
2021 Crab Lake Yellow Flag Iris Survey

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Date: August 18, 2021

1.0 Executive Summary

Effort to eradicate Yellow Flag Iris (**YFI**, Yellow Iris) from Crab Lake are significantly enhanced by having knowledge regarding where both **YFI** and Blue Flag Iris (**BFI**, Blue Iris) exists on the lake as well as the total extent of the infestation. To that end, efforts to survey the lake were started in 2019 with additional surveying in 2020 and 2021. This report¹ is crafted to convey the results of the surveys to date to the **Crab Lake Conservation Foundation** for their consideration.

A summary of the survey efforts to date is as follows:

1. Discussion of the extent of shoreline surveyed to date is provided in [Section 3.1](#) of this report. The extent of survey can be summarized as:
 - a. Total mainland shoreline surveyed is **14.76** miles for **97.7%** of total Crab Lake mainland shoreline.
 - b. Total island shoreline surveyed is **2.83** miles for **84.1%** of total island shoreline on Crab Lake.
 - c. This report estimates total Crab Lake shoreline at **15.10** miles for mainland and **3.37** miles for islands.
 - d. Remaining shoreline to be surveyed stands at approximately **0.34** miles of mainland and **0.54** miles of islands. The mainland shoreline that remains to be surveyed consists of Billhymmer and Judd properties just east of the Crab Creek outlet. Seven islands remain to be surveyed. These are Schaffner, Fleming, Mahlum, Nickle, Loon, Dime, and Dollar.
 - e. Crab Creek, the creek outlet between Crab Lake and North Crab Lake was surveyed for the first time in 2021. The thorough survey was performed via canoe by two trained observers. Two (2) iris plants were found in the creek, one was blue and one was unknown species. This is considered good news of significant magnitude since the creek is an area that could be negatively impacted by an infestation and removal of any infestation would likely require substantial effort.
2. To date, a total of **570** stands of iris, either Yellow, Blue, or Unknown, have been found on Crab Lake. The locations of all identified iris stands have been geolocated and their relative locations are visually presented in [Section 3.2](#) of this report. Geolocation data is available upon request to the author.
3. A total of **149** Yellow Iris stands have been identified on Crab Lake to date. Abatement efforts in 2019 and 2020 removed **65** stands of **YFI**. **The total of known stands of YFI following 2021 survey efforts YFI is 84.** This number was reduced significantly by subsequent 2021 removal efforts which are discussed in a separate report.
4. A total of **249** stands were identified as native Blue Iris.
5. A total of **237** stands were identified to be iris of an unknown species. Identification as “Unknown” means that no blossom or seedpods were present to definitively distinguish the iris species. The species of any “unknown” can be expected to be either Yellow or Blue. Mature iris plants do not flower every year and immature iris starting as a new seedling can require two or more years to flower. Consequently, the population of unknown stands will likely require several years to entirely reveal their species.
6. The purpose for and methodology of surveying for **YFI** is provided in [Section 4.0](#).
7. More detailed information on **YFI** on Crab Lake is available in the Crab Lake Yellow Flag Iris Abatement Report [1] found on the **Crab Lake Conservation Foundation** website.

¹ This report of survey results was unsolicited and created through combined efforts that were not-for-hire. Time, labor, and outlay that were devoted to creation of this report were invested on a volunteer basis. This report was assembled, for information only, for the benefit and use of the **Crab Lake Conservation Foundation**. The content of this report is not, and shall not be construed as, the product of the practice of any profession licensed by the State of Wisconsin.

2.0 Yellow Iris

Yellow Flag Iris (**YFI**) (*iris pseudacorus*) is a non-native invasive species, native to Eurasia, that was introduced to the United States as a wetland ornamental and for erosion control. Like many invasive species that are introduced into non-native environments, introduction of **YFI** has resulted in unintended negative environmental consequences.

YFI does out-compete native riparian vegetation, including cattails, sedges and rushes, and it degrades native fish habitat, as well as bird nesting and rearing sites. The dense mats this iris forms can move into and crowd out native vegetation, trap sediment, and inhibit or alter flow in creeks and rivers.

Potential consequences for Crab Lake include:

1. Displacing native shoreline vegetation.
2. Introduction into the lake outlet, Crab Creek, and inhibiting flow.
3. Negative impact on loon nesting sites through congestion of the shoreline.

Yellow Iris was added to the Wis. Admin. Code NR 40 [2, 3] Invasive Species Rule on May 1, 2015 as a Restricted Invasive Species. Since 2015, the State has identified that 161 [4] waterbodies statewide, and 13 in Vilas County, have an infestation of **YFI**. The state's records are not likely to include the entire population of infested lakes since recording and citizen reporting of **YFI** only started in 2015. Crab Lake has not yet been added to the lists despite procedural reports to the WDNR.

Yellow Iris was likely planted on Crab Lake, prior to being designated as restricted, when **YFI** was readily available and commonly planted throughout Wisconsin as a favored ornamental.

Since it was once popular to plant it does currently infest multiple other Vilas County lakes including Armour and Horsehead per first hand reports to the author.

Other reported [5] water bodies include those listed below. This list is should not be considered inclusive of all infested Vilas County lakes as it does not include other infested waterbodies known to the author.

- High
- Little Spider
- Manitowish Lake
- Manitowish River
- North Turtle
- Papoose Creek
- Papoose Lake
- Rest Lake
- Rock Creek
- Rock Lake
- South Turtle
- Squirrel Lake
- Squirrel River.

3.0 Crab Lake Iris Survey

3.1 Extent of Survey

Surveys of Crab Lake for identifying iris started in 2019 with additional shoreline added in 2020 and 2021. The length of shoreline surveyed is detailed in Table 3.1 and depicted in Figure 3.1. Some shoreline has been surveyed multiple times and has been reported as surveyed in more than one year in Table 3.1. Therefore, the total miles in Table 3.1 does exceed the total length of contiguous mainland shoreline miles on Crab Lake.

Year	Shoreline Miles
2019	1.01
2020	3.91
2021	13.68
Total	18.60

Total contiguous mainland shoreline surveyed is **14.76** total miles representing approximately **97.7%** of the total mainland shoreline of Crab Lake. The author has estimated² the total length of Crab Lake mainland shoreline at **15.10** miles through use of Google Earth Pro.

The **1.01** miles surveyed in 2019 was resurveyed in 2021 for the purpose of observing shoreline where removal activity occurred in 2020.

Approximately **0.34** miles of mainland shoreline remains to be surveyed. The mainland shoreline that remains to be consists of the Billhymer and Judd properties just east of the Crab Creek outlet.

Sixteen (16) of the Twenty-three (23) islands identified and named in the CLPOA directory have been surveyed for a total of **2.83** miles of island shoreline. Approximately **0.56** miles of island shoreline remains to be surveyed on Islands identified as Schaffner, Fleming, Mahlum, Nickle, Loon, Dime, Dollar. All islands will need to be surveyed eventually if complete elimination of **YFI** is to be confidently attained.

Of the miles surveyed in 2021, **8.96** were completed in approximately 18 hours over three days. Therefore, shoreline survey by wading can be expected to proceed at an average rate of about ½ mile per hour with water level, shoreline configuration, and frequency of iris encountered significantly impacting the rate of survey of any discrete section of shoreline.

The total survey distance from 2020 includes **1.91** miles of boat survey performed in the general area including Gorrilla’s bay. The entirety of the remaining total survey (2019-2021) distance was performed via wading.

² The WDNR Historical Lake Map [6] reports total mainland shoreline length as 13.6 miles. This same map when scaled in Bluebeam yields a mainland shoreline of 14.22 miles. Using the path tool in Google Earth Pro, the author did estimate a total mainland shoreline of 15.10 miles. The author chooses to use the larger distance so as to conservatively estimate the remaining shoreline to be surveyed.

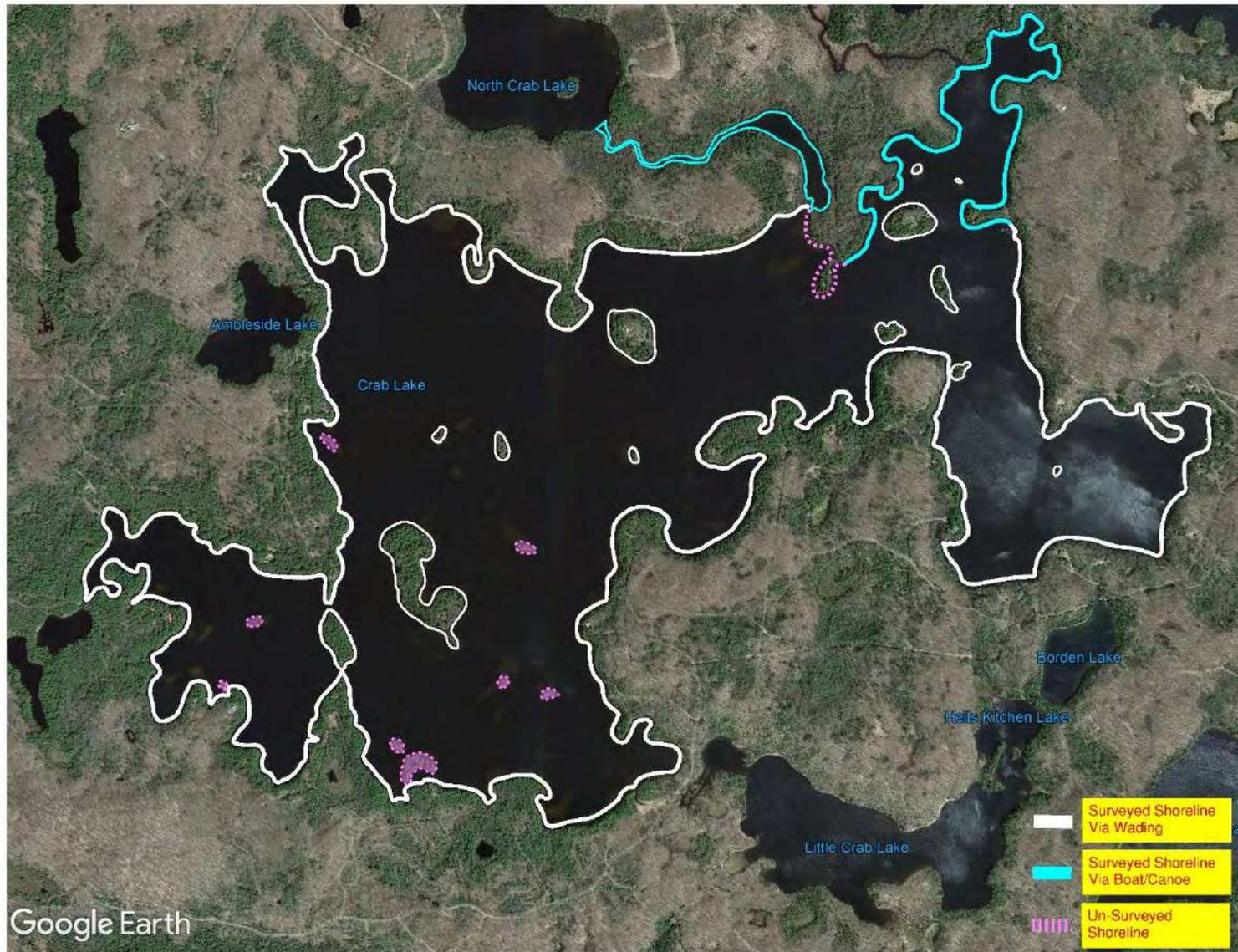


Figure 3.1 Total Extent of Crab Lake Iris Surveys as of July 26, 2021

3.2 Survey Results

The surveys identified locations of independent iris stands and recorded the following information:

1. Geolocation (Latitude and Longitude) of Stand via a handheld Garmin 64sc.
2. Species is noted as **Yellow** or **Blue** or **Unknown**. Unknown is noted where neither Yellow nor Blue can be ascertained.
3. Quantity of Leaf Fans. Iris plants are manifest in a distal fan of five leaves. Recording the number of fans per stand provides a relative mass of the stand at any particular location.

Iris stands continue to expand in size over time since a significant method of propagation is via clonal growth emanating from an originating seedling. Some stands exist where only one leaf fan is present while other locations have been found where up to 500 fans were judged to be present. Since every fan cannot be counted within a reasonable time investment, the total fans are an estimate dependent on the accuracy of the author’s judgment.

The results of the surveys are tabulated in Table 3.2 and depicted in Figures 3.2 thru 3.8.

TABLE 3.2 COMBINED SURVEY RESULTS				
	IRIS SPECIES			TOTAL
	YELLOW	UNKNOWN	BLUE	
STANDS	84	237	249	570
FANS	2783	1549	4789	9121
% OF TOTAL STANDS	14.7	41.6	43.7	-
% OF TOTAL FANS	30.5	17.8	62.3	-

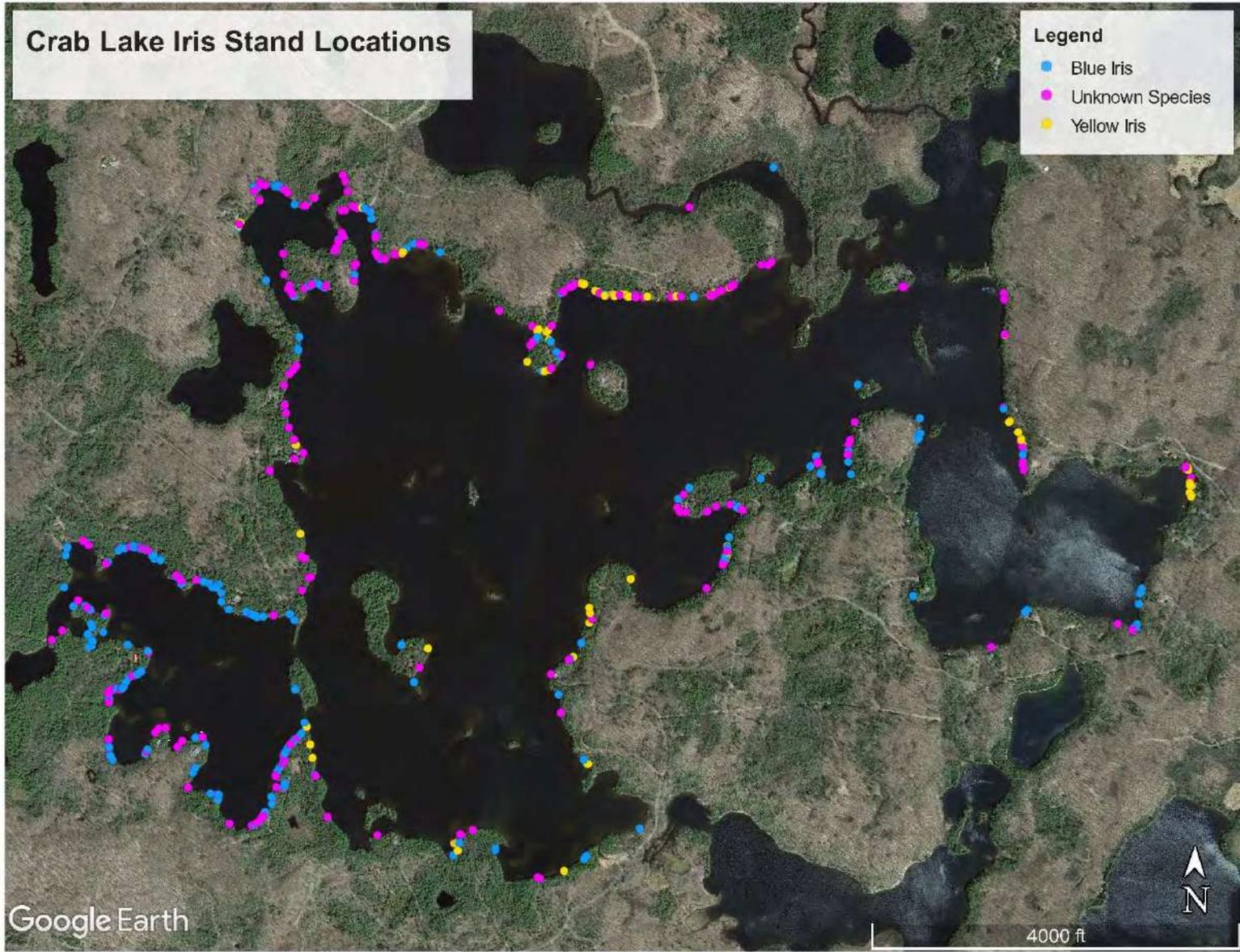
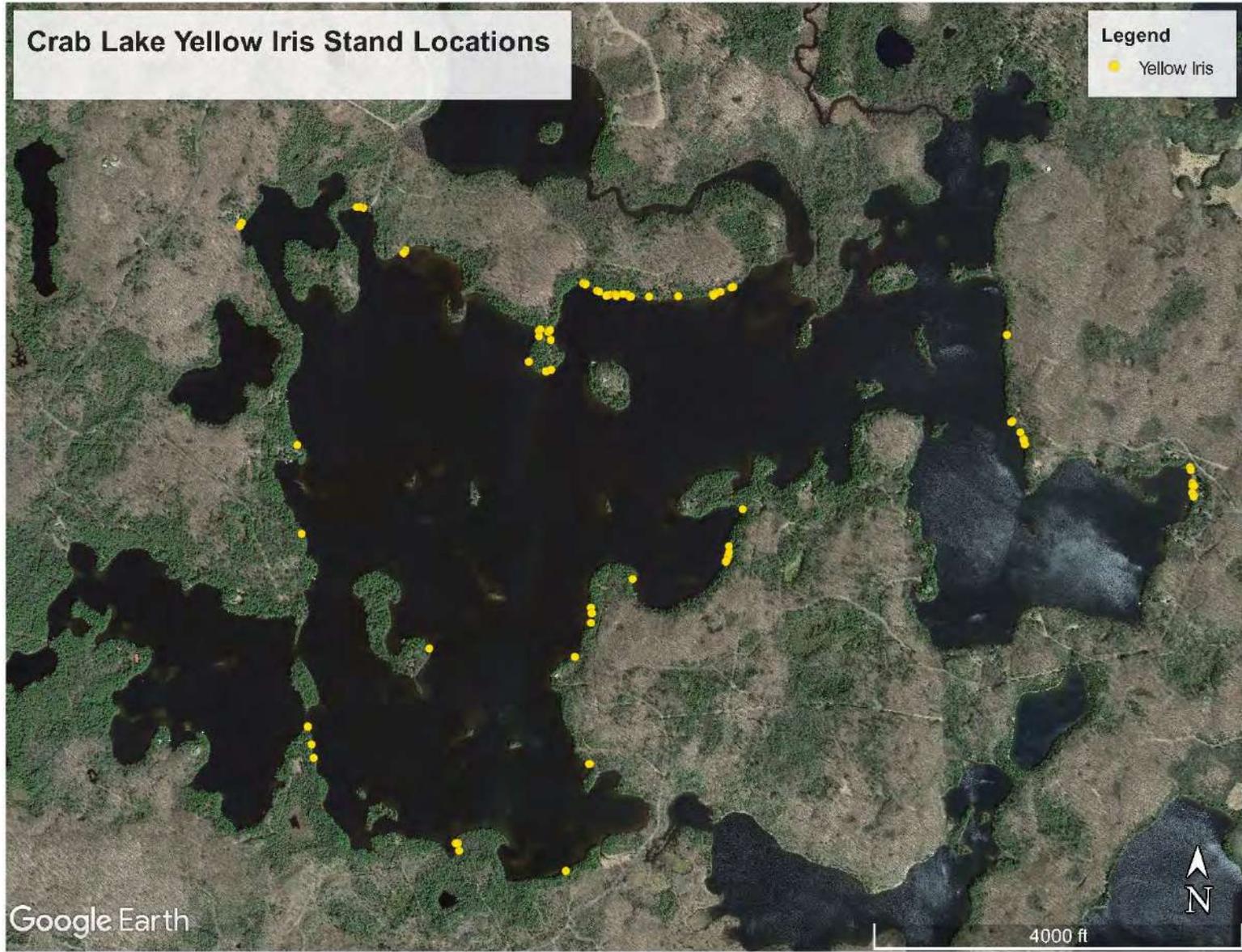


Figure 3.2 Overall Iris Stand Locations



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Figure 3.3 Crab Lake Yellow Iris Stand Locations

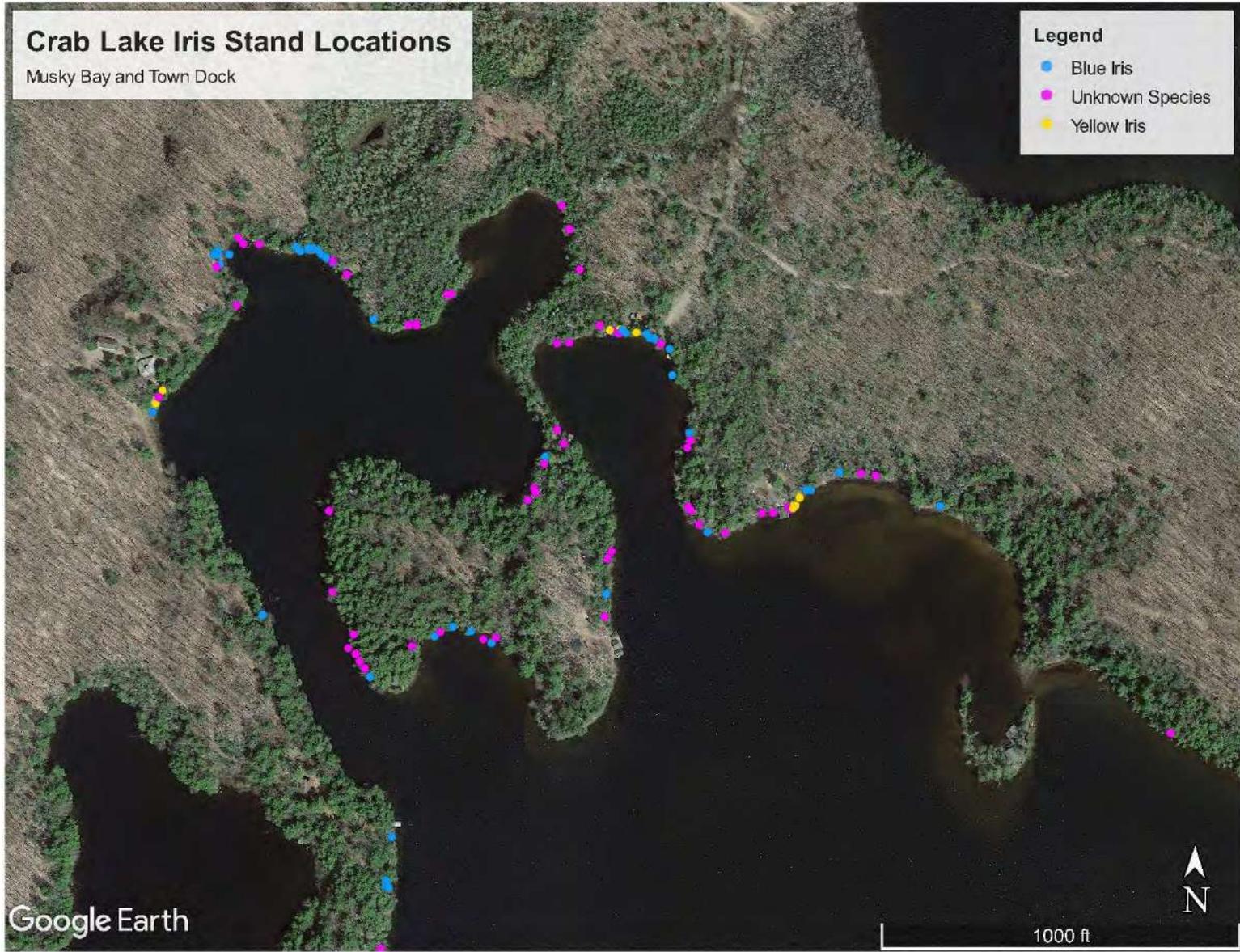


Figure 3.4 Iris Stand Locations – Town Dock

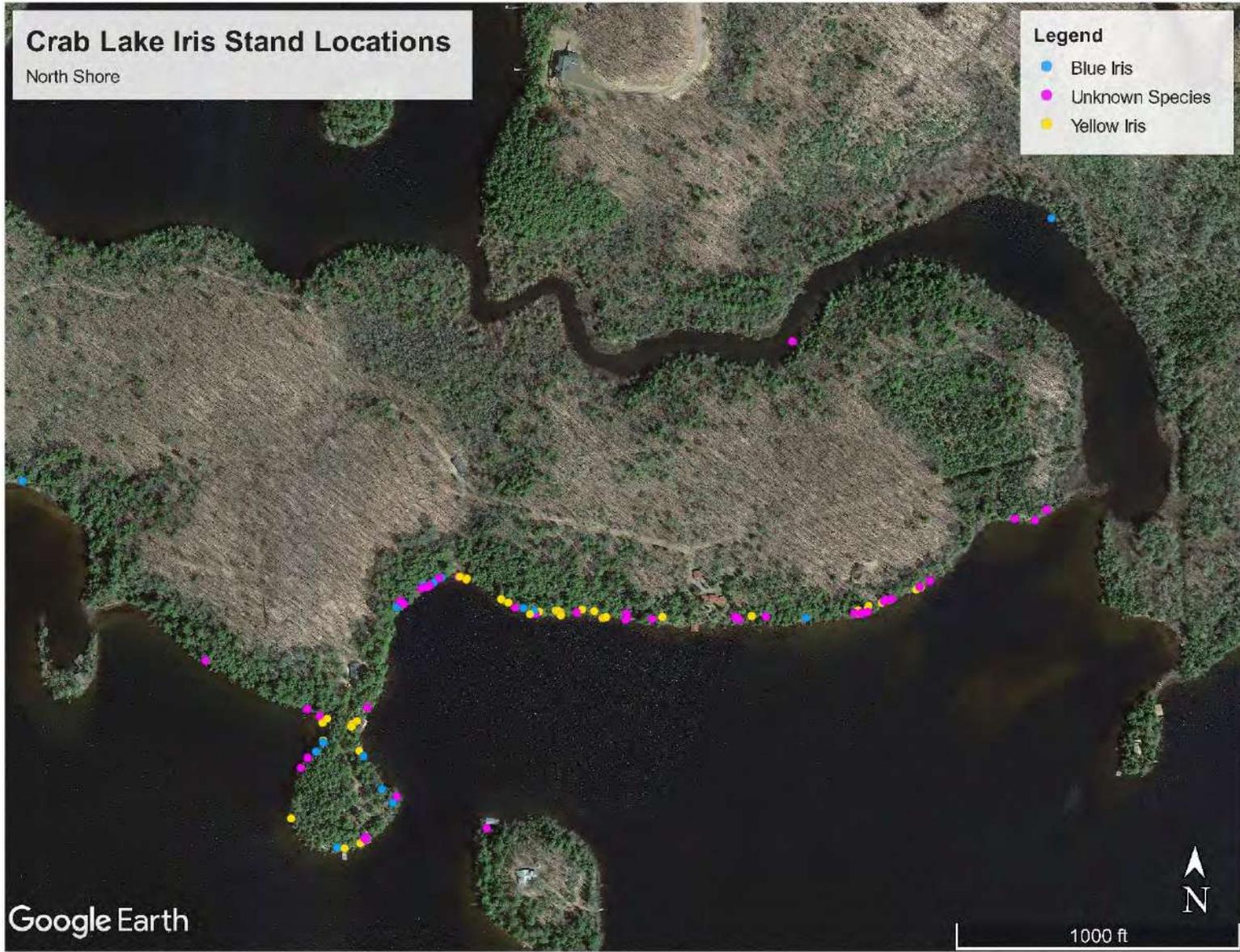


Figure 3.5 Iris Stand Locations – North Shore

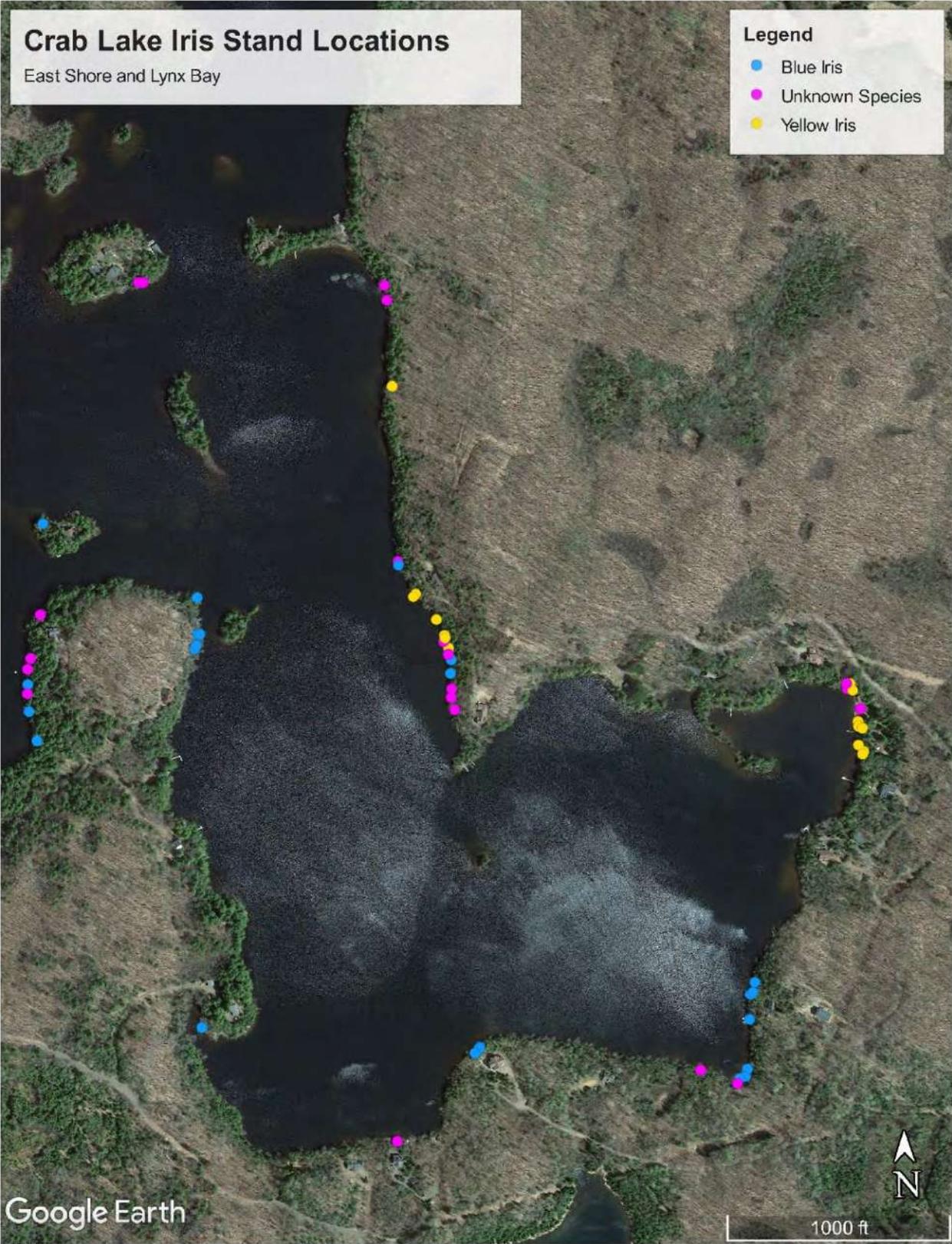


Figure 3.6 Iris Stand Locations - East Shore and Lynx Bay

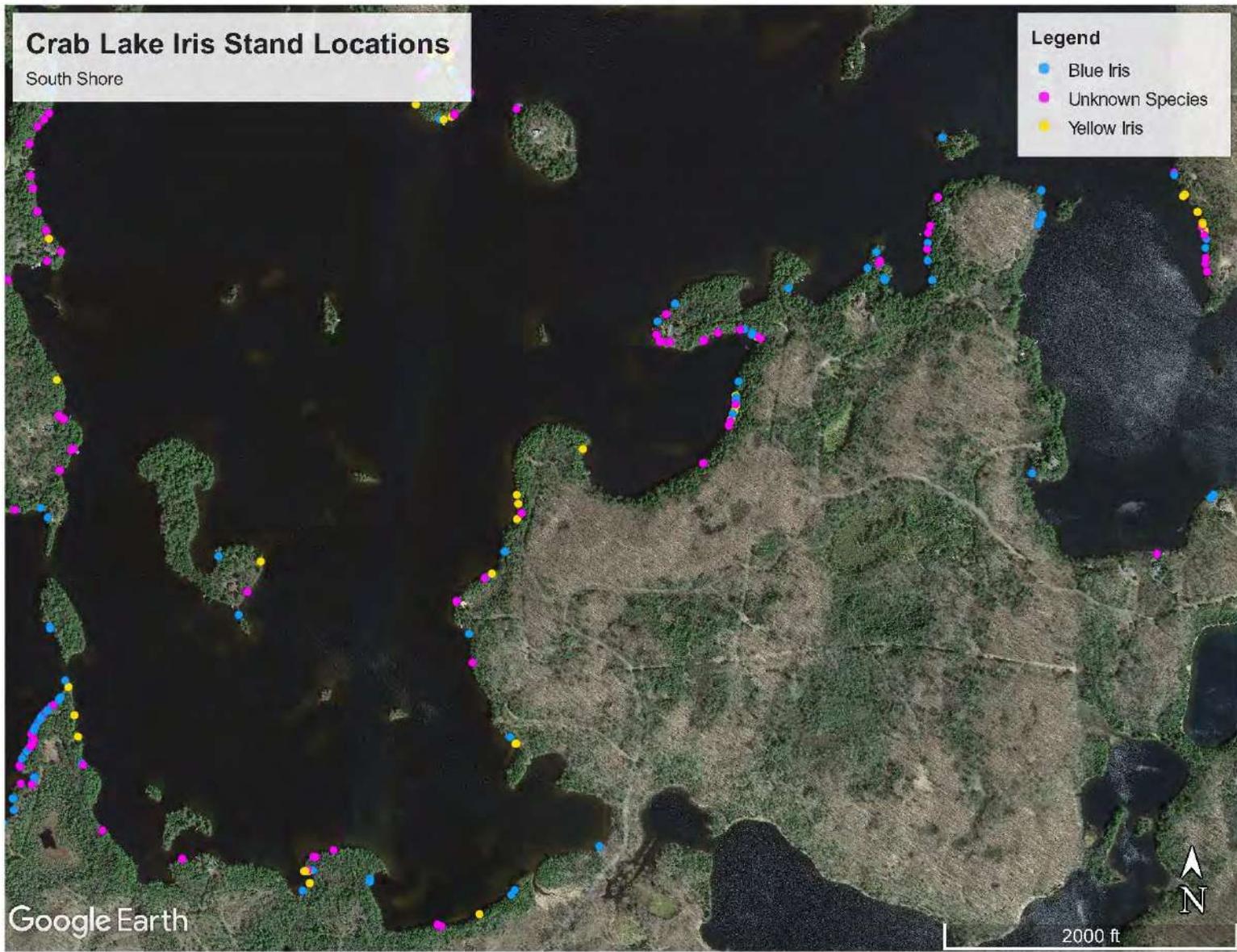


Figure 3.7 Iris Stand Locations – South Shore

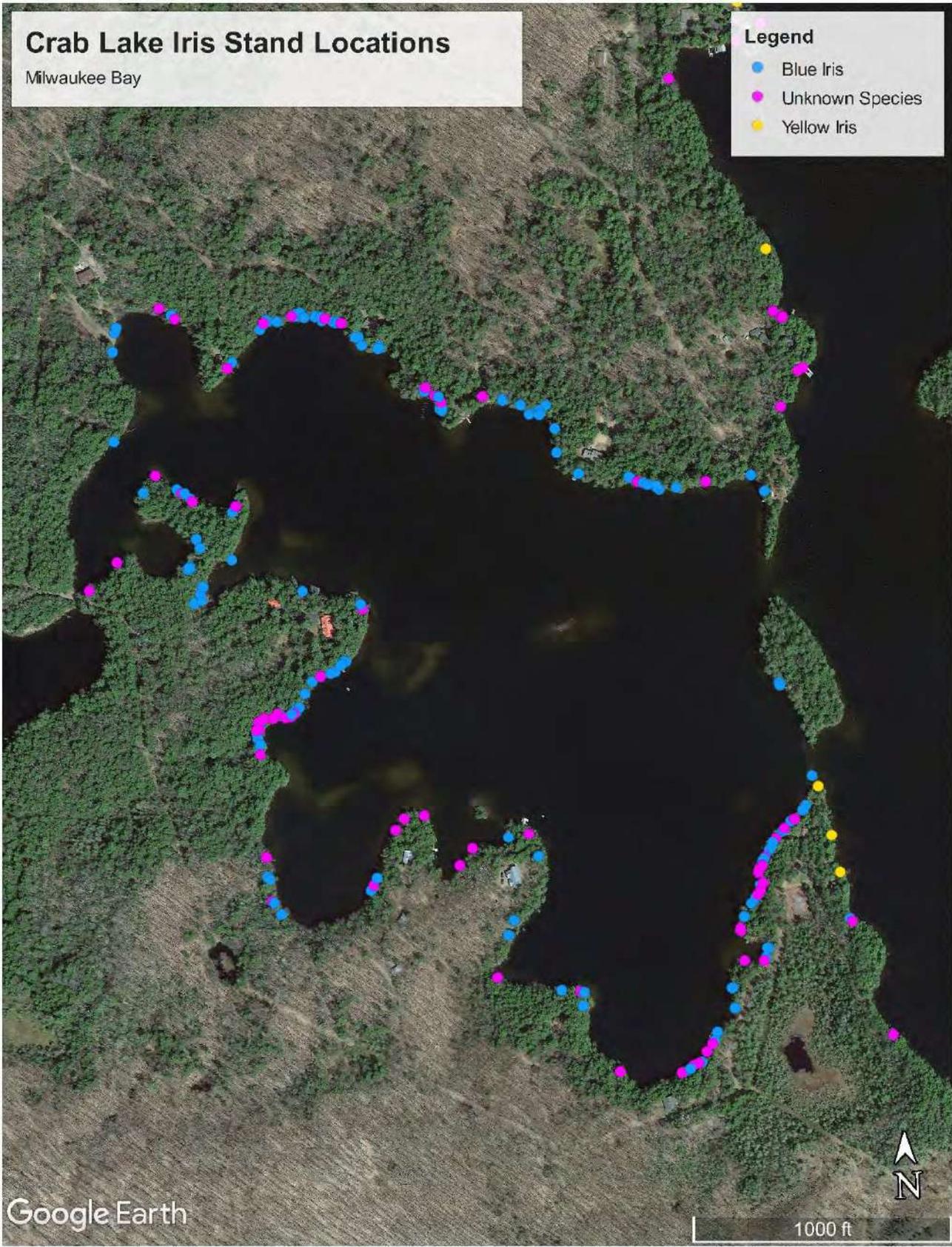


Figure 3.8 Iris Stand Locations – Milwaukee Bay



Figure 3.9 Iris Stand Locations – East Shore

3.3 Survey Discussion

Surveys in 2019 and 2020 focused on areas known to have the heaviest concentration of Yellow Iris which were along the MacLean-Graham-Spackling-Smith shorelines. Other areas of focus were shorelines where **YFI** had been reported to the author. The goal for 2021 was to survey a more extensive amount of shoreline to gain a greater appreciation of the overall iris population and the **YFI** infestation.

1. The 2019-2020 surveys identified a total of 112 **YFI** stands in 4.92 total miles of surveyed shoreline.
2. Abatement by removal or treatment disposed of 3 **YFI** stands in 2019 and 62 **YFI** stands in 2020 for a total of 65 **YFI** stands having been eliminated.
3. The 2021 surveys identified a total of 37 new **YFI** stands in 13.68 total miles of surveyed shoreline, 12.67 miles of which had not been previously surveyed.
4. As part of volunteer participation in the Adopt-A-Shoreline program, Chas Gray did report to the author the presence of **YFI** stands in Northwest corner of Lynx Bay on 6/23/2021. This notice was acted on, prompting a completion of the Lynx Bay survey.
5. The current population of known **YFI** stands on Crab Lake now stands at 84 stands (112 – 65 + 37) following all surveying and subsequent to 2021 removal efforts.

In 2020, 1.91 miles of boat survey was performed in the general area including Gorrilla's bay. No iris was identified during this survey. In the summer of 2021, Colleen Gorrilla did identify two stands of iris of an unknown species along the shoreline covered by said boat survey. It can be expected that these stands were likely present in 2020 and should have been found by an accurate survey. The author feels this is evidence supporting that boating surveys can miss iris stands and are not as accurate relative to a wading survey. It is very important that surveys are thorough as any **YFI** left undiscovered has the potential to render abatement efforts useless.

In 2020, removal and treatment of 65 stands was performed. The area where these stands were located was resurveyed in 2021 in part for the purpose of judging success of abatement methodology. The survey indicated that no iris stands are currently found, in a dominant portion of the subject locations, where stands had formerly existed. It was recognized that some iris leaf fans did survive the 2020 abatement effort in a few locations that were treated as well as locations where removal was employed.

Digging up and removal of stands has proved to be very effective as most 2020 dig locations did not contain leaf fans in 2021. A few stands that received removal focus in 2020 do remain, yet currently exist as a significantly smaller stand. As example, two stands now exist with two fans each where 20 and 75 fans had existed prior to digging. In order to be 100% effective in eliminating a particular stand, diligent attention to the detail of removing all rhizome is required. Leaving any viable rhizome behind can, and has, resulted in new growth. Leaving any rhizome behind, at any one location, would eventually render the whole removal effort useless if return visits in following years were not invested. During the 2020 removal effort, individuals were specifically tasked with policing the dig area and removing any rhizome fragments that remained after the heavy burden of removing the bulk of the stand was complete. The author believes that this is a critical task in any removal effort and is one reason for the relative success of the 2020 dig. Attention to this critical task will have the effect of reducing the need for future surveys and follow up remedial efforts.

Treatment of stands also proved to be very effective with some stands having been entirely expired while others having been significantly reduced. Therefore, it is the author's opinion that properly applied treatments are a very effective abatement methodology. In some cases, digging up certain stands will likely be so destructive to shoreline and/or adjacent flora that treatment would be considered to be the preferred method for abatement.

4.0 Yellow Iris Survey Purpose and Methods

4.1 Survey Purpose

Surveys are performed for two primary reasons:

1. Ascertain extent of infestation.
2. Identify specific plants and areas for abatement.

4.2 Survey Methodology

Surveys can be performed using three primary methods:

1. Wading:

- a. Most detailed and preferred method due to the natural state of the shoreline. Density of forest and littoral vegetation frequently obscures Iris from view. Close proximity gained by wading is the only option to find some plants.
- b. Close proximity allows for distinguishing:
 - i. Type of Plant: Iris, Cattail, Grasses, etc.
 - ii. Plant Species: Yellow, Blue, Unknown.
- c. Close proximity allows for more accurate geolocation:
 - i. Geolocation (Waypoints) allow for:
 1. Conveying information (see report).
 2. Tracking removal success year over year (see report).
 3. Planning/Discussing removal of specific plants or clusters of plants.
 4. Planning future surveys.
- d. More time consuming than boat tour.
- e. Wading is the most accurate.
- f. Wading allows for more immediate access to **YFI** to allow clipping of blossoms or seed pods to preclude broadcast of seeds.

2. Boat Tour:

- a. Tours by boat, kayak, or paddle board cover distance rapidly relative to other methods.
- b. Can only identify Iris that is not obscured by adjacent vegetation and is readily visible.
- c. Requires repeated beaching to provide proximity required for identification, geolocation, and clipping of blossoms or seed pods.
- d. Geolocating iris and/or clipping YFI does require approach to the iris stands. 2021 survey geo-located 491 stands and clipped 72 of these stands identified as **YFI**. Mounting and dismounting a kayak or paddle board almost 500 times along the Crab Lake shoreline could be considered hazardous.

3. Hiking Landside of Shoreline

- a. Natural shoreline, more often than not, provides either difficult access or inadequate visual perspective for surveying.
- b. Hiking in certain circumstances can provide for an easier and better visual perspective relative to wading.
- c. Hiking is best used as an alternative while wading.
- d. Hiking necessarily requires permission from property owners to avoid trespassing.

4.3 Species Identification

There are two species of iris known to exist on Crab Lake, invasive Yellow Flag Iris (**YFI**) (*iris pseudacorus*) and native Blue Iris (*Iris versicolor*). The species of iris is readily identified with accuracy when in bloom or if seed pods are present. If not in bloom or with seed pod, the relative size can provide evidence to species identity but cannot be considered definitive.

There are three physical attributes between the two plant species:

1. Blossom Color.
2. Seed Pod Configuration.
3. Size of plant and stand. Blue is more diminutive and less aggressive than Yellow.

The differences in blossom color and seed pod configuration are depicted in **Figure 4.1**. The difference between the seed pods is very distinct which provides for easy identification when seed pods are present. The Yellow Iris has a 6-sided pod with three seeds per cross section while the blue has a 3-sided pod with 6 seeds per cross section.



Figure 4.1 Distinguishing Features Between Yellow (left) and Blue Iris (right)

The distinct differences between species are only readily apparent during short time frames in the plant's life cycle. This essentially creates two seasons for surveying for iris where species can be readily and affirmatively distinguished. The blossoms present the most efficient and distinguishable marker. Blossoms have been used on Crab Lake to facilitate surveys as early as June 15th and late as July 10th. The seed pods develop immediately after the blossoms disappear. Within a week the seed pods mature to a point where distinguishing features are evident and last until the seed pods fall. The duration that seed pods will remain available for identification is an unknown.

5.0 Acknowledgements

The author would like to acknowledge that a number of Crab Lake property owners and their guests have engaged in identifying and removing Yellow Iris from Crab Lake. The entirety of this effort, and all of the individuals involved, is unknown to this author. The efforts of all who are involved in abatement of **YFI** on Crab Lake are appreciated.

The content provided by the author, this survey and reference **1**, cannot be expected to encompass the entirety of the **YFI** removal effort on Crab Lake and should be considered to be complementary to the overall effort invested by the Crab Lake community.

The author would like to express appreciation and thanks to the following for their assistance with the 2021 survey efforts:

- Rob Foerster for assistance with timing, provision of docking privileges, and ferry service.
- John and Heidi Pence for provision of docking privileges.
- Kimberly Monreal for granting property access.
- John Heller, Duncan MacLean, and Meredith and Chuck Ogilby for granting docking privileges and island shoreline access.
- Tom Jackson for fine conversation and drinking water.
- Mandy Tuttle and her dog Mika for a fine welcome and chat.
- Bill Mahler and Tom Balistreri for on lake assistance and welfare checks.
- Chas Gray for shoreline inspections and conveying locations of Yellow Iris.
- Colleen Gorrilla for shoreline inspections and conveying locations of iris stands.
- Gordan and Ildiko MacLean for ferry service, support, and assistance of survey of Crab Creek.
- Marjie Zander and Maye Lee MacLean for ferry service and support.
- John MacLean for ferry service and support.
- Jerry Walker for facilitating communications.

6.0 References

1. [Crab Lake Yellow Flag Iris Abatement Report](#)
2. [WDNR Topic Page Invasive Species Rule – NR 40](#)
3. [Wis. Admin. Code NR 40 Invasive Species Identification, Classification and Control.](#)
4. [WDNR AIS List Yellow Iris](#)
5. [Aquatic Invasive Species - Vilas County](#)
6. [Wisconsin DNR Lake Map, Crab Lake - Vilas County, Date – Sep 1970 - Historical Lake Map](#)