLMA Harvester runs 8 and 5 had the most incidental take with 7 and 1 fish respectively. The four harvester runs resulted in a 0.01 fish/ m² catch per unit effort, for species of concern. No T&E individuals were collected during harvesting. Actual cutting of aquatic plants on East Loon Lake during the 2020 harvester assessment was minimal; due to significant reductions in Eurasian Watermilfoil. Aquatic herbicide treatment was applied by different homeowners association in 2020 had reduced the overall aquatic plant density in East Loon Lake.

Table 2. East Loon Lake Harvester 2020

<u>Fish Data</u>	<u>5EH</u>	<u>6EH</u>	<u>7EH</u>	<u>8EH</u>	<u>Lake</u>
Total # of Individuals	1	0	0	6	7
Catch per Unit Effort	0.01	0.00	0.00	0.05	0.01
Total # of Species	1	0	0	1	1
Total # of T&E Species	0	0	0	0	0
Total # of T&E Individuals	0	0	0	0	0
Catch per Unit Effort of T&E	0	0	0	0	0
Margalef Index	0.00	0.00	0.00	0.00	0.00

RESULTS

WEST LOON SEINE

The use of a 10-m bag seine resulted in the capture of 1377 individuals in a total estimated area of 1400 m² (Table 3). This equals a catch per unit effort of 0.98 fish/m² sampled. Fourteen species were collected using this gear. Bluntnose minnow were the most abundant species representing 59.4% of the total catch. Other common species included Bluegill and Largemouth Bass present at 7.8% and 6.8%, respectively. The seven seine locations resulted in a 0.10 fish/m² catch per unit effort, for species of concern. A total of 145 T&E individuals were collected, including Banded Killifish (73), Blackchin Shiner (48), Blacknose Shiner (21), and Starhead Topminnow (3). Seine locations 1, 2 and 4 had the most diverse fish populations with Margalef index values of 3.44, 4.21 and 3.39 respectively.

Table 3. West Loon Lake Seine

Fish Data	<u>1WS</u>	<u>2WS</u>	<u>3WS</u>	<u>4WS</u>	<u>5WS</u>	<u>6WS</u>	<u>7WS</u>	<u>Lake</u>
Total # of Individuals	212	46	58	59	293	503	206	1377
Area Sampled (m ²)	200	200	200	200	200	200	200	1400
Catch per Unit Effort	1.06	0.23	0.29	0.30	1.47	2.52	1.03	0.98
Total # of Species	9	8	4	7	8	6	7	14
Total # of T&E Species	4	1	1	2	2	1	1	4
Total # of T&E Individuals	49	25	1	19	22	19	10	145
Catch per Unit Effort of T&E	0.25	0.13	0.01	0.10	0.11	0.10	0.05	0.10
Margalef Index	3.44	4.21	1.70	3.39	2.84	1.85	2.59	4.14

WEST LOON HARVESTER

Aquatic plant harvesting conducted by the LLMA on West Loon Lake resulted in the capture of 1 bluegill from a total estimated harvested area of 1399.2 m² (Table 4). This equals a catch per unit effort of 0.0 fish/m² harvested. The Margalef index was 0.0 for the West Loon Lake harvester. Clear water and sparse vegetation allowed most fish to avoid the harvester. No Eurasian water milfoil or Curlyleaf pondweed was observed during the harvester survey. The most common plants harvested were Coontail, Vallisneria and Water Stargrass.

Table 4. West Loon Lake Harvester

Fish Data	<u>1WH</u>	<u>2WH</u>	<u>3WH</u>	<u>3WH</u>	<u>Lake</u>
Total # of Individuals	0	0	1	0	1
Catch per Unit Effort	0.00	0.00	0.00	0.00	0.00
Total # of Species	0	0	1	0	1
Total # of T&E Species	0	0	0	0	0
Total # of T&E Individuals	0	0	0	0	0
Catch per Unit Effort of T&E	0.00	0.00	0.00	0.00	0.00
Margalef Index	0.00	0.00	0.00	0.00	0.00

RECOMENDATIONS

East Loon Lake and West Loon Lake are high quality aquatic resources. Current fish species of concern populations appear to be stable, with regards to the current aquatic plant management regime.

To maintain and improve the overall quality of East Loon Lake and West Loon Lake, the LCHD- ES has the following recommendations:

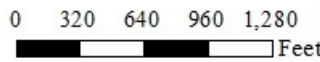
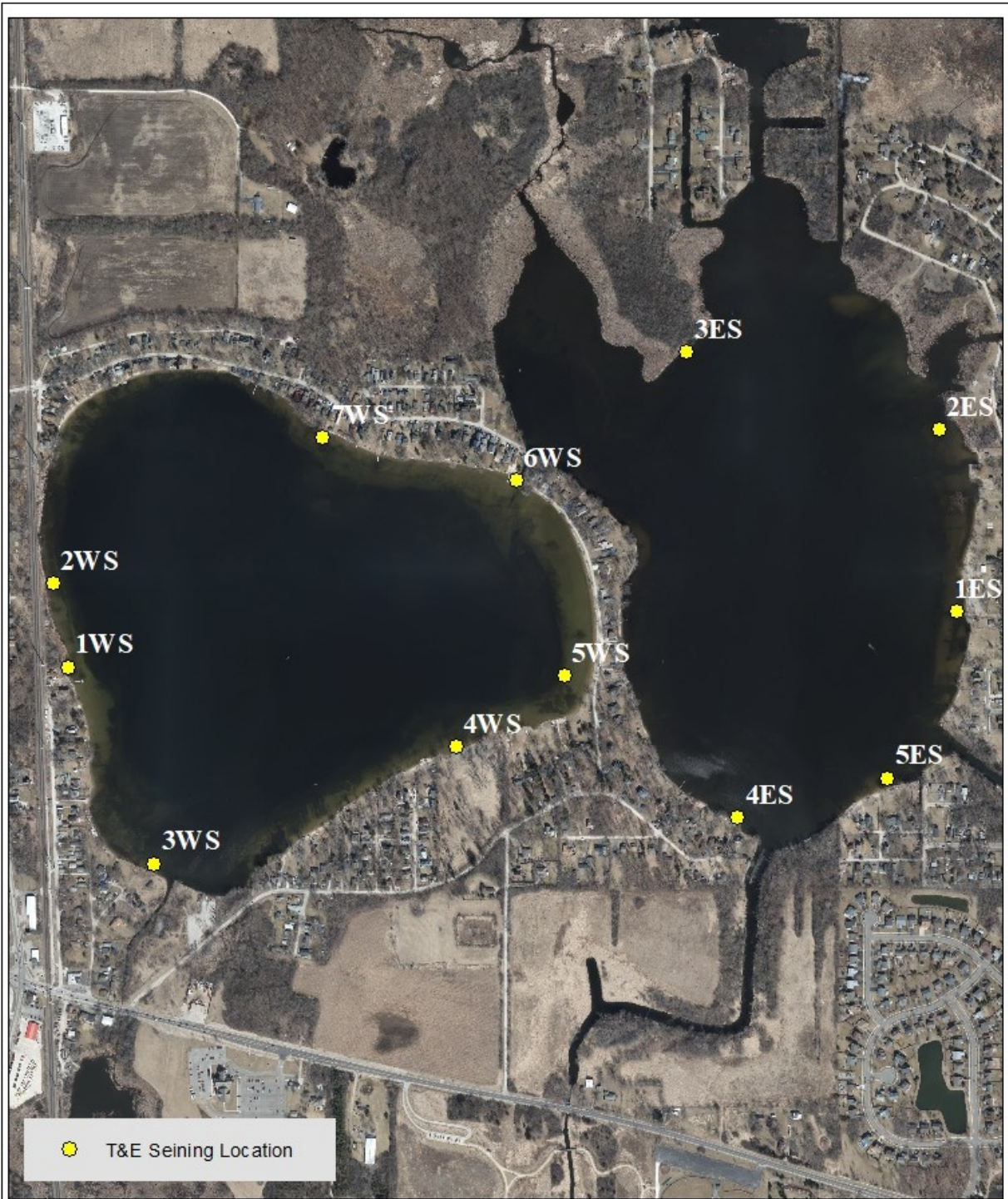
- **DO NOT HARVEST AQUATIC PLANTS IN LAKE DEPTHS SHALLOWER THAN 4 FEET.**
The species of concern congregate near aquatic vegetation as it provides protection to them as well as safe breeding habitat. They tend to avoid deeper water where they are vulnerable to predation. Harvesting aquatic plants to create access lanes from piers should be done in accordance with the ITA.
- **AVOID KNOWN AREAS WITH DENSE POPULATIONS OF SPECIES OF CONCERN AND LOW POPULATIONS OF EURASIAN WATERMILFOIL.**
Mechanical harvesting should be targeting areas on each lake with dense exotic aquatic plant species, primarily EWM.
- **WHEN HARVESTING CONCENTRATE IN ONE AREA OPPOSED TO LONG LINEAR STRETCHES.**
This will allow species of concern more time to react to the harvester to seek cover. This would be especially appropriate on East Loon Lake where the *Fundulus* sp. has a stronger presence. These topminnow species are typically found just beneath the water's surface unlike the *Notropis* sp. that occupies niches deeper in the water column.
- **DO NOT USE THE HARVESTER CUTTER HEAD TO FIND PLANTS OR DETERMINE LAKE DEPTH**
When the cutter head comes into contact with the lake bottom sediments are released into the water column, which can decrease water quality. Using a GPS with a bathymetric map of the lake will allow the operator to focus on a known area of dense exotics in depths greater than four feet, minimizing bottom disturbances.
- **DO NOT USE THE HARVESTER TO REMOVE NATIVE SPECIES.**
Native plants help sustain healthy fish populations. The diversity of aquatic plant species in the Loon lakes provide fish with places to hide and grow. The conservation plan states the harvester should target exotic species.
- **IMPROVE MECHANICAL HARVESTER RECORD KEEPING.**
By recording active harvesting times more accurate catch per unit effort can be calculated resulting in a closer approximation of amount of individuals actually collected for the incidental take permit. Ideally the operator would use a GPS to lay down tracts during harvesting so that location and distance can be analyzed. This would greatly increase the efficiency of mechanical harvesting and allow for adjustments to be made for future management more quickly.
- **LIMIT HARVESTING EFFORTS FOLLOWING SUCCESSFUL HERBICIDE TREATMENTS.**
The 2020 herbicide treatment on East Loon Lake reduced the EWM population total lake coverage. Following a successful treatment, harvester operations should be modified to address current EWM.

TABLE 5. EAST AND WEST LOON LAKE SEINE SURVEY

Year	Fish	Fish Code	1WS	2WS	3WS	4WS	5WS	6WS	7WS	1ES	2ES	3ES	4ES	5ES	Total
2020	Banded Killifish	BAK	6	0	0	18	20	19	10	0	3	2	3	3	84
2020	Blackchin Shiner	BCS	23	25	0	0	0	0	0	0	0	0	0	0	48
2020	Bluegill / Greensunfish Hybrid	BGH	0	0	0	0	0	0	0	0	1	0	0	0	1
2020	Bluegill	BLG	8	6	53	6	8	3	29	3	35	33	55	0	239
2020	Bluntnose Minnow	BLS	143	2	0	22	148	406	137	0	0	0	0	1	859
2020	Blacknose Shiner	BNS	18	0	0	1	2	0	0	0	0	0	0	0	21
2020	Brook Silverside	BRS	0	0	0	0	2	0	10	0	0	0	0	0	12
2020	Central Mudminnow	CEM	0	2	0	0	0	0	0	0	0	0	0	0	2
2020	Golden Shiner	GOS	0	1	0	0	0	0	0	0	0	0	0	0	1
2020	Grass Pickerel	GRP	2	2	0	0	0	0	0	0	0	5	3	0	12
2020	Green Sunfish	GSF	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	Johnny Darter	JOD	0	0	1	8	3	43	6	0	0	0	0	0	61
2020	Least Darter	LED	0	1	0	0	0	0	0	2	0	1	0	0	4
2020	Largemouth Bass	LMB	9	7	3	3	22	28	8	0	1	10	6	1	98
2020	Iowa Darter	OWD	0	0	0	0	0	0	0	0	1	0	0	0	1
2020	Pumpkinseed	PUD	0	0	0	0	0	0	0	0	1	0	16	0	17
2020	Redear Sunfish	RSF	0	0	0	0	0	0	0	0	0	0	4	0	4
2020	Sand Shiner	SAS	0	0	0	0	0	4	0	0	0	0	0	0	4
2020	Starhead Topminnow	SHT	2	0	1	0	0	0	0	0	0	0	2	5	10
2020	Warmouth	WAM	0	0	0	0	0	0	0	1	4	0	1	0	6
2020	Yellow Perch	YEP	1	0	0	1	0	0	6	0	1	0	0	0	9
2020	YOY Notropis sp.	UNKW N	0	0	0	0	88	0	0	0	0	0	0	0	88
2020	YOY Etheostoma sp.	UNKW N	0	0	0	0	0	0	0	4	0	0	0	0	4
		Total	212	46	58	59	293	503	206	10	47	51	90	10	1585

FIGURE 2. WEST LOON LAKE SEINE SURVEY LOCATION

Loon Lake T & E Seining Survey Locations



Lakes Management Unit
Loon Lakes Harvesting Locations 20
Revised 3/2021

FIGURE 3. LOON LAKE HARVESTER SURVEY LOCATION

Loon Lake T & E Harvester Survey 2020



FIGURE 4. LOON LAKE HISTORICAL T&E DATA

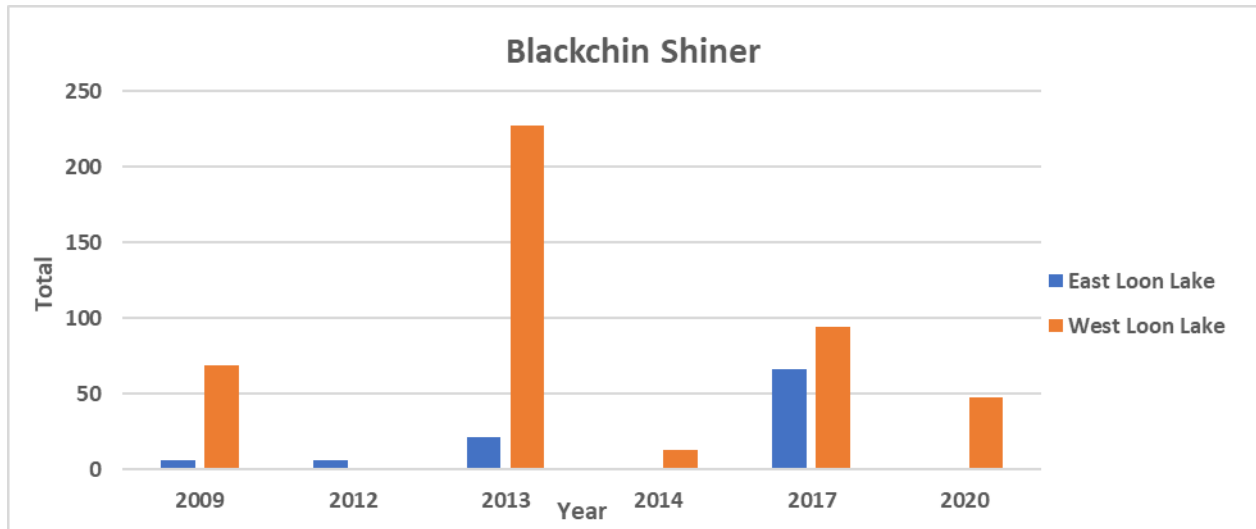


FIGURE 5. LOON LAKE HISTORICAL T&E DATA

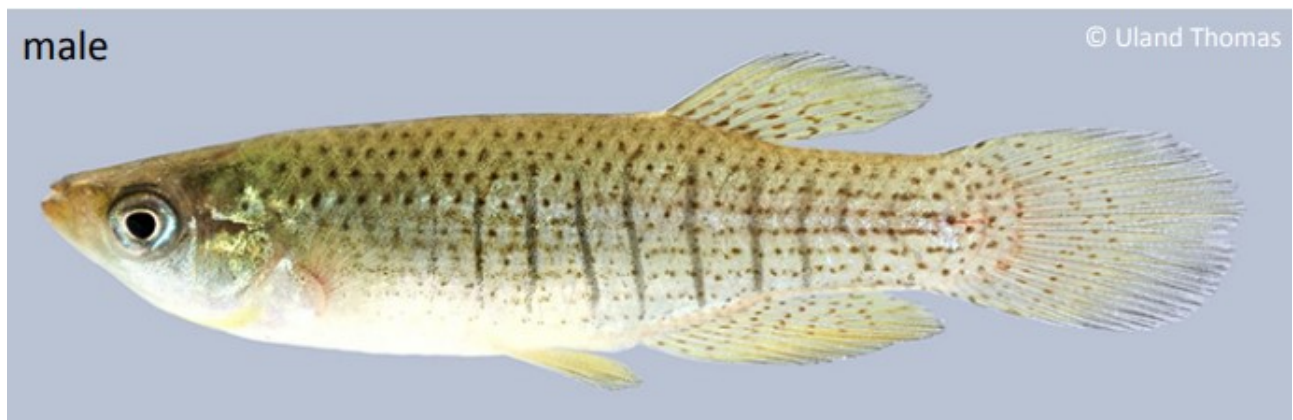
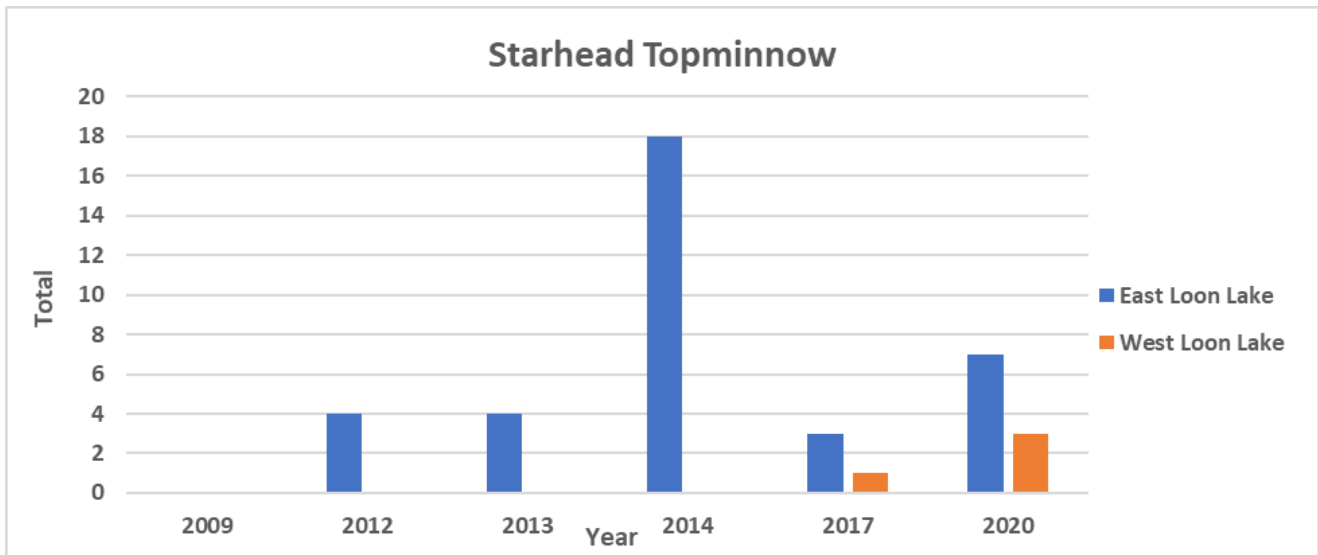


FIGURE 6. LOON LAKE HISTORICAL T&E DATA



FIGURE 7. LOON LAKE HISTORICAL T&E DATA

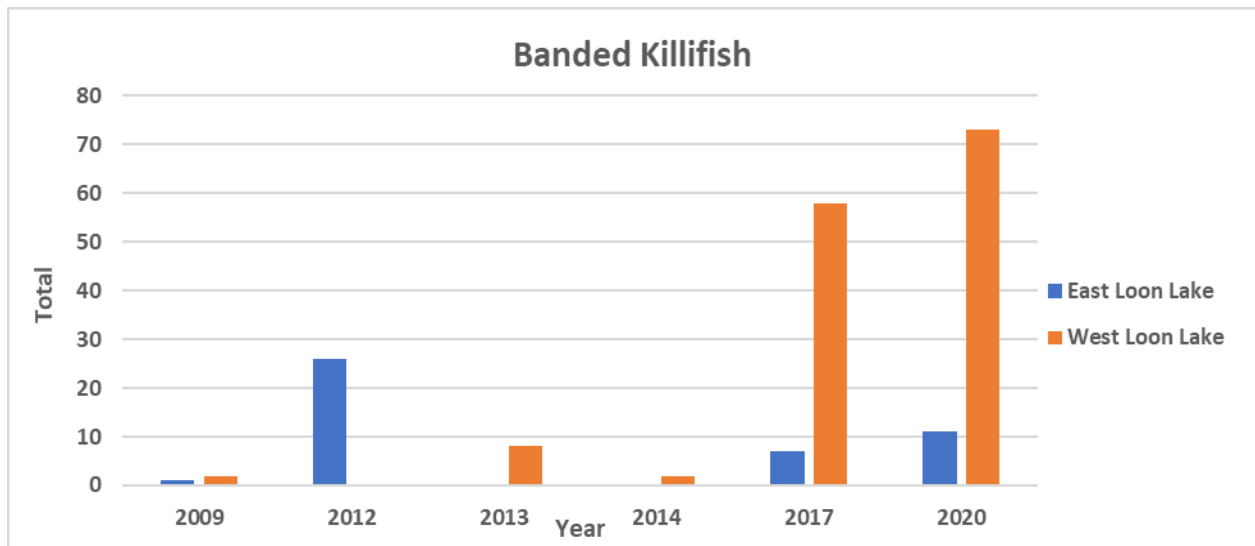


FIGURE 8. LOON LAKE HISTORICAL T&E DATA

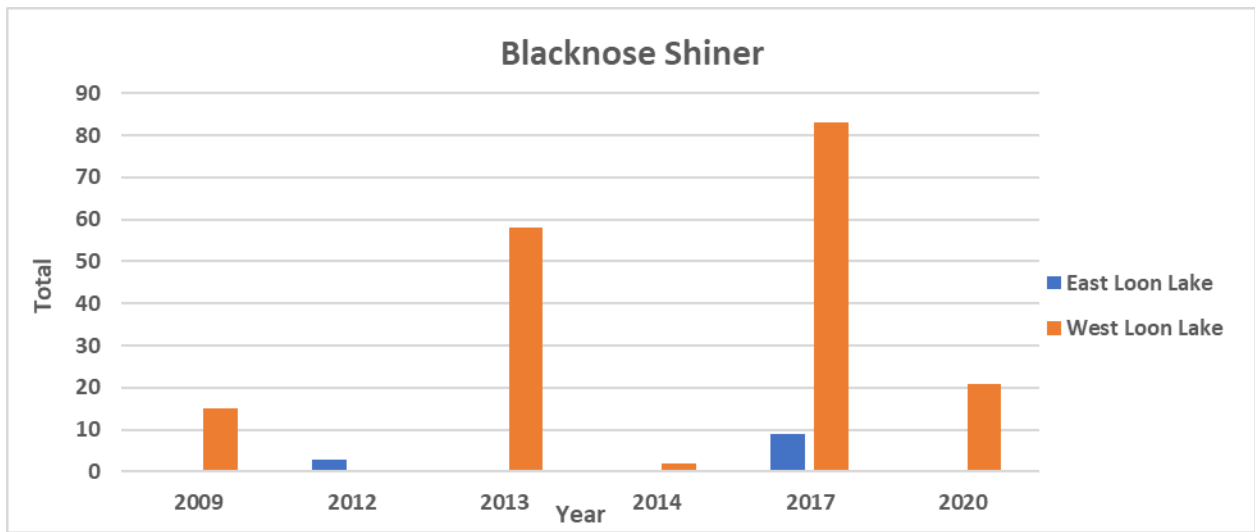


FIGURE 9. LOON LAKE HISTORICAL T&E DATA

