## Itasca SWCD Aquatic Invasive Species Control & Monitoring Report

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Cover Photo Taken on Sand Lake; Itasca County, MN

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## Preface

This publication represents the 11<sup>th</sup> seasonal report of the Aquatic Invasive Species Control Program in Itasca County. The Turtle Lake Association in Marcell, MN began The Purple Loosestrife Control Program in 2007 in cooperation with the Itasca County Land Department. In 2011, this program, which still solely focused on the control of Purple Loosestrife, switched hands to the Itasca Water Legacy Partnership. In 2015, the focus of the program expanded to the control and monitoring of all Aquatic Invasive Species as it joined forces with the Itasca SWCD and the Itasca County AIS Program.

We would like to give thanks to Itasca County, The MN DNR, The University of Minnesota Extension, The U.S. Forest Service, Itasca Water Legacy Partnership, ICOLA, and all of the seasonal staff which have truly been the backbone in making this program as successful as it has been year after year.

## Thank You

Chris Evans Itasca SWCD – AIS Division December, 2017

## Itasca SWCD AIS Monitoring & Control

## -Lake Survey Protocol-

#### Zebra Mussels / Quagga Mussels / Faucet snails

- Set Mussel Trap in an inconspicuous location near public access.
  - o 3-8 Feet of water; Foam Float suspended 2-3 Feet below water surface.
- Scour the shoreline throughout entire littoral zone for snail and mussel shells, using aqua viewers, flipping over rocks and driftwood, and inspecting vegetation for attached invertebrates.
- Take multiple substrate samples along the shore in a grid pattern working from shallow water to as deep as is reachable.
  - Sift out samples in a strainer and key out any suspicious shells.
  - Bag and label any suspicious shells and bring to MN DNR- AIS Specialist for ID confirmation.

#### Eurasian Water Milfoil /Curly Leaf Pondweed/ Starry Stonewort

• Travel the perimeter of the lakeshore searching for dense mats of weeds and anything that may resemble EWM and CLP. Take samples using a double sided weed rake and key out/identify all plants present in the samples. Document infested area, density, and location on the lake.

#### Flowering Rush/ Purple Loosestrife

• Mid-July through rest of the season. Travel the perimeter of the lake as close to shore as possible, searching for the showy pinkish purple flowers. Document infested area, density, and location on the lake.

#### **Spiny Water Fleas / Fishhook Fleas**

• Drag multiple transects around the lake and across areas of deep water; using a heavy weight and high test lead core fishing line at a slow speed. Pull up the line occasionally checking for gelatinous masses of fleas that collect on the line. Collect any suspicious samples for further identification.



Zebra Mussel Early Detection Samplers. (Right: 4 Months Submerged Under Dock at King's Landing; Pokegama Lake. Native Snails Attached.)

## Priority Lakes Surveyed Exclusively for the Early Detection of Zebra Mussels

#### -No Zebra Mussels Present-

The lakes in this list have previously been surveyed for all Aquatic Invasive Species. This season, they have been recognized as a priority for extensive Zebra Mussel early detection surveys due to their proximity to known Zebra Mussel infested bodies of water. Recreational traffic was also a consideration when selecting these Priority Lakes.

Rush Island	Swan
Round (Squaw Lake Area)	Moose
Sissebakwet	Turtle – Approx. 40% of
Little Turtle	shoreline surveyed due to
Little Bowstring	weather
Maple	
Spider	
	Rush Island Round (Squaw Lake Area) Sissebakwet Little Turtle Little Bowstring Maple Spider

### **Zebra Mussel Early Detection Samplers**

89 Early detection samplers were deployed on these 69 Itasca County lakes and waterways for the early detection of Zebra Mussels, Quagga Mussels, and Faucet Snails. (Any Samplers Containing an Invasive Species are Highlighted in \*RED)

Arrowhead- 31080500 Ball Club-31081200 Balsam-31025900 Bass - 31057600 Beatrice-31005800 Biauswah - 31086200 Blackwater- 31056100 Blandin Res.-31053300 Bluewater-31039500 \*Bowstring-31081300; FS Buck Lake-31006900 Caribou-31062000 Clear- 31084500 Clubhouse- 31054000 Coon/Sandwick- 31052400 Cottonwood - 31059400 \*Cutfoot Sioux-31085700; FS, ZM Deer - 31071900 Dixon- 31092100 \*Dora- 31088200;ZM Dunbar- 31090400 Eagle - 31045400 Forest- 31037400 Grave- 31062400 Hale- 31037300 Hart- 31002000 Holman- 31022700

Island- 31075400 Island- 31091300 Jay Gould-31056500 Jessie- 31078600 Johnson- 31058600 Larson- 31031700 Lawrence- 31023100 Little Bowstring-31075800 Little Jay Gould-31056600 Little Jessie- 31078400 Little Splithand- 31034100 Little Turtle- 31077900 \*Little Winnie- 31085000: FS.ZM Middle Pigeon - 31089200 Moose- 31072200 Moose- 31089800 Napoleon- 31029000 Noma- 31083700 \*North Star- 31065300; ZM Pickerel- 31033900 Prairie - 31038400 Pokegama- 31053200 Round- 31026800 Round- 31089600 Ruby- 31042200 Rush Island- 31083200 Shallow- 31084000

Sissebakwet- 31055400 Snaptail- 31025500 South Sturgeon - 31000300 Spider- 31053800 Split hand- 31035300 Swan- 31006700 Trestle- 31080300 Trout- 31021600 Trout (Wabana)- 31041000 Turtle- 31072500 Twin - 31039100 Twin - 31026000 Wabana- 31039200 Whitefish- 31084300 \*Winnibigoshish-11014700; ZM. FS

## **Complete Lake Surveys – AIS Infestations Found**

#### In Alphabetical Order

All lakes are surveyed as described in the *Lake Survey Protocol* for: Eurasian Water Milfoil(EWM), Curly Leaf Pondweed(CLP), Purple Loosestrife(PL), Flowering Rush(FR), Zebra Mussels(ZM), Quagga Mussels(QM), Faucet Snails(FS), Starry Stonewort(SSW), Spiny Water Fleas(SWF), and Fish Hook Fleas(FHF).

#### Bass Lake - 31057600 - PL

Purple Loosestrife was discovered by our crew during the first survey of Bass Lake, in 2012. At that time there were well over 150 Purple Loosestrife plants, mostly throughout the western shore along the residential area north of the Cohasset Public Access.

In this 2017 season, Purple Loosestrife is still located along the same residential area although there were only 1-2 small plants found at most sites, except for the northern-most site, there were 10 plants. Overall, the Loosestrife population density and area have significantly decreased due to the annual herbicide treatments since 2012.

Bass Lake will be revisited in 2018 to survey for all Aquatic Invasive Species and to continue control efforts on the Purple Loosestrife population.

#### Blandin Reservoir - 31053300 - PL, CLP

Our first AIS survey of Blandin Reservoir was conducted in 2015. The survey revealed 2 separate stands of Purple Loosestrife and a very dense population of Curly Leaf Pondweed throughout much of the lake. The Loosestrife site on the North Shore is a very boggy area with a fairly dense population; we designated this as a bio-control site. The other PL site is in the SE corner of the lake. The PL at this site was sparse and appeared to be entering the lake through the creek coming from the beaver pond on the south side of 4<sup>th</sup> St which has a very dense PL population. In 2016, we released 3,600 Purple Loosestrife beetles between the beaver pond and Blandin Reservoir.

This season, we released 3,603 Purple Loosestrife Defoliating Beetles on the dense population, south of the paper mill wood pile, early in the season. The beetle colony seemed to establish very well and all Loosestrife plants within this area had obvious insect damage and very few flowering plants remained. There was one small Loosestrife seedling found in the culvert flowage coming from Forest Lake which was treated with herbicide. We also released 1900 beetles in the pond South of 4<sup>th</sup> St. The Flowage in the SE corner connected to the 4<sup>th</sup> Street beaver pond had approximately 6 Purple Loosestrife plants. There were beetles found on some of these plants, all others were treated with herbicide to reduce the seed production. We will likely add beetles to the population in 2018.

Curly Leaf Pondweed is still very abundant throughout the littoral zone of the main lake. The CLP population has not seemed to increase or decrease in area since our original survey in 2015.

#### Blind - 31041800 - PL

The Purple Loosestrife population on Blind Lake has been on our radar since 2012; at that time there were well over 100 mature plants found along the North Shore near the U.S. Forest Service campsite. Since 2012, we have introduced 2,290 Galerucella Beetles to the most-dense areas of Purple Loosestrife but there has been very little reproduction within their colony and plant control was at a minimum. We have performed annual herbicide treatments to any PL plants that were seemingly untouched by the insect population.

This season there were 3 separate locations of Purple Loosestrife, consisting of 7 plants total, found among the NE bay of Blind Lake. There was no evidence of an existing Galerucella Beetle population present so all PL plants were treated with herbicide. Our control efforts have decreased the Purple Loosestrife on Blind Lake by over 90%

We will revisit Blind Lake in 2018 to survey for all Aquatic Invasive Species and to continue to manage the Purple Loosestrife population.

#### Bower - 31005200 - PL

A population of Purple Loosestrife was located by our crew in the NW corner of Bower Lake in 2016; there were 4 large patches consisting of around 40 plants total. Herbicide was applied to all PL found on Bower in 2016 in order to reduce seed dispersal.

The herbicide treatment in 2016 made an obvious decrease in PL density; this season we located 3 small flowering plants in the same location as last season. All PL plants found were treated with herbicide. Bower Lake will be revisited in 2018 to survey for all Aquatic Invasive Species and to monitor the PL control efforts.

#### Bowstring - 31081300 - PL, FS

Our crew has been releasing Galerucella Beetles for the biological control of Purple Loosestrife on Bowstring Lake since 2009 and making herbicide treatments on PL, outside the bio-control areas, since 2012. Including the cohort of insects released this season, we have dispersed a total of **100,154** beetles throughout all of Bowstring Lake, along the South Access Road, and along the Bowstring River towards Sand Lake.

The Purple Loosestrife Defoliating Beetle population throughout most of the lake has been reproducing very well. There are still a couple areas along the North Shore, west of the Public Access with no beetle evidence. Any PL plants found on Bowstring Lake with no insect damage were treated with herbicide to reduce the seed production and dispersal.

Faucet Snails were still found in substrate samples throughout the whole lake but there population was not as dense and obvious as last season. Despite its close proximity and connection to the heavily Zebra Mussel-infested Sand Lake, there were no Zebra Mussels found in Bowstring Lake this season. We will return in 2018 to survey for all Aquatic Invasive Species, add beetles to the bio-control population, and apply herbicide to any PL plants that lie outside of the bio-control areas.

#### Bray - 31014700 - PL

The Purple Loosestrife population on Bray Lake was discovered by our crew in 2016; there were a total of 11 mature flowering plants, mostly near the culvert along Hwy 56, as well as 1 plant along the West Shore near the large duck blind. Herbicide was applied to all Purple Loosestrife found.

This season, there were approximately 10 Purple Loosestrife seedlings east of the culvert along Hwy 56 where they had been found last season. These plants were obviously sprouting from the residual seed bank. There were 2 small sprouts along the West Shore in the same location as last season near the duck blind. There was a new PL location found this season on the western tip of the island. All PL found was treated with herbicide; there were no other Invasive Species found at the time of our survey.

We will return to Bray Lake in 2018 to survey for all Aquatic Invasive Species and to further work towards the eradication of Purple Loosestrife.

#### Clubhouse - 31054000 - PL

There were only 4 Purple Loosestrife plants found on Clubhouse Lake this season on the northern-most point on the lake, west of the creek flowing from Mike's Lake. There was only 1 PL plant found east of the creek in Mike's Lake. There were approximately 100+ PL plants throughout these locations when we first surveyed the lake in 2009. The PL density has significantly decreased each season due to herbicide applications.

We will return in 2018 to survey for all Aquatic Invasive Species, evaluate the results of our Purple Loosestrife control efforts, and to make additional herbicide treatments if necessary.

#### Coon/ Sandwick - 31052400 - EWM

Despite Control efforts contracted out by the DNR, Eurasian Watermilfoil is found to be abundant throughout the littoral zone of Coon Lake. Since our first AIS survey in 2015, the Milfoil has crept through the channel into Sandwick Lake where smaller patches have now been newly established along the West Shore.

Our crew will return to Coon & Sandwick Lakes in 2018 to survey for all Aquatic Invasive Species and to further monitor the spread of Eurasian Watermilfoil.

#### Crooked - 31019300 - PL

The Purple Loosestrife population on Crooked Lake has been on the radar of our AIS crew since 2012 when we had discovered over 30 mature plants near the Public Access. Due to herbicide treatments, the PL population has significantly decreased every season. This year, there were 3 total Purple Loosestrife plants located near the public access that were obviously sprouting from the residual seed bank. There were no other Aquatic Invasive Species found at the time of our survey.

We will revisit Crooked Lake in 2018 to survey for all Aquatic Invasive Species and to make an herbicide application to any Purple Loosestrife found emerging near the Public Access.

#### Crystal/Ice - 31037200 - EWM, PL

The Galerucella Beetle (Purple Loosestrife Defoliating Beetle) population has existed on Crystal Lake for well over 10 years. The West Shore was one of the original beetle collection sites for our program when it was started up in 2007. We, shortly thereafter, found more productive sites and stopped collecting from Crystal Lake.

Our first survey for all Aquatic Invasive Species on Crystal Lake was in 2015. The original survey revealed a continuous population of Eurasian Watermilfoil around approximately 90% of the Lake mostly in 6-12ft of water, as well as, a scattered Purple Loosestrife population throughout the South and West shores.

The PL had shown a fair amount of beetle damage in 2015 but there were still areas where the beetles had not yet reached the point of controlling the PL. In those areas, we added 455 beetles to the population to attempt to boost their numbers.

This season, in 2017, the Purple Loosestrife population shows very good insect damage from the Galerucella beetle colony along a majority of the shoreline. We added another 1500 beetles to the areas of the shore where the PL showed the least amount of insect damage. Herbicide was applied to any PL plants that were found outside of the bio-control areas.

Eurasian Watermilfoil is still very abundant throughout most of the littoral zone, especially near the boat access. We will return in 2018 to survey for all Aquatic Invasive Species, evaluate the progress of our bio-control site, and to monitor any changes in the Eurasian Watermilfoil population.

#### Cut Foot Sioux - 31085700 - PL, FS

Our first AIS survey on Cut Foot Sioux Lake was conducted in 2012. At that time, Purple Loosestrife was the only Aquatic Invasive Species present and it was located east of the Hwy 46 Bridge in the exact spot where The MN DNR puts in their nets and viewing pier that they use when harvesting Walleye eggs. This site originally had 12 mature Purple Loosestrife plants along with hundreds of seedlings. The amount of PL at this site has steadily decreased annually as a result of herbicide applications and this year there were just 3 seedlings emerging from the residual seed bank

In 2015, Zebra Mussels were known to be in low numbers in Winnibigoshish Lake but they had not yet been discovered in Cut Foot Sioux Lake. Last season (2016), The ZM population exploded in Winnie Lake and had spread into Cutfoot Sioux. Although they were known to be present, we did not locate any ZM's when surveying the littoral zone.

This season (2017), Our Zebra Mussel Samplers, which were placed under the access docks at the McCavity Bay and Williams' Narrows Landings, both had Zebra Mussels on them when we retrieved them in late August. There were no ZM's found on our samplers at these accesses last season.

We plan to revisit Cutfoot Sioux Lake in 2018 to survey for all Aquatic Invasive Species, to monitor the advancements of Zebra Mussels throughout the Lake, and to apply herbicide to any Purple Loosestrife seedlings to further work toward eradication.

#### Deer - 31071900 - PL

Our crew first surveyed Deer Lake and began integrating both chemical and biological control methods for Purple Loosestrife in 2012. At that time, Loosestrife was densely growing on over 80% of the South Shore, 30% of the North Shore, and also was abundant on the WMA islands off of the East Shore. We have revisited Deer Lake every year since, adding beetles to the most-dense areas of Loosestrife and applying herbicide to all PL plants found outside of the bio-control areas. From 2012-2016, we released 22,538 Galerucella beetles throughout the shores of Deer Lake.

There were 3 site visits made to Deer Lake this season. On June 6<sup>th</sup>, we released 3,698 Galerucella beetles along the South Shore in all areas where loosestrife is abundant. While releasing these beetles, we noticed evidence of their population becoming more dense and widespread throughout the lake. We returned on 2 other separate occasions for a complete lake survey for all Aquatic Invasive Species and to apply herbicide to any PL that displayed no beetle evidence.

We hand-pulled 3separate, small patches of Curly Leaf Pondweed near the access dock. This was the only CLP located on the entire lake. We will conduct another complete lake survey in 2018 to search for all Aquatic Invasive Species, monitor the progress of the PL bio-control population, and to remove any CLP.

#### **Deer River – PL**

We began integrating biological and chemical methods for the control of Purple Loosestrife within the Deer River in 2014. At the time of discovery, there were 5 very large flowering PL plants throughout the emergent vegetation to the West of County Rd 142. Those 5 PL plants were treated with herbicide and just 2 plants emerged from their seed bank in 2015.

During the 2016 season, we surveyed the entire stretch of the deer river from County Rd 142 to the Clara Lutheran Church Rd. There was Purple Loosestrife found along the 1<sup>st</sup> mile of river, gradually decreasing in density as you travel downstream. Much of this 1<sup>st</sup> mile of river has been designated as a bio-control site due to the population density; any PL plants outside of the most-dense areas were treated with herbicide to reduce the output of seed.

This season (2017), we released 5,000 Galerucella beetles in the densest patches of Purple Loosestrife along the banks of the Deer River from County Rd 142 westward for about <sup>3</sup>/<sub>4</sub> of a mile. Some of the PL had shown some minor evidence of an existing beetle population. Any single PL plants found outside of the bio-control areas were treated with herbicide to assist the bio-control efforts.

We will revisit this stretch of river in 2018 to monitor the beetle population, add beetles if necessary, and apply herbicide to any PL plants found outside of the bio-control area if necessary.

#### Dora - 31088200 - ZM

Dora Lake is the Headwaters for the Bigfork River. In 2016, a full lake survey was conducted for all Aquatic Invasive Species in Dora Lake and despite Dora being downstream of a known Zebra Mussel Infestation (Sand Lake Chain), no Zebra Mussels were present in 2016.

This season (2017), the Zebra Mussel population was found to be spreading from Rice Lake of the Sand Lake Chain. We tracked them downstream of Rice Lake, finding fairly large mature Mussels attached to rocks and woody debris at the Shogren Dam. We then jumped approximately 4 miles downstream to Dora Lake finding ZM's attached to the boulders underneath the County Road 29 Bridge. The ZM's were fairly small in size, suggesting that they are the young of the year that had been carried through the current of the Bowstring River coming from Rice Lake. From Dora Lake, we tracked the Zebra Mussel population spreading into the Bigfork River and eventually found our last Mussel approximately 9.5 Miles downstream of Dora.

Our crew will continue to monitor the spread of this Zebra Mussel Colony down the Bigfork River in future seasons.

#### Dunbar - 31090400 - PL

Dunbar Lake was first surveyed by our crew in September of 2015. At that time, we discovered 3 sites on the lake with scattered dense patches of Purple Loosestrife that had already flowered out and were dropping seed. There were no PL control efforts made in 2015 on Dunbar.

In 2016, Loosestrife was found in the same 3 locations as the year before. One site, along the East Shore, showed good evidence of an existing Galerucella Beetle Colony (Purple Loosestrife Defoliating Beetle). The 2 sites along the West Shore were void of any biological control insects. Any PL plants lacking insect damage on Dunbar Lake were treated with herbicide in 2016 to reduce the seed production and dispersal.

This season (2017), the area and density of the PL population had noticeably decreased along the West Shore due to herbicide treatments in 2016. The stand of PL on the East Shore had not changed much although the beetle population seems to be reproducing very well. All PL plants on Dunbar, that showed no evidence of beetles, were treated with herbicide to assist the biocontrol in the reduction of seed output.

We will conduct another full lake survey in 2018 for all Aquatic Invasive Species and to monitor the results of our Purple Loosestrife control efforts.

#### Eagle - 31045400 - PL

The Purple Loosestrife infestation on Eagle Lake has been on the radar of our crew since 2013. At the time of discovery, PL was present in high densities among every section of the lake except for the northern- most shore. Our crew applied herbicide to all PL plants found in order to stop the dispersal of seed.

Early in the 2014 season, we released 5,095 Galerucella Beetles in the most-dense stands of Purple Loosestrife throughout the south half of Eagle Lake. When we returned for the annual full-lake survey, we noticed that the bio-control population had already gone to work, decimating the PL in many areas. Any PL located with no evidence of an insect population was treated with herbicide in order to assist the bio-control efforts.

In 2016, there were another 4,316 Galerucella beetles added to the population throughout the channel of the creek flowing south from Eagle Lake. All PL plants found outside of the bio-control areas were again treated with herbicide.

The Purple Loosestrife population is now mostly confined to the southern-most bay of Eagle Lake as well as the creek that flows south. There were 2 other PL locations found; one just east of the access and one along the NW shore. These 2 locations found outside of the bio-control areas were treated with herbicide. The Galerucella beetle population is still reproducing very well and is providing good control throughout the southern-most bay although the PL along the creek shows minimal insect damage. We released 6000 beetles this season along the creek flowage in order to boost the population.

We will conduct another full lake survey in 2018 for all Aquatic Invasive Species and to monitor the Galerucella beetle population.

#### East Smith - 31061600 - PL

Historically, there has not been Purple Loosestrife on East Smith Lake although neighboring Smith Lake, to the north, has had a widespread PL population for well over a decade.

In 2016, our crew located one Purple Loosestrife site on East Smith, west of the access point on County Rd 49. The site consisted of 1 mature plant accompanied by an old seed head that the plant had produced the year before. Our crew applied herbicide to the 1 PL plant.

This season (2017), Purple Loosestrife was present in 3 locations on the North Shore of East Smith. The new locations are near a duck blind and on wildlife trails between Smith & East Smith Lakes. The seed is likely being spread from Smith Lake by animals and waterfowl hunters. Herbicide was applied to the 3 Purple Loosestrife plants.

Curly Leaf Pondweed has been located in Smith Lake, to the north. The description of the CLP site can be found under <u>Smith Lake</u>. We will conduct another full lake survey of East Smith Lake in 2018 to search for all Aquatic Invasive Species and to monitor our PL control efforts.

#### Forest - 31037400 - PL

Our crew has been managing the Purple Loosestrife population on Forest Lake in Grand Rapids since 2012. At the time of our first survey, there were continuous patches of PL along the South Shore, as well as a dense population in the boggy portion of the NW corner of the lake. We applied herbicide to the PL along the South Shore and designated the NW corner as a biological control site.

In the seasons of 2013-14, we released a total of 2,420 Galerucella Beetles throughout the South shore and the NW corner of the Lake. No herbicide was applied on Forest Lake during these two seasons, attempting to leave the work up to the bio-control insects.

In 2015-16, our crew assisted the bio-control agents by applying herbicide to any flowering Purple Loosestrife plants throughout the lake. The beetle population was obviously reproducing but had not yet reached the point of controlling the production of seed. We added 200 more beetles to the population in 2016.

The Galerucella beetle population has shown very good reproduction this season (2017) along a majority of the shoreline of Forest Lake. We applied herbicide to the PL plants showing minimal insect damage in order to assist the bio-control efforts. We added 2,035 beetles between the South Shore and the NW corner of the lake in order to further boost the population.

We will conduct another full lake survey in 2018 for all Aquatic Invasive Species and to monitor the Purple Loosestrife control efforts.

#### Hale - 31037300 - EWM, PL

In 2012, our crew first surveyed and mapped the Purple Loosestrife population on Hale Lake. At that time, there were continuous dense patches of PL around a majority of the shoreline. During our survey, we applied herbicide to all Loosestrife found except for the most-dense stand located in the West end of the lake. We designated the West End as the central location of our bio-control efforts in future seasons.

We released 900 Galerucella beetles among the Loosestrife on the West End of the lake in 2013; in 2014, we released 9,007 beetles throughout the entire lake. There were no herbicide applications made in 2013-14.

2015 was the first survey our crew conducted on Hale Lake for all Aquatic Invasive Species. At that time we mapped the Eurasian Watermilfoil that was found in small patches along the East, West, and South shores in approximately 6-12ft of water.

This season (2017), Eurasian Watermilfoil was found to be a bit more abundant than previous years, especially along the East and North Shorelines where shallow water is being crowded by EWM.

Purple Loosestrife is still found to be emerging from the residual seed bank throughout a majority of the shore with there being really no areas void of PL. There is evidence of a Galerucella Beetle population in many different areas of Hale Lake but the population has not yet reached a level where the beetles will control the Loosestrife on their own. Herbicide was applied to all PL plants found outside of the bio-control sites.

Hale Lake will be revisited in 2018 for another full-lake survey for all Aquatic Invasive Species, to monitor any changes in the EWM population, and to evaluate the progress of the beetle population.

#### Hart – 31002000 - FR

Our first Aquatic Invasive Species survey of Hart Lake was conducted in 2015. During this original survey, Flowering Rush was found in approximately 40 separate patches throughout the littoral zone along the South and West shores.

In both 2016 & 2017, the density of the Flowering Rush gradually increased throughout the infested sites and since 2015 there are 10 or more new FR sites near the North Public Access and along the North Shore.

We will revisit Hart Lake in 2018 to complete another survey for all Aquatic Invasive Species and to monitor any changes in area or density within the Flowering Rush population.

#### Hartley - 31015400 - PL

Our crew first discovered Purple Loosestrife near the Public Access of Hartley Lake in 2012 and at that time there were 5 mature plants found in the "Native Planting" to the southeast of the fish ladder project.

Purple Loosestrife was not found at this site again until 2016 when 3 seedlings were discovered in the same location as 2012. Herbicide was applied to those 3 plants.

This season (2017), there was only 1 individual Purple Loosestrife plant found in the same location. Herbicide was applied to this 1 plant. Hartley Lake will be revisited in 2018 to survey for all Aquatic Invasive Species and to further work towards eradicating Purple Loosestrife from this location.

#### Holman – 31022700 - FR, PL

Our crew first began integrating biological and chemical control methods for Purple Loosestrife on Holman Lake in 2012; at that time PL was densely populated among approximately 50% of the entire shoreline, being most-dense in the north and south extremities of the Lake as well as on the island directly west of the Public Access.

There was an existing Galerucella Beetle colony on Holman Lake in 2012 and about half of the plants showed insect damage to some degree. Herbicide was applied to all plants that were flowering to assist the bio-control in seed reduction.

Since 2013, our crew has released 9,250 beetles throughout the entire population of Purple Loosestrife on Holman Lake. The reproduction of the bio-control species has been minimal over recent years but had greatly improved over this last season. Every PL plant found this season had insect damage to some extent with many plants being reduced to an unrecognizable brown stalk.

We began mapping the Flowering Rush in Holman Lake in 2015 and at that time there were only 3 separate patches found. The FR population has steadily increased over the past 2 seasons and this year there were 13 individual patches located mostly in the north half of the lake. Prior to the 2018 season we will develop a management plan in attempt to control the spread of the Flowering Rush population on Holman Lake.

#### Jay Gould - 31056500 - CLP

Our Crew has been mapping the Curly Leaf Pondweed in Jay Gould Lake since 2015. Although CLP was known to be abundant in the lake throughout spring and early summer, our crew did not locate any at the time of our survey due to the usual mid-summer die-off of CLP.

In the 2016 season, we conducted our survey earlier in the summer in order to catch the CLP before it died off for the season. Although the die-off had already begun, we found sparse patches of CLP in the channel coming from Blackwater Lake and also in the channel heading to Little Jay Gould. Little Jay Gould was found to have a large population of CLP in the SW section of the lake heading through the flowage to Pokegama Lake; this is the apparent source of the CLP in Pokegama.

This season we did our survey even earlier in the season than 2016 in attempt to map the full extent of the CLP population. There were no new individual patches found compared to 2016 but the density was much higher in most CLP locations.

Our crew will survey the Jay Gould Lakes again in 2018 to monitor the spread of CLP and to search for all other Aquatic Invasive Species.

#### Johnson - 31058600 - PL

Our crew first surveyed Johnson Lake in 2008. At that time there were no Aquatic Invasive Species present in the lake. We again surveyed Johnson Lake in 2016 and again found No AIS. This season, the entire shoreline of Johnson Lake was thoroughly surveyed specifically for the early detection of Zebra Mussels. No Zebra Mussels were found but we did discover 2 separate patches of Purple Loosestrife along the West Shore. The 1<sup>st</sup> site was an approximate 150 yard stretch of residential shoreline containing scattered dense patches of PL. There was also 1 individual plant found just over a mile north of the first patch.

Because the Purple Loosestrife had already reached maturity and flowered out, there were no control efforts made on Johnson Lake this season. We will return in 2018 to further evaluate the extent of the infestation, create a control plan, and to implement control efforts accordingly.

#### Leighton – 31073900 – PL

The first AIS survey was conducted on Leighton Lake in 2012; at that time there were over 200 mature Purple Loosestrife plants found within an approximate 80 yard stretch near the Public Access. Herbicide was applied to all PL plants in 2012 in order to reduce the seed output.

In 2013, this site had been reduced to an approximate 100 PL plants due to the herbicide application in the previous season. We released 2,000 Galerucella Beetles throughout this 80 yard stretch and designated it as a biological control site. No herbicide applications were made in 2013 on Leighton Lake.

There were still about 100 plants in 2014 and there was minimal evidence of a beetle population. Another 5,500 Galerucella Beetles were added to this site in 2014 to boost their population; no herbicide treatments were made in 2014 or 2015.

Despite releasing thousands of Galerucella Beetles in past seasons, there was no sign of a beetle population at this site in 2016 and there were still 100+ PL plants. Herbicide was applied to all Purple Loosestrife plants found in order to reduce the dispersal of seed throughout the lake.

This season (2017), due to the herbicide treatment in previous season, there were only12 small PL seedlings discovered within approximately 20 yards of each side of the boat access. In order to reduce the seed production, herbicide was applied to all Purple Loosestrife found and we will return in 2018 for a follow up application if necessary. We will likely abandon the bio-control efforts due to the lack of reproduction at this location.

#### Lilly - 31037500 - PL

In 2015, our crew had discovered an approximate 100 Purple Loosestrife plants growing throughout the tall grass and emergent vegetation along the fence adjacent to Airport Road. There was some evidence of an existing biological control population on less than half of the PL plants found. Herbicide was applied to the PL plants that showed no sign of biological control.

This season (2017), our crew located approximately 12 individual patches of Purple Loosestrife growing along the fence and within the emergent vegetation of Lily Lake. Most of the PL is found along the West Shore and 2 small patches were found in the NE corner of the lake. There was only minimal evidence of a bio-control population. Herbicide was applied to all Purple Loosestrife found and Lily Lake will be re-surveyed in 2018 to search for all Aquatic Invasive Species and to perform control efforts on PL plants where found.

#### Little Drum – 31074100 - PL

Our crew first surveyed Little Drum Lake in 2016 for all Aquatic Invasive Species. There were 2 separate dense patches of Purple Loosestrife discovered on floating bog portions of the shoreline on opposite sides of the lake (east and west). Herbicide was applied to the PL plants that were accessible from the water in order to reduce the seed dispersal throughout the lake. These areas were then designated as biological control sites for future seasons.

We released 448 beetles early this season (2017) throughout the 2 Purple Loosestrife sites on Little Drum Lake. When we returned to survey for all Aquatic Invasive Species and to monitor the Loosestrife control efforts, the water level was so low we could not even get a canoe in the lake. We will attempt to return in 2018 to survey for all AIS and to add to the Galerucella Beetle population.

#### Little Jay Gould – 31056600 - CLP

See the description of Little Jay Gould Lake under the section for Jay Gould

#### Little Long – 31061300 - PL

Our crew first surveyed Little Long Lake in 2012; at that time roughly 90% of the shoreline in the southern half of the lake had a population of Purple Loosestrife to some degree. Herbicide was applied to all PL plants except in the boggy bay portions of the lake which we designated as biological control sites.

There were 17,695 Galerucella Beetles released throughout Little Long Lake from 2013 to 2016. Herbicide was applied to all of the Purple Loosestrife that lied outside of the bio-control areas during this period.

This season (2017), Purple Loosestrife is still found in most of the boggy portions and small bays of Little Long Lake. There is evidence of strong beetle reproduction throughout much of the infested area except for the southern-most bay of the lake. We released 750 Galerucella Beetles this season in areas where their population had seemed to be struggling. Herbicide was, again, applied to any PL plants lying outside of the bio-control sites.

We will return to Little Long Lake in 2018 to conduct a survey for all Aquatic Invasive species and continue our control efforts on the Purple Loosestrife population.

#### Little Sand - 31085300 - ZM

We did not visit Little Sand Lake this season. There is a known Zebra Mussel infestation that has spread from Sand Lake. Our efforts, this season, were focused on monitoring the spread of the Zebra Mussel population from Little Sand through the Bowstring River to Dora Lake. More details on the spread of this Zebra Mussel population are described under *Dora Lake*.

#### Little Turtle – 31077900 - PL

Our crew has been performing chemical control for Purple Loosestrife on Little Turtle Lake since 2007. At the time of our first survey, PL was confined to the SW corner of the lake throughout the emergent vegetation, as well as, in the wetland across Hwy 286. Herbicide was applied to all PL plants found from 2007-2013 to work toward the depletion of the residual seed bank.

From 2014 to 2016, there were 4,063 Galerucella Beetles released throughout the infested area. Herbicide is seasonally applied to the Loosestrife on the extreme ends of the infestation in order to confine it to the designated biological control area.

This season (2017), the Galerucella Beetle population is reproducing very well in the SWt corner of Little Turtle Lake with a majority of all Purple Loosestrife plants showing good evidence of bio-control. The PL population on the south side of Hwy 286, however, had no evidence of bio-control. We released 2,250 more beetles this season to boost their population. Any PL that showed minimal insect damage was treated with herbicide to assist the bio-control efforts. Little Turtle will be revisited in 2018 to survey for all Aquatic Invasive Species and to monitor the results of the control efforts on the Purple Loosestrife populations.

#### Little White Oak – 31074000 - PL

In 2016, we discovered 8 mature Purple Loosestrife plants scattered through the tall grass and emergent vegetation near the public access of Little White Oak Lake. Herbicide was applied to all PL found.

This season (2017), we found no PL at this site. We will revisit Little White Oak in 2018 to survey for all Aquatic Invasive Species and to conduct control efforts on any Purple Loosestrife found sprouting from a residual seed bank, if needed.

#### Little Winnibigoshish – 31085000 - ZM

While deploying our ZM sampler at the Little Winnie Resort, we found a soda can in the water with 2 small Zebra Mussels on it. We went directly to the Winnie Dam and found that ZM's were densely populated on the rocks below the dam. In the following days, we assisted Rich Rezenka of the MN DNR in a full-lake survey of Little Winnie. There were adult ZM located throughout Little Winnie Lake and were found to have spread approximately 17.5 miles downstream through the Mississippi River past the confluence of the Leech River.

Although these are already designated infested waters, this is the first documentation of adult Zebra Mussels spreading from Lake Winnie. We surveyed the entire river stretch from Lake Winnibigoshish to the White Oak Lake Public Access.

We will visit this stretch of river, and beyond, in 2018 to monitor the Spread of Zebra Mussels towards the Grand Rapids Area.

#### Long – 31057000 - PL

The Purple Loosestrife infestation on Long Lake in Cohasset has been on the radar of our crew since 2010. Purple Loosestrife is found only in the East Bay, near the access and along the south side of Hwy 63.

Past seasons have proven that this site is minimally conducive to the reproduction of the Galerucella Beetle. From 2012 to 2015, our crew has released 7,100 beetles throughout the infestation on Long Lake. Through that same period, herbicide was applied to all PL plants that were void of any beetle evidence.

This season, the Loosestrife to the east of the Public Access showed fairly good evidence of a reproducing beetle population, while the PL plants to the west of the access and to the south of Hwy 63 showed very little, if any, insect damage. Herbicide was applied to all PL plants showing no beetle damage.

Long Lake will be revisited in 2018 to survey for all Aquatic Invasive Species, add beetles to the population, and to monitor the Purple Loosestrife infestation.

#### Loon - 31057100 - PL

Our crew has been managing the Purple Loosestrife population on Loon Lake since 2010. Our original survey revealed approximately 25 Purple Loosestrife plants to the west of the Public Access, being most-dense near the culvert coming from Long Lake. Herbicide was applied to all PL present in 2010.

Over the next few seasons, the number of PL plants emerging from the residual seed bank gradually became fewer and fewer as a result of our annual herbicide applications.

This season (2017), we found 1 Purple Loosestrife plant about 40 yards west of the Public Access. We will continue to visit this site annually to make herbicide applications if necessary.

We will conduct another survey of Loon Lake in 2018, searching for all Aquatic Invasive Species.

#### Lower Balsam – 31024700 - PL

Purple Loosestrife was discovered on Little Balsam Lake in 2016, found in scattered dense patches periodically throughout the lakeshore. All PL found last season was treated with herbicide and the density of these patches came back this season about 25% of what they were before the treatment.

We released 3,382 Galerucella beetles throughout the PL along the East Shore early in June of this year. Upon returning to Lower Balsam for a full-lake survey in late July, we noticed the beetle population already taking affect with obvious insect damage on much of the PL population.

Any PL found with no insect damage was treated with herbicide in order to assist the biological control in the reduction of seed output. We will revisit Lower Balsam Lake in 2018 to survey for all Aquatic Invasive Species and to monitor the populations of both the Purple Loosestrife and the Galerucella Beetles.

#### Lower Lawrence - 31023800 - PL

In 2009, our crew discovered sparse patches of Purple Loosestrife in Lower Lawrence Lake, west of the channel coming from Lawrence Lake. There were Approximately 10 individual plants at the time of discovery; herbicide was applied to all Loosestrife found.

In 2010, only 5 seedlings emerged from the residual seed bank, which were treated with herbicide. This site was void of Purple Loosestrife until 2014 when 2 more seedlings were discovered.

Since 2014, there have been 1-2 seedlings found each season in this location. Herbicide was applied to the PL each season to further work towards the depletion of the residual seed bank. Our crew will revisit Lower Lawrence Lake in 2018 to survey for all Aquatic Invasive Species and to manage the Purple Loosestrife.

#### Maple - 31077300 - PL

Our crew has been managing the Purple Loosestrife on Maple Lake since 2008 when we discovered 2 separate locations on the lake consisting of a total of 25 mature plants. One site was within the "Native Planting" area to the east of the Public Access and the other site was on the point, midway along the West Shore. Our herbicide treatments have gradually decreased the PL population since 2008; there were still 2 seedlings emerging from the site along the West Shore this season (2017).

We performed AIS surveys of Maple Lake on two occasions this season, searching for all Aquatic Invasive Species. There were no AIS found beside Purple Loosestrife. We will revisit Maple Lake in 2018 to work towards the eradication of Purple Loosestrife on Maple Lake and to search for all other Aquatic Invasive Species.

#### McKinney - 31037000 - EWM, PL

Our crew has been visiting McKinney Lake since 2012. At the time of our first survey, there was a fairly continuous population of Purple loosestrife throughout the entire shoreline except for along the residential shoreline in the NE. The PL was found to be most dense on the floating bog shoreline in the bays on the North Shore.

Since 2013, we have released 5,671 Galerucella beetles throughout the densest areas of Purple Loosestrife; their reproductive success seems to vary from year to year in McKinney Lake. Annual herbicide applications have been made every season in order to assist the bio-control insects in the reduction of overall seed output.

We began mapping the Eurasian Watermilfoil in McKinney Lake in 2015; at that time there were dense patches milfoil present around most of the circumference of the lake in 6-12 feet of water. This population of EWM has only slightly increased in density over the last two seasons; there are a couple new sites along the north shore that did not have Milfoil in the past.

We plan to revisit McKinney Lake in 2018 to survey for all AIS, add beetles to the bio-control population, and to monitor any changes within the EWM and PL communities.

#### Mike's (Clubhouse Chain) - 31096600 - PL

Purple Loosestrife has been managed on Mike's Lake since 2007. At the time of discovery, there were approximately 30 PL plants among a 40 yard stretch of the South Shore. We have applied herbicide to all PL plants found on Mike's lake every season since 2007 in order to work towards the depletion of the residual seed bank.

This season, there were 2 Purple Loosestrife seedlings found sprouting from the residual seed bank on the South Shore, just east of the flowage coming from Clubhouse Lake. Herbicide was, again, applied to the 2 PL plants found.

Mike's Lake will be revisited in 2018, during our AIS survey of the Clubhouse Chain of Lakes, in order to maintain control of the PL population.

#### Mississippi River – ZM, PL, CLP

In this 2017 season, our crew tracked the spread of Zebra mussels for 17.5 miles from the Winnie Dam, through Little Winnie Lake, and downstream through the Mississippi River to the confluence of the Leech River. The river becomes deep with much darker water after the Leech River flows into it. We did not find any ZM's downstream of the Leech River confluence at this point in time although it is likely they have made it further.

There were similar densities of Curly Leaf Pondweed, compared to seasons past, in the stretch of river from Blackwater Lake to the confluence of the Prairie River. CLP is found in sparse patches in many low-flow areas of the river.

The Galerucella Beetle population downstream of the Blandin Dam had a very successful reproduction year (Likely due to low water levels) and damage to the Purple Loosestrife was

very evident along the banks of the river. Herbicide was applied to any PL found with no evidence of a beetle population to assist the bio-control in the reduction of seed production.

We will resurvey the Mississippi River in 2018 to document the spread of Zebra Mussels and Curly Leaf Pondweed, as well as to conduct control efforts for Purple Loosestrife.

Starry Stonewort is currently known to be invading Winnibigoshish Lake. We will be monitoring the river flowage downstream of Winnie Dam in search of any sign of SSW spreading into the Mississippi River.

#### Moose – 31072200 - PL, CLP

The amount of Curly Leaf Pondweed near the South Access of Moose Lake has decreased greatly due to our 3 separate sessions of hand-pulling plants in 2016. This season, during our first visit to Moose Lake, we found 4 individual stems of Curly Leaf and hand-pulled them. We stopped at the site again 2 more times for a follow-up and found no more CLP.

The Purple Loosestrife population is still present in the same locations as found in previous seasons, being most abundant along the North Shore in front of the Moose Lake Resort. The Galerucella Beetle population has reproduced very well along the North Shore and throughout the creek flowage to Deer Lake. Any PL found on the East Shore was treated with herbicide; all other PL was designated as a bio-control site. Upon revisiting Moose on 9/13/2017, there was no visible PL seed head among the bio-control areas.

We will revisit Moose Lake next year to perform control measures on the CLP and to add beetles to the PL populations if needed.

#### Napoleon - 31029000 -PL

The Purple Loosestrife infestation on Napoleon Lake was first discovered by our crew in 2013. At that time there were dense patches of mature PL plants found throughout a majority of the entire shoreline.

Herbicide was applied to all PL in Napoleon Lake in 2013-14 in order to knock back a majority of the population. We began integrating biological control insects into our management plan for Napoleon Lake in 2015; 1,260 Galerucella Beetles have been released throughout the shores of Napoleon Lake.

The overall density of the Purple Loosestrife population on Napoleon Lake has significantly decreased over the last 4 seasons due to the combination of biological and chemical control methods. The Galerucella Beetle population is providing adequate control in most areas where they have been released, although the boggy bay on the northern tip of the lake shows minimal insect damage. The residential point on the West Shore was mowed short last season which assisted in the reduction of seed dispersal but made it hard to evaluate the bio-control population. This season it was not mowed and the beetle damage was very evident.

We will continue to integrate biological and chemical control methods in 2018 to ensure maximum effectiveness in our efforts.

#### Northstar - 31065300 - ZM

Our crew last surveyed Northstar Lake in 2015. At the time of that first survey, there were no Aquatic Invasive Species found within the lake. This season (2017), a shore land owner had discovered a Zebra Mussel population while removing their dock / boat lift from the lake.

The Zebra Mussel colony is fairly abundant along the East Shore of the main lake but less frequent among the rest of the lake. There were no ZM's found this season in the bays which are more or less secluded from the main lake.

We plan to visit Northstar Lake again in 2018 to document any changes occurring in the Zebra Mussel population, as well as, to survey for the presence of all other Aquatic Invasive Species.

#### O'brien - 31003200 -PL

In 2016, there were 11 Purple Loosestrife locations discovered on O'brien Reservoir south of Hwy 169 and 6 locations to the north of Hwy 169. Due to last season's herbicide application, many of those sites did not have PL present when revisited this season. There were a total of 9 PL plants found in the entire body of water this season, all of which were reoccurring sites from last season and only consisted of 1 small plant at each site.

We will do another complete lake survey in 2018 to survey for all Aquatic Invasive Species and to apply herbicide to any Purple Loosestrife found within O'brien Reservoir.

#### Pokegama - 31053200 - CLP, PL

The infested area of Curly Leaf Pondweed in Tioga Bay has not seemed to increase since the 2016 survey although there was found to be a fairly large increase from 2015 to 2016. CLP is present along the shallow flat area of Tioga bay and into the channel connected to Little Jay Gould Lake where Curly Leaf Pondweed is abundant. We discovered a couple new patches of CLP just inside the harbor leading to the Pickled Loon Saloon.

The Purple Loosestrife population has decreased significantly this season in Pokegama Lake. The PL sites on the Wendigo Arm had no PL plants present this season; the residual seed bank, however, is likely still present so we will return in 2018 to search for seedlings.

The Loosestrife sites in Sherry's Arm show very good progress; the site on the East Shore showed a major reduction in the number of PL plants present due to the annual herbicide applications since 2012. The PL site along the Western Shore had roughly the same amount of plants but they were near unrecognizable as Purple Loosestrife due to the plant damage caused by the biological control species, the Galerucella Beetle; there were 6,794 beetles released at this site in 2013. The entire littoral zone of Pokegama Lake will be resurveyed in 2018 for all Aquatic Invasive Species. Our crew will continue to integrate biological and chemical methods for the control of Purple Loosestrife on Pokegama Lake.

#### Portage - 31082400 - PL

Our crew has been integrating biological and chemical control methods on the Purple Loosestrife population of Portage Lake since 2009. When discovered, the Purple Loosestrife population was present throughout 80% of the entire shoreline with the most-dense population found along the western residential shoreline. There were 27,100 insects released from 2009-2012 and the population of the PL Defoliating Beetles had flourished, providing adequate control through 2014.

Due to poor reproduction of the bio-control species in 2015-16, our crew released 10,731 Galerucella Beetles, this season, throughout the entire Purple Loosestrife infestation of Portage Lake. When we returned for our full-lake survey, the beetles were working very hard at consuming the PL and there was very little need for chemical control. There were 10 plants on the entire lake that looked untouched by the biological control; herbicide was applied to those 10 plants.

Due to the direct connection to Sand Lake, Portage Lake is now also infested with a Zebra Mussel population.

Our crew will revisit Portage Lake in 2018 to survey for all Aquatic Invasive Species and monitor any spread of the Zebra Mussels and the results of our Purple Loosestrife control efforts

#### Prairie - 31038400 - CLP

Our crew has mapped the Curly Leaf Pondweed population on Prairie Lake since 2015. The population appeared to become more widespread from 2015 to 2016, increasing from 3 sites to 13 sites throughout the lake. Most of the patches discovered in 2016 were less than 10ftX10ft in area except for the site in the far SE tip of the lake where there was a solid patch of around 20 acres in size.

This season (2017), our survey was conducted slightly later in the summer than in previous years and there were again only 3 patches of CLP found in all of Prairie Lake and the 20 acre patch was not present. The decline in CLP locations is likely attributed to the mid-summer die-off characteristics of this particular species.

Our crew will attempt to visit Prairie Lake earlier in 2018 to survey for all Aquatic Invasive Species, map the entire Curly Leaf Pondweed population, and attempt to locate it near the dam.

#### **Prairie River – PL**

In 2016, there was 1 Purple Loosestrife plant found growing under the Hwy 169 Bridge; herbicide was applied to that one plant. There was no Purple Loosestrife found at that location this season. We will survey the Prairie River in 2018 for the presence of any Aquatic Invasive Species and to apply herbicide to any Purple Loosestrife found.

#### Rice – 31087600 - ZM

See description for Sand Lake Chain

#### Sand Lake Chain - 31082600 - ZM, PL

Although they are still abundant, judging by the number of Zebra Mussels attached to boats, docks, and lifts this season, their density has decreased compared to last season.

In 2016, the ZM's were known to have spread from Sand Lake, through Little Sand and into the river channel to the mouth of Rice Lake. Seemingly due to the lack of hard surfaces for Zebra Mussels to attach to, there were none found in the main basin of Rice Lake or downstream.

In this 2017 season, we located Zebra Mussels downstream from Rice Lake throughout the river channel, into Dora Lake and we ultimately found our last Zebra Mussel in the Bigfork River, approximately 2 miles east of the County Road 31 Bridge in Wirt, MN. Our findings show the rapid advancement of Zebra Mussels on a seasonal basis throughout the Bowstring/Bigfork River system which is fueled by the ZM population in the Sand Lake Chain. The ZM's were not found in great densities; we only located 2 mussels in a 4 mile stretch. One could speculate that they may be found in a much higher abundance in years to come throughout the Bigfork River toward the Canadian border.

The Purple Loosestrife population has not changed much in area over the last couple seasons. There is still a viable seed bank at most of the sites where new seedlings sprout each season. All PL sites on Sand Lake are revisited annually; herbicide being applied to the smaller, low density sites. The larger, more inaccessible areas are designated as bio-control sites for the use of the Purple Loosestrife Defoliating Beetle. Some herbicide applications are made in the bio-control sites to reduce the seed production.

We will revisit Sand Lake in 2018 to evaluate the progress of our control efforts on the PL community and to document any changes in the Zebra Mussel population.

#### Sand - 31043800 - PL

Our crew has been managing the Purple Loosestrife population on Sand Lake since 2010. At the time of our first survey there were over 100 mature PL plants within a 100 yard stretch along the South Shore, west of the landing. There was also one plant found in the NW corner of the lake.

There were just 5 individual plants found along the South Shore this season. The decline in PL is credited to the annual herbicide applications since 2010. We will continue to revisit Sand Lake in future seasons to conduct lake surveys for all Aquatic Invasive Species and to further eliminate the residual Purple Loosestrife seed bank through herbicide applications on any seedlings found.

#### Smith - 31065000 - CLP, PL

Purple Loosestrife has been treated both chemically and biologically by our crew on Smith Lake since 2007. At the time of our original survey, it was found to be abundant along a majority of the shoreline, being most-dense in the boggy bay portions of the lake. Historically, Galerucella Beetles have been released in the most-dense areas and herbicide has been applied to all PL plants found outside of the bio-control sites

Overall, the PL population has decreased throughout much of the lake this season except at one site in particular on the South Shore, east of the landing, which had considerably more PL than

seasons past. We had released bio-control beetles in this area in years past but their population seems to be struggling. We plan to add Galerucella beetles in 2018 to the most-dense PL patches on Smith Lake to boost their population.

Curly Leaf Pondweed fragments were found floating throughout the lake during our 2015 survey but a patch of rooted plants was not found. In 2016, we did locate a fairly small patch of CLP just out from the landing but is too deep for our crew to hand-pull.

We will survey Smith Lake in 2018 for all Aquatic Invasive Species and will make further efforts to control the Purple Loosestrife. There were 2 Purple Loosestrife plants found in East Smith Lake where they had not been historically. See the section under *East Smith Lake* for more info.

#### Snaptail - 31025500 - PL

Our AIS crew has been integrating biological and chemical control for Purple Loosestrife on Snaptail Lake since 2012 and at that time there were dense stands of mature PL plants among approximately 80% of the shoreline.

Since 2012, our crew has released 17,910 Galerucella Beetles throughout the stands of Purple Loosestrife on Snaptail Lake that were the most-dense and inaccessible.

The population of Galerucella Beetles has increased significantly over the last 2 seasons and has reached the point of causing extreme damage to the Purple Loosestrife along the western and northern shores. Although there is significant beetle damage along the eastern and southern shores as well, there are still PL plants in those areas that show minimal beetle damage. In 2017, herbicide was applied to all PL that was untouched by beetles in order to assist the bio-control in the reduction of seed production.

Snaptail Lake will be revisited in 2018 to evaluate the bio-control population and to release more beetles and apply herbicide if needed.

#### South Sturgeon/Little Sturgeon – PL 31000300/69129000

This season (2017) was our first survey within the Sturgeon Chain of Lakes and we searched for all Aquatic Invasive Species along the entire littoral zone of South Sturgeon and Little Sturgeon Lakes.

There was 1 Purple Loosestrife plant found on the south side of the channel, east of the County Road 473 Bridge. This was the only PL plant found in all of South Sturgeon and Little Sturgeon and it looks like it was imported with the soil used for the construction of the new bridge.

We will revisit the Sturgeon Chain of Lakes in 2018 to survey for all AIS and to apply herbicide to the PL plant if it returns.

#### South Sugar - 31055500 - PL

Our crew has been managing the Purple Loosestrife population on South Sugar Lake since 2013. At the time of discovery there were about 15 mature PL plants within a 30 yard stretch along a residential portion of the North Shore.

There have consistently been fewer PL plants sprouting from the seed bank each season due to our annual herbicide applications. There were just 3 plants found this season where there were 10 plants and multiple seedlings last season

There were no other invasive species located in South Sugar at the time of our survey. We will return in 2018 to survey for all Aquatic Invasive Species and to apply herbicide to any Purple Loosestrife found.

#### Spider - 31053800 - FR

We have been hand pulling Flowering rush on Spider Lake since 2015. At the time of discovery, there were 2 patches of Flowering Rush near the public access totaling about 140 sq. ft. in size.

In 2016, there was still around 80 sq. ft. of FR near the access and another small patch, about 20 sq. ft. in size, was located in the Northern-most bay along the Eastern shore; all Flowering Rush was removed by hand.

This season, the FR was much less dense and the infested area was greatly reduced to around 40 sq. ft. near the access and only 2 stems of FR were located at the site in the North Bay. We pulled FR on 3 separate occasions this season to ensure adequate control.

We conducted a full shoreline survey between 9/19/17-9/21/17 to specifically search for Zebra Mussels and new patches of Flowering Rush; there were none found. We will return in 2018 to resurvey the complete shoreline for all Aquatic Invasive Species and to hand pull any Flowering Rush found.

#### Swan – 31006700 - CLP, PL

Our crew has been managing Purple Loosestrife on Swan Lake since 2010; at that time there were 2 sparsely populated locations of PL discovered on the entire lake. Herbicide was applied to those locations and adequate control was achieved.

Since 2010, there have been other random PL plants found, as well as a large stand throughout a residential property in the NW corner of the lake. Herbicide has been applied to all of those PL plants during our annual lake surveys and there has been a major reduction in the number of plants that emerge from the seed bank each year; most sites now being void of any PL.

We began surveying for all Aquatic Invasive Species and mapping the Curly Leaf Pondweed on Swan Lake in 2015, and since then, we have witnessed the Curly Leaf Pondweed explode in population density throughout the Western portion of the lake. There are large dense patches reaching the surface in much of the West Bay, inhibiting the normal recreational use of the lake. The CLP is further spreading into the Eastern Basin of the lake to the north and south. One small patch of CLP was located on the very northern tip of the East Basin.

We will revisit Swan Lake in 2018 to survey the entire shoreline for all Aquatic Invasive Species, evaluate the spread of the Curly Leaf Pondweed, and to further our control efforts of the Purple Loosestrife population.

#### Trout - 31021600 - PL, \*FR in 2015

Our Crew has been managing the Purple Loosestrife population on Trout Lake since 2013 and managing the Flowering Rush population since 2015.

The PL has historically been located in the Drainage ditch, east of the North Public Access and the Flowering Rush site is located just out from the boat ramp at the same access.

We conducted 2 separate AIS surveys on Trout Lake this year; the 1<sup>st</sup> survey focusing on monitoring of the Flowering Rush and Purple Loosestrife populations previously found on Trout Lake, as well as, the detection of all other Aquatic Invasive Species. There was no Purple Loosestrife or Flowering Rush this season at the sites where they had been previously documented. The 2<sup>nd</sup> survey focused solely on the detection of Zebra Mussels; no Zebra Mussels were found.

We will revisit Trout Lake in 2018 to ensure the eradication of Flowering Rush and Purple Loosestrife and to conduct another full-lake survey for all Aquatic Invasive Species.

#### Trout - 31041000 - PL

The Purple Loosestrife population of Trout Lake has been on our crew's radar since 2009. At the time of discovery, there was a continuous stand of Loosestrife spanning from the Public Access on the North End of the lake to the creek in the NE corner. There was also 1small patch of PL located on the West Shore.

Due to 9 seasons of herbicide applications, the Purple Loosestrife population has been confined to the creek area in the NE corner of the lake.

This season (2017), there were 10 Purple Loosestrife seedlings found in the NE corner of Trout Lake where there had only been 3 plants found last season. These plants appeared to be sprouting from the residual seed bank. There were no PL plants found, for the 4<sup>th</sup> consecutive season, in the other locations where it had been documented in the past.

No other aquatic invasive species were located during our survey. We will return to Trout Lake in 2018 to apply herbicide to any PL seedlings present and to survey for all Aquatic Invasive Species.

#### Turtle – 31072500 - PL

The Purple Loosestrife population has steadily declined in density and area throughout Turtle Lake since 2007, when the Turtle Lake Association started up the Purple Loosestrife Control Project in partnership with the Itasca County Land Dept.

There have been 62,570 Galerucella beetles added to 4 bio-control areas on Turtle Lake since 2007; those sites are the areas where Purple Loosestrife is still densely populated. Herbicide has been applied annually to all other Loosestrife within the lake; much of the previously documented sites are now void of any PL.

We surveyed Turtle Lake twice this season. The 1<sup>st</sup> visit was mainly to conduct our control efforts on the PL population and to survey for all other Aquatic Invasive Species. Our second visit to Turtle Lake was specifically to survey for Zebra Mussels. We did not locate any ZM's on Turtle Lake. We will return again in 2018 to continue to monitor the Purple Loosestrife population and to resurvey the entire lake for the early detection of all other Aquatic Invasive Species.

#### Twin - 31002600 - PL

Our crew has been integrating biological and chemical methods of control on the Purple Loosestrife population of Twin Lakes in Pengilly, MN since 2014. At the time of discovery, roughly 80% of the shoreline in the east half of the lake contained dense stands of mature Purple Loosestrife plants. There has been 5,594 Galerucella Beetles released throughout the East side of Twin Lakes since 2015.

The population of the Galerucella Beetles (bio-control species) seems to be struggling to reproduce on Twin Lakes. Some PL plants show minimal insect damage; most plants showing no evidence of a beetle population. The amount of area infested with PL is slightly down in most areas, likely due to the annual herbicide treatments since 2015.

We will return to Twin Lakes in 2018 to survey for all Aquatic Invasive Species, add beetles to the bio-control population, and to apply herbicide to any PL that lies outside of the bio-control area in order to assist in the reduction of seed production.

#### Twin – 31039100 - FR, EWM, PL

Our crew has been collecting Galerucella Beetles from the North Shore of Twin Lakes since 2012. The stand of Purple Loosestrife on this stretch of shoreline has supported great beetle reproduction year after year and this site has supplied a large portion of the bio-control insects that we have dispersed throughout Itasca County.

The Purple Loosestrife is still abundant in all documented locations from past seasons. The Beetle population seems to be lower than past years but that is likely due to the number of beetles we have collected in the past 5 seasons.

We began mapping the Eurasian Watermilfoil and Flowering Rush on Twin Lakes in 2015. At the time of our first survey, FR was found to be scattered fairly continuously around North Twin Lake and there were 2 small patches located in South Twin.

This season, Flowering Rush has reached a very high density in areas of North Twin Lake. Many of the patches of FR along the northern shore have grown into each other becoming one continuous stretch. The number of individual patches of FR in South Twin is relatively the same as last season but they have all increased in area and density. Shortly after our survey of Twin Lakes, a private lake vegetation management firm had been contracted out by the MN DNR to chemically treat the Flowering Rush. When we returned a week later, we documented that much of the FR had yellowed and was dying but there were still many areas where the Flowering Rush had seemed unaffected by the herbicide treatment.

Eurasian Watermilfoil is scattered, mostly along the eastern shore, in low density populations. There are two large patches of vegetation, reaching the surface, that have been increasing in area every season. Those patches, which are acting like Eurasian Milfoil, are actually the native variety Northern Watermilfoil. We will return in 2018 to monitor the Galerucella beetle population and collect some if the population will support it, evaluate the spread, if any, of the Eurasian Watermilfoil, and to document the resilience of the Flowering Rush after the herbicide treatment. We will also search for any other Aquatic Invasive Species while we conduct our survey.

#### Wasson-31028100-PL

Our first survey was conducted on Wasson Lake in 2016; 6 mature Purple Loosestrife plants were discovered along the western shore of the NW bay. Herbicide was applied to all PL found in 2016.

This season, there were 25+ seedlings sprouting from the residual seed bank where the PL was found last season. The seedlings were, again, treated with herbicide. We will revisit Wasson Lake in 2018 to survey the entire Lake for all Aquatic Invasive Species and to further eliminate Purple Loosestrife sprouts from the North Bay.

## Winnibigoshish - 31014700 - (North shore from Plughat Landing to West Winnie Landing) ZM, FS, PL, SSW

Our crew began mapping the populations of Zebra Mussels, Starry Stonewort, Faucet Snails and Purple Loosestrife in Lake Winnibigoshish in 2016.

The Purple Loosestrife population on the western side of Raven's Point has been reduced to 5 seedlings emerging from the residual seed bank in the location where we found 8 mature plants in 2016. Those are the only 5 plants located on Winnie and they were treated with herbicide. This site will be revisited in 2018 for a follow-up.

Besides being widespread in the shallows near the West Winnie Public Access, Starry Stonewort is found to be fairly consistent on the 10-15ft drop-off along both the Western and Eastern shores. While speaking with the DNR vegetation sampling crew, they stated that SSW was also quite abundant along the Southern shore. No SSW was found downstream of the Winnie Dam but we will continue to search for its spread downstream in future seasons. Las t season, Zebra Mussels were not easy to find in the shallows along the Itasca County shoreline of Winnibigoshish. This season, nearly every rock, native mussel, bulrush, and piece of woody debris is clustered with Zebra Mussels. ZM's have also spread downstream through the Winnie Dam, into Little Winnie, and have made it approximately 17.5 miles down to the Leech River confluence and possibly farther.

We will survey Lake Winnibigoshish again in 2018 to monitor the spread of Starry Stonewort and document any changes within the Zebra Mussel and Purple Loosestrife populations.

### **Itasca County Lakes Surveyed to Date - No AIS Present**

-Organized by Year of Survey-

#### <u>2015</u>

Arrowhead-31080500 Balsam-31025900 Bello-31072600 Beauty-31002800 Bluewater-31039500 Burnt Shanty-31042400 Caribou-31062000 Cavanaugh-31057201 Cottonwood-31059400 Day-31063700 Dixon-31092100 Forest-31066300 Grave-31062400 Guile-31056900 Hay-31040700

Holland-31080400 Island-31091300 Island-31040600 Jessie-31078600 King-31025800 Lammon Aid-31009600 Little Bass-31057500 Little Deer-31075100 Little Moose-31061000 Little Sand-31009300 Little Splithand-31034100 Long-31000100 Loon-31010400 Lower Panasa-31011200 New-31070000 North Star-31065300

O'Leary-31070000 Pancake-31016000 Pughole-31060200 Reed-31074000 Round-31089600 Ruby-31042200 Siseebakwet-31055400 Smith-31054700 Splithand-31035300 Stingy-31051000 Tank/Helen-31023000 Tioga Pit-31094600 Trestle-31080300 Wabana-31039200 Whitefish-31084300 Woodtick-3103570

#### 2016

Antler -31034900 Ball Club-31081200 Barwise/Cedar-31027800 Batson-31070400 Battle-31019700 Bear-31015700 Beatrice - 31005800 Beaver-31026100 Big Island-31067100 Big McCarthy-31012000 Big Ole-31067000 Big Sucker-31012400 Big Too Much-31079300 Birdseye-31083400 Black Island-31041600 Blind Pete-31028500 Bosely-31040300 Brown-31042500 Buck-31006900

Burns-31065400 Burrows-31041300 Busties-31053000 Button Box-31017500 Cad-31065500 Cameron-31054400 Canisteo Pit-31128200 Carlson-31036600 Charlie-31041900 Chase-31074900 Clear-31084500 Clearwater-31040200 Cowhorn-31035600 Cresent-31029400 Dead Horse-31062200 Decker-31093400 Deer-31033400 Dinner Pail-31055100 Dock-31064900

Dollar-31013900 Dora-31088200 East-31046000 Elbow-31032800 Grass-31072700 Greeley-31086300 Gunderson-31078200 Gunn-31048000 Gunny Sack-31026700 Hale-31037300 Hatch-31077100 Highland-31048100 Island-31021700 Island-31075400 Jack the Horse-31065700 Johnson-31068700 Johnson-31058600 Kelly-31029900 Klingenpiel-31019400

#### 2016 Cont'd

Kremer-31064500 Larson-31031700 Lawrence-31023100 Little Ball Club-31082200 Little Bass-31054100 Little Bear-31015600 Little Bowstring-31075800 Little Cowhorn-31019800 Little Island-31002200 Little Jessie-31078400 Little McKewen-31068300 Little Ole-31067600 Little Rice-31071600 Little Siseebakwet-31073300 Little Smith-31067900 Little Wabana-31039900 Long-31026601 Long-31060500 Long-31078100

Lost-31028900 Lost Moose-31043200 Lower Pigeon-31089300 Maple-31055200 McAvity-31058500 McGuire-31013200 McKewen-31068200 Middle Hansen-31039600 Middle Pigeon-31089200 Mink-31045500 Mirror-31016000 Moose-31089800 Moose-31019200 Nickel-31047000 Noma-31083700 Nose-31041700 Orange-31058700 O'Reilly-31021900 Owen-31025200 Oxhide-31010600 Peterson-31079100

Pickerel-31033900 Pickle-31029100 Pine-31047800 Raddison - 31028400 Rice - 31071700 Round - 31026800 Rush Island - 31083200 Sand - 31082000 Scooty - 31015000 Shallow - 31084000 Shamrock - 31021800 Snowball - 31010800 Someman - 31027600 Spring - 31078900 Thistledew - 31015800 Tuttle - 31072500 West Smith - 31068000 Wilson - 31032000 Willow - 31077500 Wolf - 31015200

#### <u>2017</u>

Bass - 31031600 Bass - 31083300 Biauswah -31086200 Big Rose - 31076800 Birch - 31026300 Bluebill - 31026500 Buckman - 31027200 Carpenter - 31064100 Cutaway - 31042900 Duck - 31031400 Elbow - 31078300 Erskine-31031100 Farley - 31090200 Fawn - 31060900 Five Island - 31028300 Fox - 31046300 Gale - 31051300 Gauze - 31028800 Ghost - 31066200 Johnson - 31005900 Lake of the Isles -31050600 Little Cottonwood-31059500 Little Moose -31016200 Little Whitefish -31083600 Minisogama -31093000 Morph - 31092900 Mosomo - 31086100 Pear - 31067500 Pigeon River Flowage-31089400 Roosevelt - 31124700 Section 11 - 31006000 Shallow Pond - 31091000 Sioux - 31090700 Spruce - 31084900 Sucker - 31031200 Trout Coleraine -31021600 Wagner - 31091200 Wilderness - 31090100 Wirt - 31084800

## **Biological Control of Purple Loosestrife**

Purple Loosestrife Defoliating Beetles (*Galerucella spp.*) were collected from North Twin Lake (Marble, MN), Kelly Creek (Kelly Lake, MN) and the SW corner of Bowstring Lake.

Beetles were released throughout known dense stands of Purple Loosestrife in these locations in 2017:

- 11,614 Beetles released east of Hwy 65, south of Swan River on the Greenway Trail
- 10,731 Beetles released along the eastern and southern shores of Portage Lake
- 8,369 Beetles released on the north side of Hwy 169 along ATV trail in Bovey
- 6,794 Beetles released both sides of County Rd 161; north of Orty's Meats
- 6,689 Beetles released along the Mississippi River from Blandin Dam to Prairie River
- 6,000 Beetles released on Eagle Lake throughout the creek on the south end
- 5,000 Beetles released on The Deer River from County Rd 256 downstream <sup>3</sup>/<sub>4</sub> mile
- 4,500 Beetles released on Turtle Lake among Maple Creek, Moose Bay, and Alex Bay
- 4,000 Beetles releases along Schafer Creek, south of County Rd 539
- 3,882 Beetles released along the East Shore of Lower Balsam Lake
- 3,698 Beetles released on Deer Lake throughout the bays on the south and east shores
- 3,675 Beetles released throughout Holman Lake
- 3,603 Beetles released in the 2 PL sites on Blandin Reservoir
- 3,230 Beetles released between Bowstring River and South Bowstring Access Road
- 2,442 Beetles donated to the Leech Lake Tribe to be released throughout Cass County
- 2,250 Beetles released throughout Plum Creek, both sides of Hwy 6
- 2,250 Beetles released in the SW corner of Little Turtle Lake
- 2,035 Beetles released throughout Forest Lake in Grand Rapids
- 2,000 Beetles released in the water hazard of hole 16 at the Sugar Lake Golf Course
- 2,015 Beetles released in the wetland south of the L&M Warehouse on Hwy 169
- 1,900 Beetles released throughout the beaver pond south of 4<sup>th</sup> St, Grand Rapids
- 1,811 Beetles released throughout the East half of Twin Lakes, Pengilly
- 1,500 Beetles released along the South and East Shores of Ice/Crystal Lake
- 1,500 Beetles released throughout the wetland just south of the YMCA
- 1,000 Beetles released along Hwy 65, north of Nashwauk
- 750 Beetles released on Little Long Lake mostly along the eastern shore
- 448 Beetles released in the 2 PL sites on Little Drum Lake

## **Total of 103,686 Galerucella Beetles Collected and Relocated in 2017**

## Itasca SWCD - AIS Control Monitoring 2017 Galerucella Beetle Summary

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Site Total
Turtle Lake	4,800	16,100	12,800	1,700	5,600	3,700	0	2,885	4,481	6,004	4,500	62,570
4th St GR Beaver Pond	0	0	0	0	0	0	0	0	0	3,600	1,900	5,500
Blandin Reservoir	0	0	0	0	0	0	0	0	0	0	3,603	3,603
Blind Lake	0	0	0	0	0	0	1,500	790	0	0	0	2,290
Bovey – ATV Trail	0	0	0	0	0	0	0	0	0	6,261	8,369	14,630
Bowstring Lake/River	5,500	9,500	6,100	7,500	4,600	25,400	9,200	14,319	13,155	1,650	3,230	100,154
Creek/ Deer River	U	U	U	U	U	U	800	200	U	U	U	1,000
Crystal/Ice Lake	0	0	0	0	0	0	0	0	455		1,500	1,955
Cty RD135 Cass Cty	0	0	0	0	0	0	0	3,685	0	0	0	3,685
Deer Lake	0	0	0	0	0	2,300	7,700	2,000	500	10,028	3,698	26,226
Donated to DNR	0	0	0	0	0	5,500	5,750	6,000	0	3,365	0	20,615
Donated to Leech Tribe	0	0	0	0	0	0	0	0	0	0	2,442	2,442
Donovan Pond	0	0	0	0	0	0	0	0	0	5,900	0	5,900
Eagle Lake	0	0	0	0	0	0	0	5,095	0	4,316	6,000	15,411
Forest Lake	0	0	0	0	0	0	1,300	1,100	0	200	2,035	4,635
Hale Lake	0	0	0	0	0	0	900	9,007	0	0	0	9,907
Holman Lake	0	0	0	0	0	0	5,600	0	0		3,675	9,275
Hwy 65/Nashwauk	0	0	0	0	0	0	0	0	0	0	1,000	1,000
Hwy 65/Swan River	0	0	0	0	0	0	0	0	2,900	6,928	11,614	21,442
Kelly Creek RD	0	0	0	0	0	0	0	200	0	0	0	200
L&M Wetland	0	0	0	0	0	0	0	0	0	2,278	2,015	4,293
Leighton Lake	0	0	0	0	0	0	2,000	5,500	0	0	0	7,500
Little Drum Lake	0	0	0	0	0	0	0	0	0	0	448	448
Little Long Lake	0	0	0	0	0	0	2,300	4,525	7,600	2,845	750	18,020
Little Turtle Lake	0	0	0	0	0	0	0	2,563	2,500	1,650	2,250	8,963
Long Lake	0	0	0	0	0	500	4,700	1,500	400	0	0	7,100
Lower Balsam Lake	0	0	0	0	0	0	0	0	0	0	3,882	3,882
McKinney Lake	0	0	0	0	0	0	1,100	1,325	630	2,616	U	5,671
Mississippi River	U U	U	U	U	U	11,200	14,000	U	U	U	6,689	31,889
Napoleon Lake	U U	U U	U	U	U	U U	U	U	U	1,260	0 704	1,260
Urty's Meats	U U	U U	U	U	U	U U	U 1400	U	U	U	6,794	6,794
Pelican Lake(Buttalo, MN,	U U	U U	U	U	U	U U	1,100	U	0 0 0 0	U		1,100
Plum Creek	U U	U U	U	U	U	U U		U	8,373	U	2,250	10,623
Pokegama	<u> </u>	<u> </u>	7 000	0 000	0 000		6,800	U		U 700		6,800
Portage	<u> </u>	<u> </u>	7,300	3,000	9,900	6,600	U U	U		/86	10,731	38,317
Schater Ureek	U U	U U	U	U	U	U	U U	0	U	U	4,000	4,000
Serpent	U U	U	U	U	U		0 100	2,000	0 000		U	2,000
Snaptail	<u> </u>	<u> </u>	U	<u> </u>	U	3,200	2,400	750	6,302	5,258		17,910
SugarLakeGolfCourse	L	L					L	/50	U		2,000	2,750
The Deer River	L v						<u> </u>	0	2 700	0	5,000	5,000
TWIN Lakes(Pengilly)							<u> </u>	0	3,103	0	1,011	5,594
TMCA Wetland	U 10 202		0	U 12 202	U 201-00	U 50.400	07450	U NOR NO V	U 51.070	U RA DAEL	102,000	1,500
Tearly Total	r 10,300	25,600	26,200	r 12,200	20,100	58,400	r 67150	64,194	51,073	64,345	103,666	503,854

## -Purple Loosestrife Highway Sites-

Purple Loosestrife is an Aquatic Invasive Species that often spreads into aquatic systems from adjacent roadways. This invasive plant is by far the most widespread Aquatic Invasive Species in the United States, as well as, in Itasca County, MN.

Since 2007, our crew has taken the initiative to locate, document, and perform control efforts on all Purple Loosestrife found as a preventative tactic against its seed dispersal into the pristine waters and wetlands of Itasca County.

There are approximately 40 roadside wetland sites throughout Itasca County where our crew is currently managing infestations of Purple Loosestrife on an annual basis. There are numerous sites where PL has been discovered and eradicated over the last 11 years, yet new sites are discovered seasonally.

For further information on the locations of Purple Loosestrife in Itasca County, MN, contact the AIS Division in our office at (218) 280-1547.

## -AIS Location Maps-Year to Year Comparisons

The following sets of maps show a side by side comparison of AIS locations found in Itasca County from one year to another.

Some map sets were chosen to be displayed in this report to show the results of our control efforts on AIS infestations; other map sets display the rapid spread of certain AIS species, such as Zebra Mussels and Starry Stonewort, that are unable to be controlled once introduced into a body of water.

Although these maps depict locations of Aquatic Invasive Species infestations found in Itasca County during the 2017 field season, they are meant to be a REPRESENTATION of the infestations. There may be AIS locations outside of what is shown on the maps.

If you would like to request an AIS map of a body of water not included in this report, contact our AIS Division at <u>chris.evans@itascaswcd.org</u> with a formal request.



This set of maps displays the typical results of integrated control efforts on a Purple Loosestrife infestation.

Our management goal for Purple Loosestrife populations is to establish a prevalent Galerucella Beetle colony throughout the areas with the highest plant density while applying herbicide to the Loosestrife that lies outside of the designated bio-control areas.

The maps to the left show a decline in the Purple Loosestrife population on Eagle Lake from 2015 to 2017 which is a result of both chemical and biological control methods annually.

There have been over 15,000 Galerucella Beetles released throughout the south portion of Eagle Lake since 2014.



Flowering Rush is an exotic plant species that spreads rapidly throughout the littoral zone of a water body once introduced.

If the plant population is discovered early, it may be successfully removed by handdigging or chemical application.

These maps depict the spread of Flowering Rush throughout Hart Lake between 2015 and 2017.

Our crew has not performed control measures for Flowering Rush within Hart Lake. At the time of discovery, the population was already very widespread.





The above map displays the locations where Zebra Mussels were detected within the Bowstring / Bigfork River Flowage in 2017. The mussel population has spread from the Sand Lake Chain, coming from the south of the Shogren Dam.



This set of maps compares our 2016 and 2017 surveys of Little Winnibigoshish Lake.

In 2016, Faucet snails were the only invasive species located while taking sediment samples throughout Little Winnie.

Our 2017 survey revealed the spread of Zebra Mussels from Lake Winnibigoshish, through the dam, to Little Winnie and downstream through the Mississippi River.

The last Zebra Mussel our crew located in the Mississippi River was 17.5 miles downstream of the Winnie Dam near the confluence of the Leech River.



Starry Stonewort

Our 2016 survey only revealed Zebra Mussels near the SW corner where the Mississippi River flows into Lake Winnie.

Sediment samples in 2017 produced Zebra Mussels widespread along the West and East Shores.

There was also a fairly steady population of Starry Stonewort located in the same areas

Our crews will be searching the river flowage in 2018 in attempt to monitor the spread of Starry Stonewort from Lake Winnie into the Mississippi River.

We did not survey the Southern Cass County shoreline.



The map above displays the spread of Zebra Mussels from Lake Winnibigoshish downstream through the Mississippi River on a larger scale.

The river becomes much deeper with darker water downstream of the Leech River Confluence which makes sediment sampling very difficult. Although we did not find any ZM's past the Leech Confluence, It is likely that Zebra Mussels have made it further.



Above is a year to year comparison of Lower Balsam Lake. The Purple Loosestrife population was discovered on this lake in 2016; herbicide was applied to all Loosestrife in 2016 in order to stop the seed dispersal.

In 2017, Galerucella Beetles were added to the areas with the highest Purple Loosestrife Density in attempt to achieve some long-term control. The beetle population colonized very quickly.

This, again, represents fairly typical results from integrating biological and chemical control efforts for Purple Loosestrife, after just one season.



This set of maps shows the spread of Curly Leaf Pondweed within Swan Lake from 2015 to 2017.

The population density has increased immensely throughout the Western Bay of the lake and smaller patches are becoming established within the main basin to the north and south of the channel.

There is also one individual plant growing at the far north end of the lake which likely started as a plant fragment carried to the site by boat traffic.

# -AIS Photos-2017

The following collection of photographs were taken by the 2017 Itasca SWCD Aquatic Invasive Species Control & Monitoring Crew.



This is a photo of an iconic starshaped bulbil from the aquatic macro algae Starry Stonewort.

The bulbils are the reproductive root-like structure which has the ability to over-winter and begin a new life cycle in the next season.

The bulbils are attached to the vegetative structure by a thin clear filament as seen to the left of the bulbil in this photo.

The clear filaments may easily break, allowing the bulbils to travel to a new location with wave action, current, or animal and human transport.

This Photo was taken at the West Winnie Boat Access.



#### Pictured Above:

A mound of Starry Stonewort that our crew cleaned off of the boat ramp at the West Winnie Landing in attempt to prevent its spread to other lakes by boat traffic.

#### Left:

Posting signage after our cleanup efforts to inform boaters of the presence of the Aquatic Invasive Species Starry Stonewort.

McKeon Roberts (Left) Keenan Hansen (Right)



#### Pictured Above:

Five members of the 2017 Itasca SWCD AIS Control & Monitoring Crew evaluating and mapping the extent of the Starry Stonewort population along the West Shore of Lake Winnibigoshish.

#### Pictured Below:

A Crayfish found in Lake Winnibigoshish with Zebra Mussels attached. This is an often overlooked vector for the transport of Zebra Mussels. Zebra Mussels have a difficult time traveling against current, but hitchhiking is always an option.





Pictured Left:

McKeon Roberts decontaminating Zebra Mussel Early Detection Samplers once removed from Itasca County Lakes.

All Zebra Mussel Samplers are decontaminated no matter what body of water they were used on.



Pictured Right:

Pressure washing every crevice of Zebra Mussel Samplers with 160 -180 degree water.



Pictured Left:

Keenan Hansen steam cleaning the canoes after a long day of lake surveys.

All watercraft are decontaminated after completing a lake survey before being used on another lake.

Pictured Right:

Decontamination Unit ready for action.

Hot, high pressure water is used for blasting away and killing Aquatic Invasive Plants and Animals.





#### Pictured Above:

LIFE CULIRDS CHLY

Flowering Rush Infestation along the swimming beach at Twin Lakes in Marble, MN.

W. ST.

#### Pictured Left:

Stems growing in a "match stick" formation is a key identification characteristic of Flowering Rush.



#### Pictured Left:

Waylon Glienke holding a large stalk of Flowering Rush after removing it by hand from Spider Lake.

<image>

Pictured Right:

The picturesque flower of Flowering Rush is another key identification characteristic.

It is thought that typically only 1 out of 1000 stems produce a flower at most sites in MN.

Pictured Right:

Hundreds of Galerucella Beetles eating a single stalk of Purple Loosestrife.

This is a higher than normal abundance of beetles than what is typically found at collection sites.



This photo is more typical of the number of Galerucella beetles usually found at the peak of the collection season.



Pictured Left:

Waylon Glienke with a Zebra Mussel encrusted tire exhumed from the bottom of Sand Lake.

This is a typical representation of the population density of a wellestablished Zebra Mussel colony.

Pictured Right:

There were no mussels attached to the inside of the tire.

