Wisconsin Department of Natural Resources
Surface Water Grants Program
Aquatic Invasive Species
Grant # AIRR-216-17

Buckatabon Lakes Eurasian Watermilfoil Control and Prevention Rapid Response Project (2015-2017)

Upper and Lower Buckatabon Lakes - Vilas County, WI

Final Reporting

Submitted To:
Wisconsin Department of Natural Resources
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And

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Submitted By:

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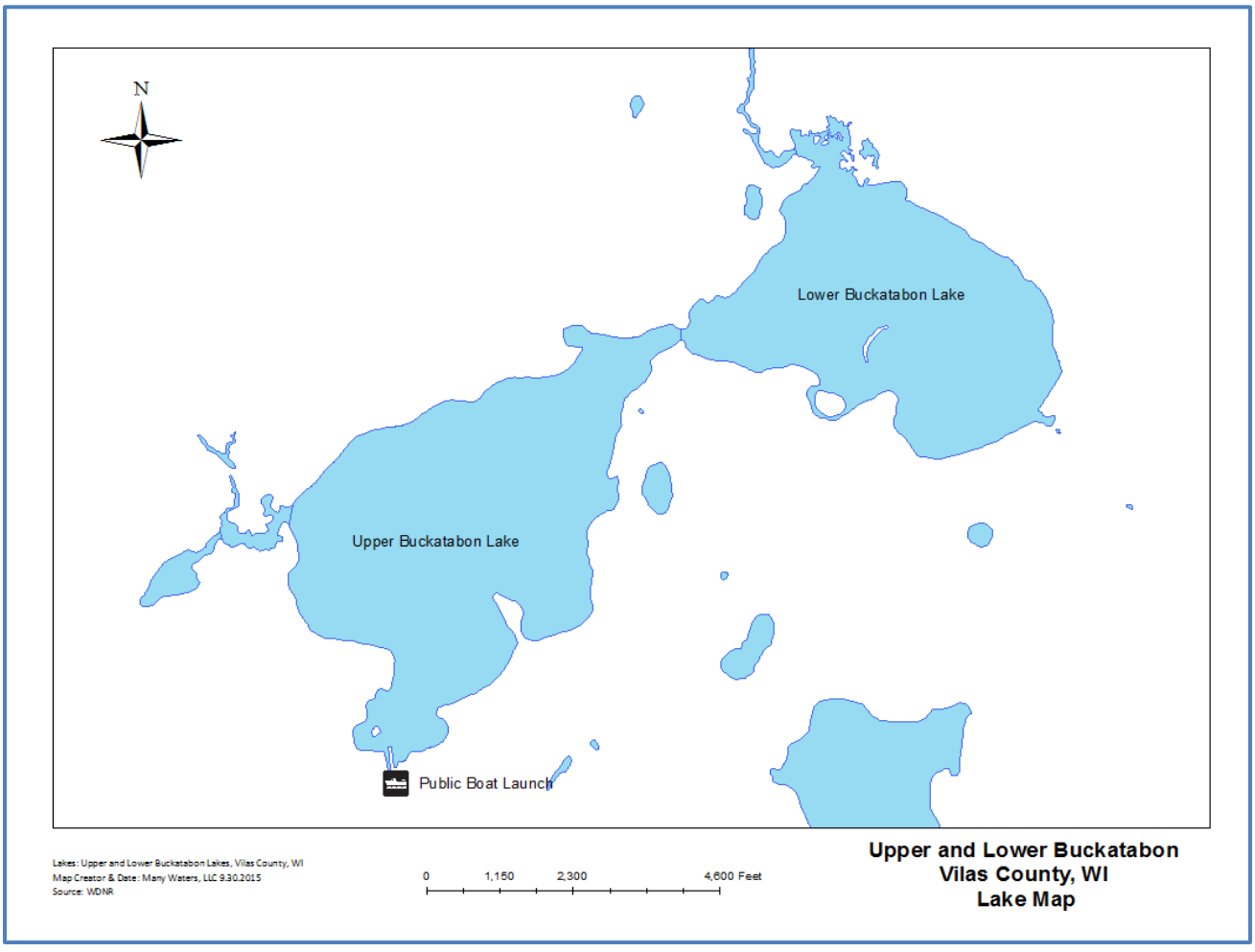
PROJECT AREA

Upper and Lower Buckatabon Lakes are connected waterbodies located in Conover Township, Vilas County, WI with 493 and 352 surface water acres respectfully. Upper Buckatabon has a maximum depth of 30 feet and Lower Buckatabon has a maximum depth of 16 feet. Both lakes are drainage lakes. A dam owned and operated by Wisconsin Valley Improvement Company is located along the eastern end of Lower Buckatabon that drains Buckatabon Creek to the Wisconsin River. A public boat launch owned by Vilas County is located on Upper Buckatabon, whereas a channel between Upper Buckatabon and Lower Buckatabon provides public access to Lower Buckatabon. Private boat launches also provide access to Lower Buckatabon.



OVERVIEW

This report is a summary of activities completed from 2015-2017 under the WDNR Aquatic Invasive Species Grant # AIRR-216-17 for Eurasian watermilfoil (EWM). Specifically this report synthesizes (1) Eurasian watermilfoil (EWM) monitoring, (2) EWM management strategies and, (3) discussion of project highlights.

In 2015, EWM, discovered by lake resident Dan Benson, initiated a response by the WDNR to complete an aquatic plant survey using the WDNR point intercept (PI) methodology. Results of this survey found EWM near four sampling locations, two on Lower Buckatabon, and two on Upper Buckatabon. EWM, based on the point intercept frequency of occurrence, for Upper and Lower Buckatabon is 0% and floristic quality index is 30.86 and 32.86 respectfully.

To receive WDNR surface water grants, sponsors had to be eligible under a designated set of criteria set forth by the WDNR, at the time of the EWM discovery, Buckatabon Lakes did not qualify. Using the Town of Conover, which was an eligible sponsor, the Buckatabon Lakes requested that the Town initially sponsor a WDNR Surface Water Grant for Aquatic Invasive Species Early Detection and Response. In the meantime, lake members worked with the WDNR to formally organize a qualified lake association titled the Buckatabon Lakes Association (BLA). Once legally organized, a one year grace period is required prior to the Association becoming eligible to receive future funding. During the summer of 2016, this grace period was met, and the BLA worked directly with the WDNR on transferring the grant sponsorship from the Town of Conover to the BLA.

SEASONAL MONITORING EWM

Eurasian watermilfoil monitoring surveys using a meander approach are primarily completed with visual observations, but also include the use of rake tosses and underwater cameras. Monitoring efforts are qualitative in nature, meaning that information collected describes the condition of EWM rather than using measured or quantitatively calculated values. For example, Table 1 describes the general observed abundance estimate of EWM found during a survey. Smaller sites are geo-referenced with a GPS point and extent is determined by using a visually estimated circumference converted to acres. This is an observed estimate of exact extent and not footprint. On average, these sites are less than a 0.10 of an acre in size. Larger sites, typically greater than a 0.10 of an acre in size are circumnavigated and extent in acres is calculated and represented by a polygon. Each year two surveys are completed. The first survey, timed during the first half of the growing season, focuses on reconfirming previous years EWM locations to refine management strategies and monitor for EWM in shallower water. The second survey, timed to capture EWM plants at or near the greatest growth potential for a given year, occurs typically second half of the growing season and includes deeper waters where vegetation grows.

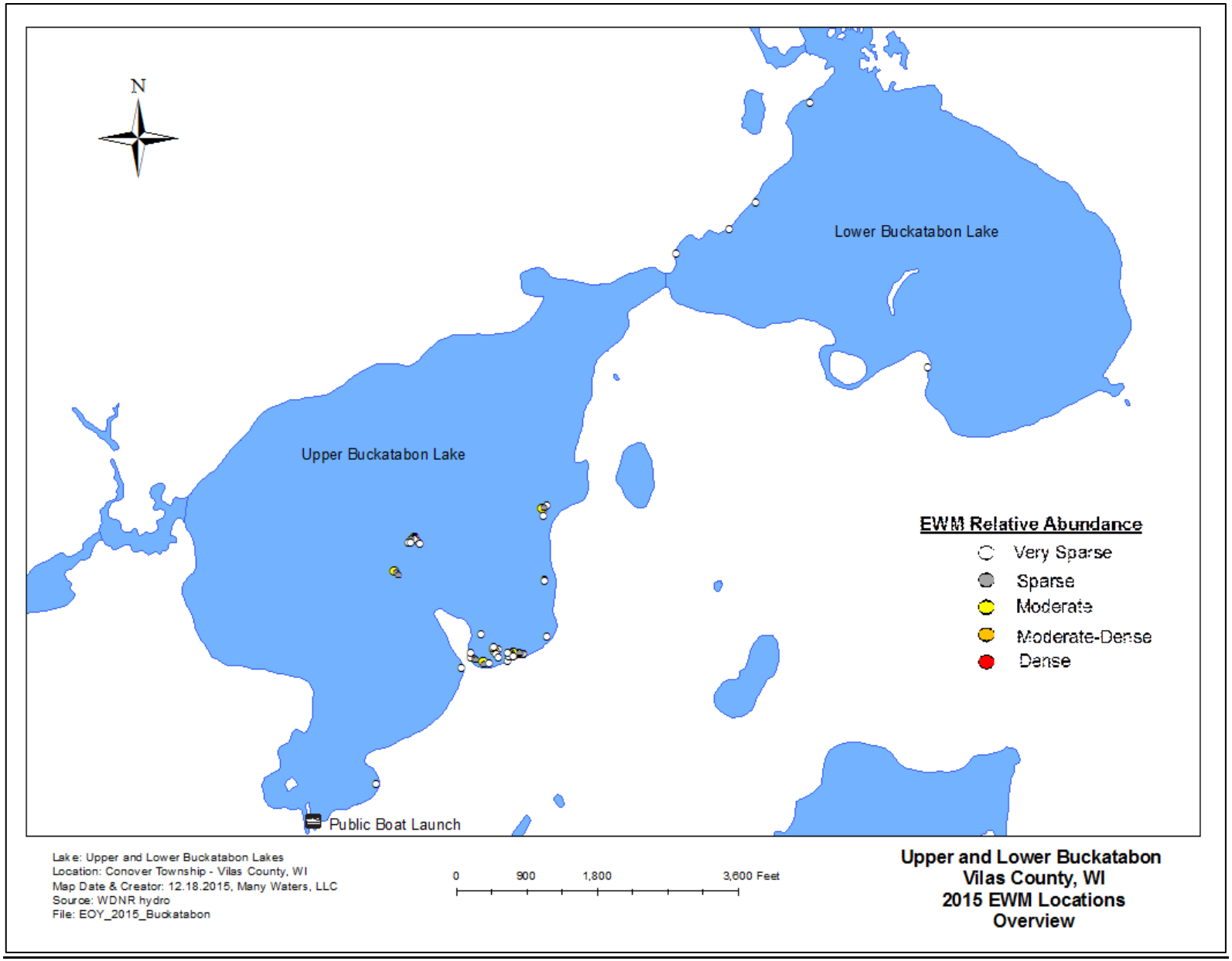
Table 1: Estimated qualitative density rankings.

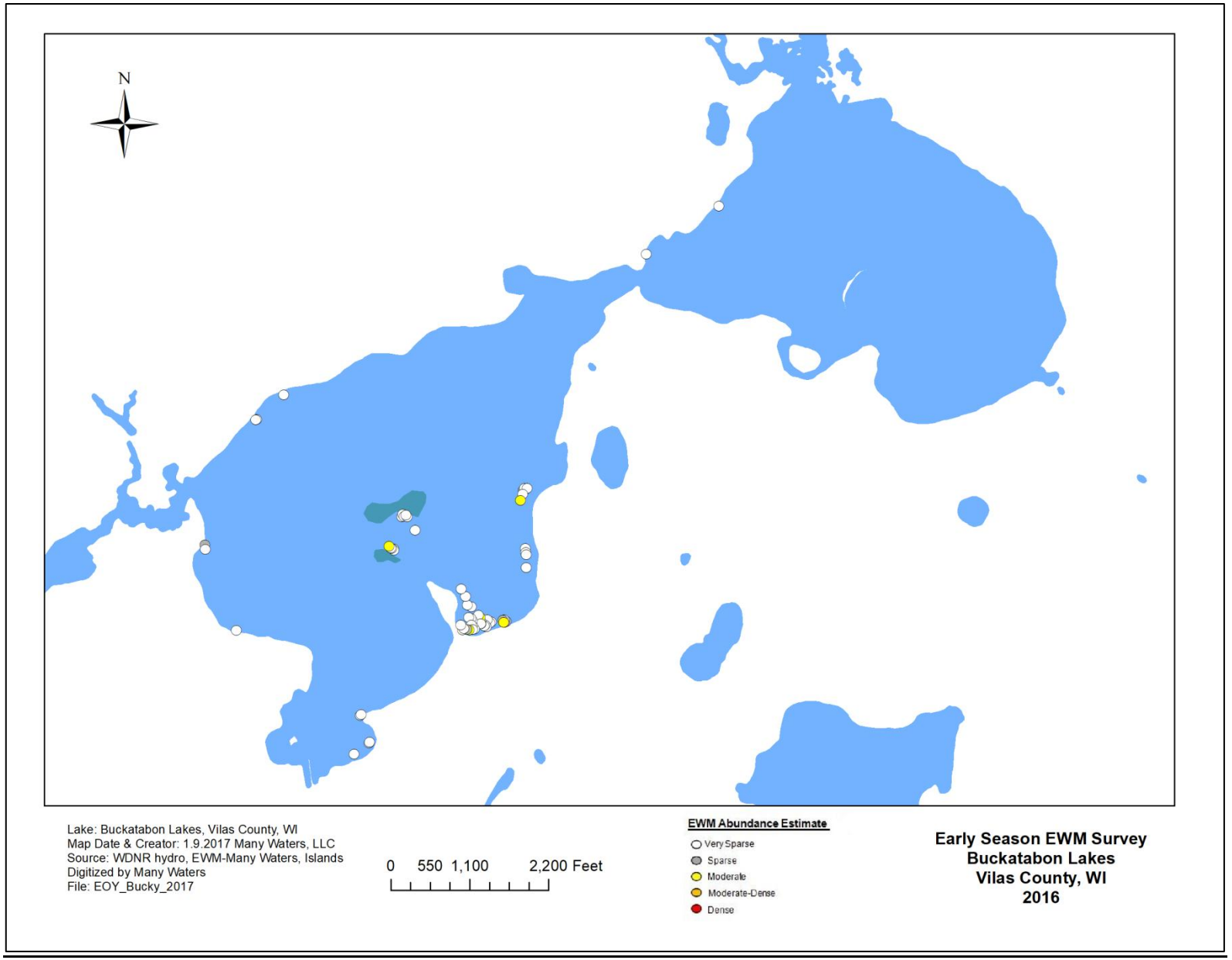
Very Sparse	Typically consists of less than 10 plants visually observed, unless otherwise noted. Extent varies and is estimated visually for smaller locations and noted. Larger locations are delineated using GPS to calculate area.
Sparse to Scattered	Typically consisted of 10-20 plants visually observed, unless otherwise noted. Extent varies and is estimated visually for smaller locations and noted. Larger locations are delineated using GPS to calculate area.
Moderate	Typically consists primarily of EWM with some native vegetation visually observed to be intermixed. Extent varies and is estimated visually for smaller locations and noted. Larger locations are delineated using GPS to calculate area.
Moderate-Dense	Typically consists of dominant EWM with little observed native vegetation intermixed. Extent varies and is estimated visually for smaller locations and noted. Larger locations are delineated using GPS to calculate area.
Dense	Dominant EWM, with little to no native vegetation observed. Dense locations may or may not have surface matting depending on the time of year. Extent varies and is estimated visually for smaller locations and noted. Larger locations are delineated using GPS to calculate area.

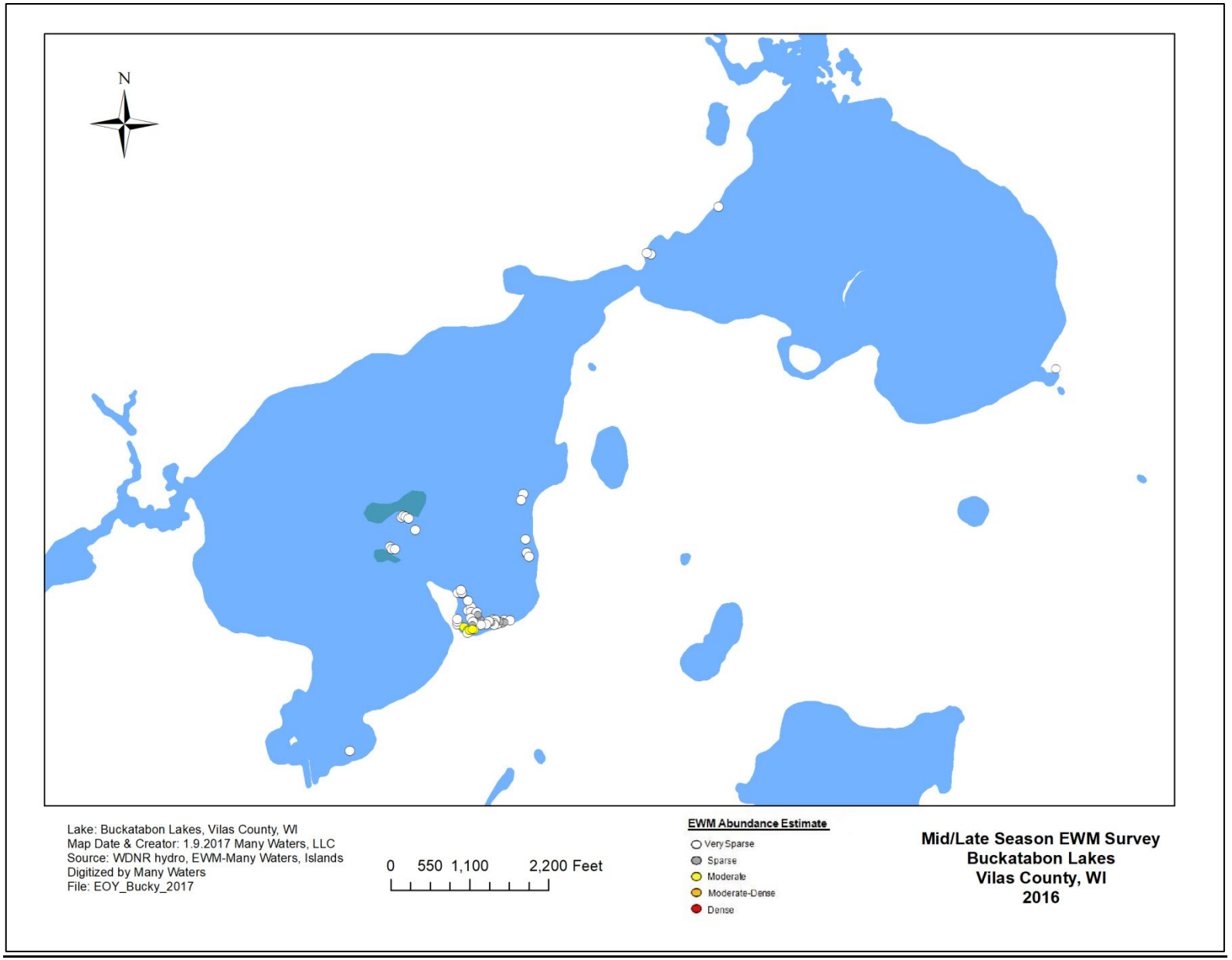
After the initial discovery and subsequent PI completed by the WDNR, a whole lake meander survey took place on Upper and Lower Buckatabon Lakes in September of 2015. This survey collected information on lake-wide abundance and distribution of EWM on both Upper and Lower Buckatabon. This survey located EWM adjacent to the initial findings by the WDNR and at several additional locations in both Upper and Lower Buckatabon, with the majority of EWM documented in Upper Buckatabon. Based on this survey, lake-wide distribution and abundance of EWM on both Upper and Lower Buckatabon Lakes is considered low. Several moderate density pockets of EWM exist on Upper Buckatabon Lake; however, these are small and isolated in size, with the majority of these sites found along a bay located along the southeastern shore. Samples of EWM from both lakes analyzed for the presence of hybrid watermilfoil confirmed Eurasian watermilfoil, not hybrid watermilfoil (Appendix A). Hybrid watermilfoil is a cross between the native Northern watermilfoil and Eurasian watermilfoil.

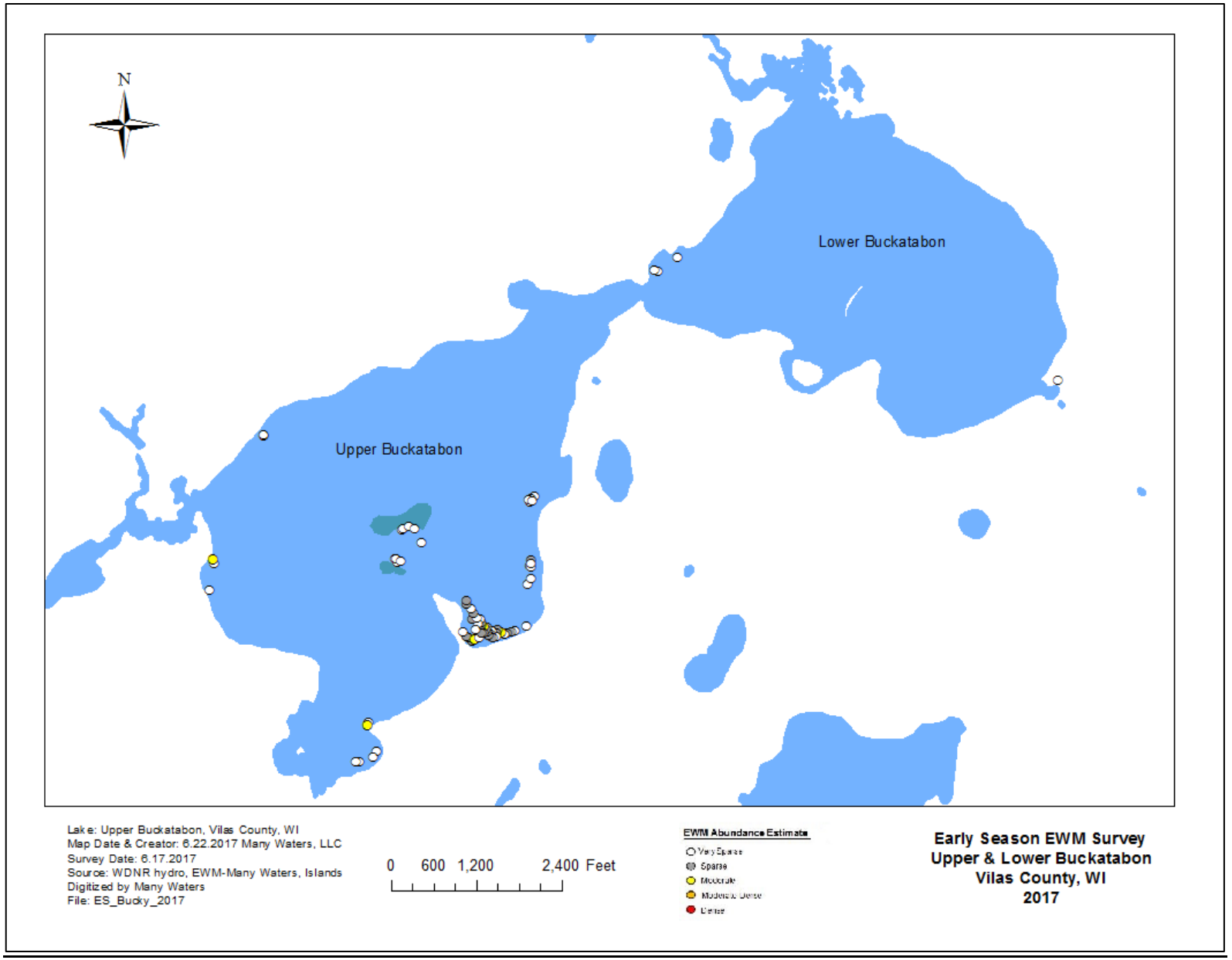
Early season monitoring continued in June of 2016 and 2017, focused on relocating existing EWM locations found in the previous and high likelihood areas including boat launches, shallow bays and regions adjacent to known locations. This information finalized management strategies including specific DASH locations and WDNR permitting.

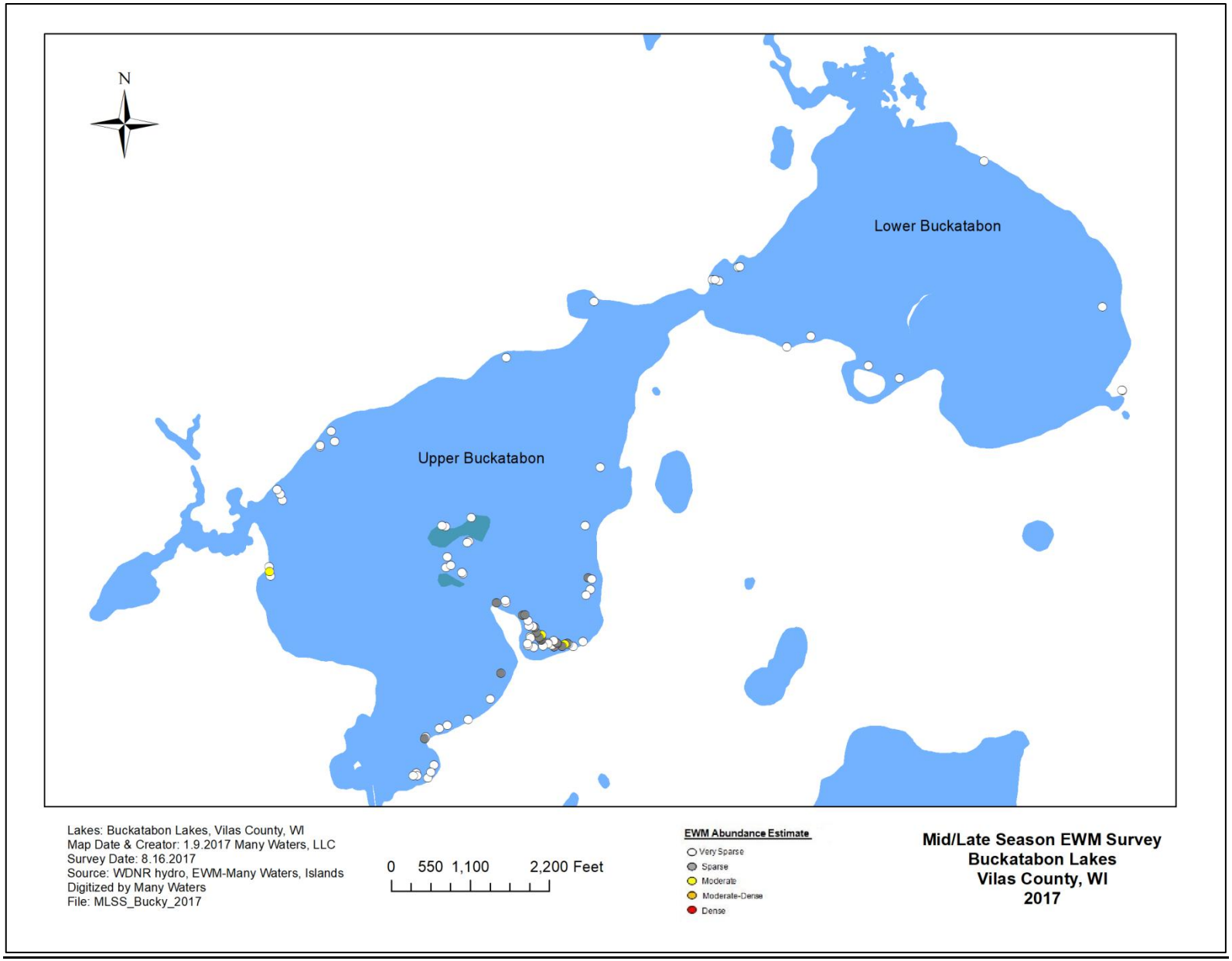
Mid/Late season EWM monitoring in 2016 overall found very few new EWM locations on both Upper and Lower Buckatabon Lakes. One new location along the far southern end of Lower Buckatabon adjacent to the dam and one new location east of the boat launch on Upper Buckatabon were detected. In 2017 mid/late season, monitoring efforts detected several new isolated to single EWM locations on Lower Buckatabon. These sites were primarily within the vicinity of previously known locations; however, surveys identified several new scattered locations on Upper Buckatabon. Overall, the abundance and distribution has remained low on both Upper and Lower Buckatabon Lakes during the course 2015-2017 monitoring efforts.


N
Lower Buckatabon Lake
Upper Buckatabon Lake
Public Boat Launch
EWM Relative Abundance
Very Sparse
Sparse
Moderate
Moderate-Dense
Dense
Lake: Upper and Lower Buckatabon Lakes
Location: Conover Township - Vilas County, WI
Map Date & Creator: 12.18.2015, Many Waters, LLC
Source: WDNR hydro
File: EOY_2015_Buckatabon
0
900
1,800
3,600 Feet
Upper and Lower Buckatabon
Vilas County, WI
2015 EWM Locations
Overview


N
Lake: Buckatabon Lakes, Vilas County, WI
Map Date & Creator: 1.9.2017 Many Waters, LLC
Source: WDNR hydro, EWM-Many Waters, Islands
Digitized by Many Waters
File: EOY_Bucky_2017
0 550 1,100 2,200 Feet
EWM Abundance Estimate
Very Sparse
Sparse
Moderate
Moderate-Dense
Dense
Early Season EWM Survey
Buckatabon Lakes
Vilas County, WI
2016


N
Lake: Buckatabon Lakes, Vilas County, WI
Map Date & Creator: 1.9.2017 Many Waters, LLC
Source: WDNR hydro, EWM-Many Waters, Islands
Digitized by Many Waters
File: EOY_Bucky_2017
0 550 1,100 2,200 Feet
EWM Abundance Estimate
Very Sparse
Sparse
Moderate
Moderate-Dense
Dense
Mid/Late Season EWM Survey
Buckatabon Lakes
Vilas County, WI
2016


N
Lower Buckatabon
Upper Buckatabon
Lake: Upper Buckatabon, Vilas County, WI
Map Date & Creator: 6.22.2017 Many Waters, LLC
Survey Date: 6.17.2017
Source: WDNR hydro, EWM-Many Waters, Islands
Digitized by Many Waters
File: ES_Bucky_2017
0 600 1,200 2,400 Feet
EWM Abundance Estimate
Very Sparse
Sparse
Moderate
Dense
Early Season EWM Survey
Upper & Lower Buckatabon
Vilas County, WI
2017


N
Lower Buckatabon
Upper Buckatabon
Lakes: Buckatabon Lakes, Vilas County, WI
Map Date & Creator: 1.9.2017 Many Waters, LLC
Survey Date: 8.16.2017
Source: WDNR hydro, EWM-Many Waters, Islands
Digitized by Many Waters
File: MLSS_Bucky_2017
0 550 1,100 2,200 Feet
EWM Abundance Estimate
Very Sparse
Sparse
Moderate
Moderate-Dense
Dense
Mid/Late Season EWM Survey
Buckatabon Lakes
Vilas County, WI
2017

EWM MANAGEMENT

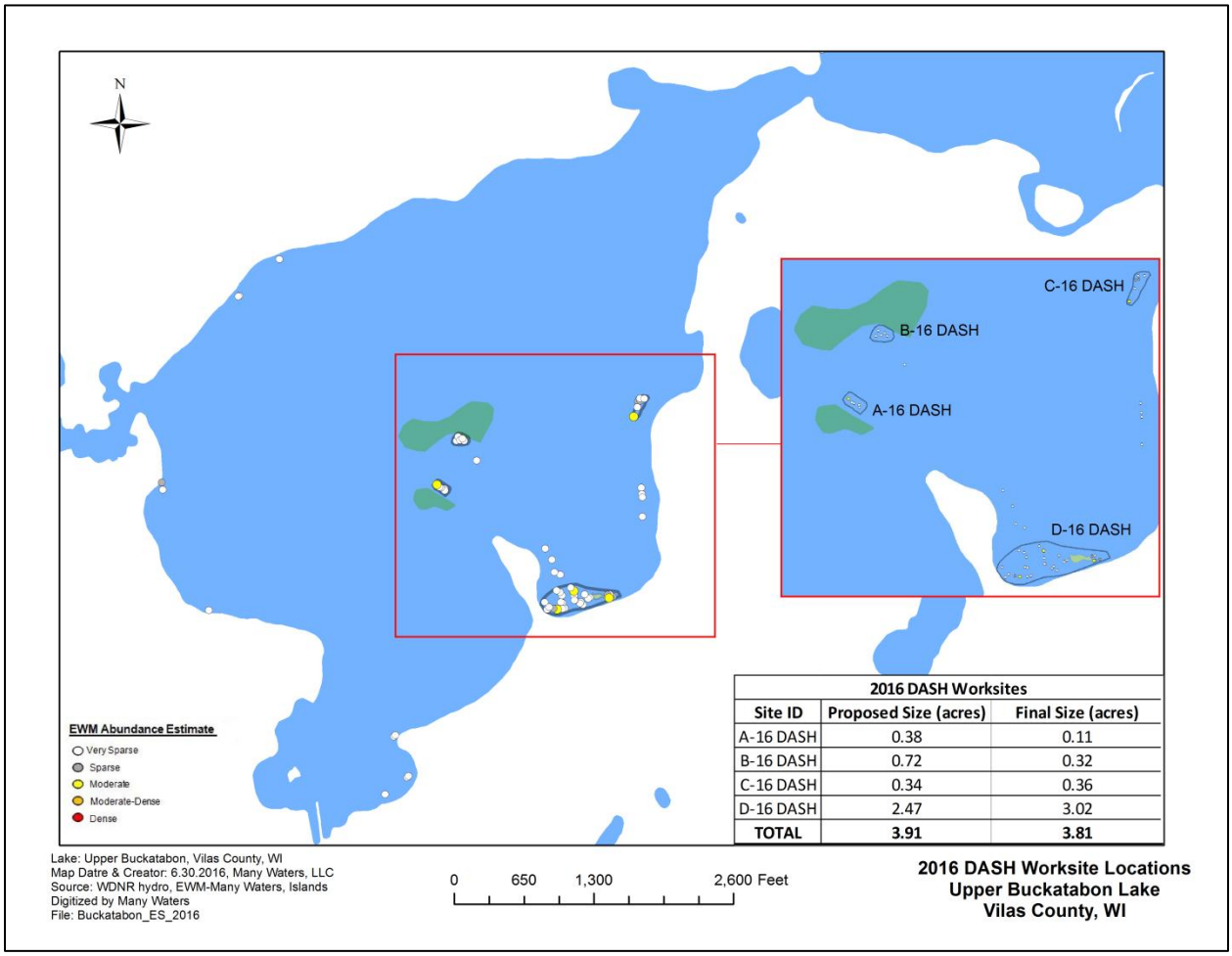
2016

Management of aquatic invasive species shall provide benefits to the use and ecological function of a waterway. It should include the use of control techniques that support the best use of resources, are best fit and adaptive to address the expansion/reduction at the time, and are most likely to result in long-term control. Due to the timing and commencement of the Buckatabon Lake's EWM project, no management of EWM occurred in 2015. However, based on information from the 2015 survey, the proposed management strategy in 2016 would be to manage with hand removal. Hand removal is selective at removing the target species and would be most appropriate alternative given the low population of EWM within Upper and Lower Buckatabon Lake. Site specific strategies were refined with information from the 2016 early season survey and included a two pronged approach using divers and DASH on Upper Buckatabon and diving alone on Lower Buckatabon.

To determine whether a site is controlled using hand removal alone versus DASH, several factors are considered. DASH improves the efficiency of hand removal at locations when multiple large to very large EWM plants exist (especially later in the season) and when patches or continuous beds of EWM exist. Hand removal is preferred when locations consist of isolated individual or low-density EWM plants, when low-density plants are scattered over a larger area and swimming with divers is more efficient, and when set up and break down of the DASH boat is more effort than the actual time using DASH.

Diver Assisted Suction Harvesting – Permit # NO 2016-64-102M

The initial plan for DASH was to work sites A-16, B-16, and C-16, then continue onto site D-16. Due to strong winds during the time of DASH efforts, site order had to be re-arranged and initiated at site D-16. DASH efforts removed a total of 521 pounds of wet weight EWM in 17 dive hours.



2016 DASH Worksites		
Site ID	Proposed Size (acres)	Final Size (acres)
A-16 DASH	0.38	0.11
B-16 DASH	0.72	0.32
C-16 DASH	0.34	0.36
D-16 DASH	2.47	3.02
TOTAL	**3.91**	**3.81**

Lake: Upper Buckatabon, Vilas County, WI
Map Datre & Creator: 6.30.2016, Many Waters, LLC
Source: WDNR hydro, EWM-Many Waters, Islands
Digitized by Many Waters
File: Buckatabon_ES_2016

2016 DASH Worksite Locations
Upper Buckatabon Lake
Vilas County, WI

Table 2: 2016 Summary of DASH Efforts.

Date	Location	Size (acres)	DASH Boat Location		Dive Time (hrs)	EWM (lbs*)	Native (lbs*)	Incidental Native Plant Harvest (%)	Total (lbs*)
			Lat (NAD 83)	Long (NAD 83)					
7/12/2016	D-16	3.02	46.01201	89.34207	5.50	273.0	13.50	5%	286.50
7/13/2016	D-16	3.02	46.01204	89.34216	2.00	36.0	2.00	6%	38.00
7/13/2016	D-16		46.01193	89.34179	1.75	16.0	0.50	3%	16.50
7/15/2016	C-16	0.34	46.01694	89.3404	1.00	33.0	1.00	3%	34.00
7/15/2016	A-16	0.38	46.01477	89.34774	0.75	14.0	0.50	4%	14.50
7/15/2016	D-16	3.02	46.01202	89.34177	1.75	28.0	1.00	4%	29.00
7/15/2016	D-16		46.01192	89.34207	0.75	8.0	0.50	6%	8.50
9/30/2016	D-16	3.02	46.01195	89.34215	3.50	113.0	13.00	12%	126.00
* wet weight					**17.00**	**521.0**	**32.00**	**5% Ave.**	**553.00**

Daily DASH Dive Log

July 12th 2016 Weather- Partly Cloudy, 80˚F, S SW wind 10-15 mph

Due to very strong winds, we were unable to dive the work areas near the island or on the eastern shore. D-16 was the only DASH work area where we could hold on anchor. Five and half dive hours removed 273 pounds of EWM. Incidental harvest of native species included water celery (*V. americana*), common waterweed (*E. canadensis*), fern pondweed (*P. robbinsii*), coontail (*C. demersum*), small pondweed, (*P. pusillus*), northern watermilfoil (*M. sibericum*) and water marigold (*B. beckii*).

July 13th 2016 Weather- Sunny, 70˚F, W SW wind 10-15 mph

Again today due to wind, the only feasible work area was D-16. Three and three quarter dive hours removed 52 pounds of EWM. Incidental native harvest remained similar to the previous day.

July 15th 2016 Weather- Overcast, 60˚F, N NE wind 5-10 mph

Due to lighter winds, we were able to work the remaining DASH work areas. We started on C-16, proceeded to A-16 and then to D-16. At C-16, there was high fishing pressure and at times, we had anglers much closer to our divers than we were comfortable so we moved to a different work area. A total of four and a quarter dive hours removed 83 pounds of EWM, thirty-three pounds from C-16, fourteen pounds from A-16 and thirty-four from D-16. Incidental harvest of native species remained similar to previous efforts.

September 30th 2016 Weather- Cloudy, 51˚F, north wind 5-10 mph

DASH efforts focused on D-16. Due to the later timing of this site visit, we expected much better water clarity than what we experienced. Diver visibility was less than two feet, as with an outreached arm your hand was usually not visible. The poor visibility made finding EWM plants difficult if there were not multiple EWM plants right next to each other. Three and half dive hours removed 113 pounds of EWM. Diving Efforts

Diving Efforts

Diving efforts focused on scattered, low-density EWM locations on both Upper and Lower Buckatabon.

Table 3: 2016 Summary of Dive Efforts.

Date	Dive Site	~ Number of EWM Plants Removed	Pounds* of EWM Removed
6/25/2016	North Shore - Lower Buckatabon	8	1
	North Side of Channel - Lower Buckatabon	8	1
	Point Near Camp Ramah - Upper Buckatabon	21	5
	Southeastern Portion of the Boat Landing Bay - Upper Buckatabon	7	2
6/27/2016	Northwest Shore - Upper Buckatabon	1	<1
	Northwest Shore - Upper Buckatabon	9	1.5
	West Shore, South of Springs Inlet - Upper Buckatabon	70	13
	West Shore, South of Springs Inlet Upper Buckatabon	4	<1
	East Shore South of B-16 – Upper Buckatabon	80	28
7/18/2016	A-16 – Upper Buckatabon	100	29
	B-16 – Upper Buckatabon	40	8.5
	Southeast of B-16 – Upper Buckatabon	16	4.5
	C-16 – Upper Buckatabon	7	3
9/29/2016	North Shore - Lower Buckatabon	8	2
	B-16 – Upper Buckatabon	61	10.5
	A-16 – Upper Buckatabon	50	11.5
	Northwest of D-16 Along West Shore – Upper Buckatabon	1	1
	South of C-16 – Upper Buckatabon	6	2.5
	South of C-16 – Upper Buckatabon	79	16
Date	Cove East of Outlet - Lower Buckatabon	19	2
	North Side of Channel - Lower Buckatabon	6	< 1
	TOTAL	~593	~144

*wet weight

2017

Management continued in 2017 with a similar approach as in 2016. Based on the early season survey, one main DASH area was identified, whereas the remaining EWM sites on both Upper and Lower Buckatabon diving alone would be the more appropriate management option. Based on the remaining budget within the WDNR Rapid Response Grant, roughly a third of the DASH and dive work was funded by the WDNR Rapid Response grant, whereas the remaining two-thirds were paid for directly by the BLA.

Diver Assisted Suction Harvesting – Permit # NO-2017-64-63M

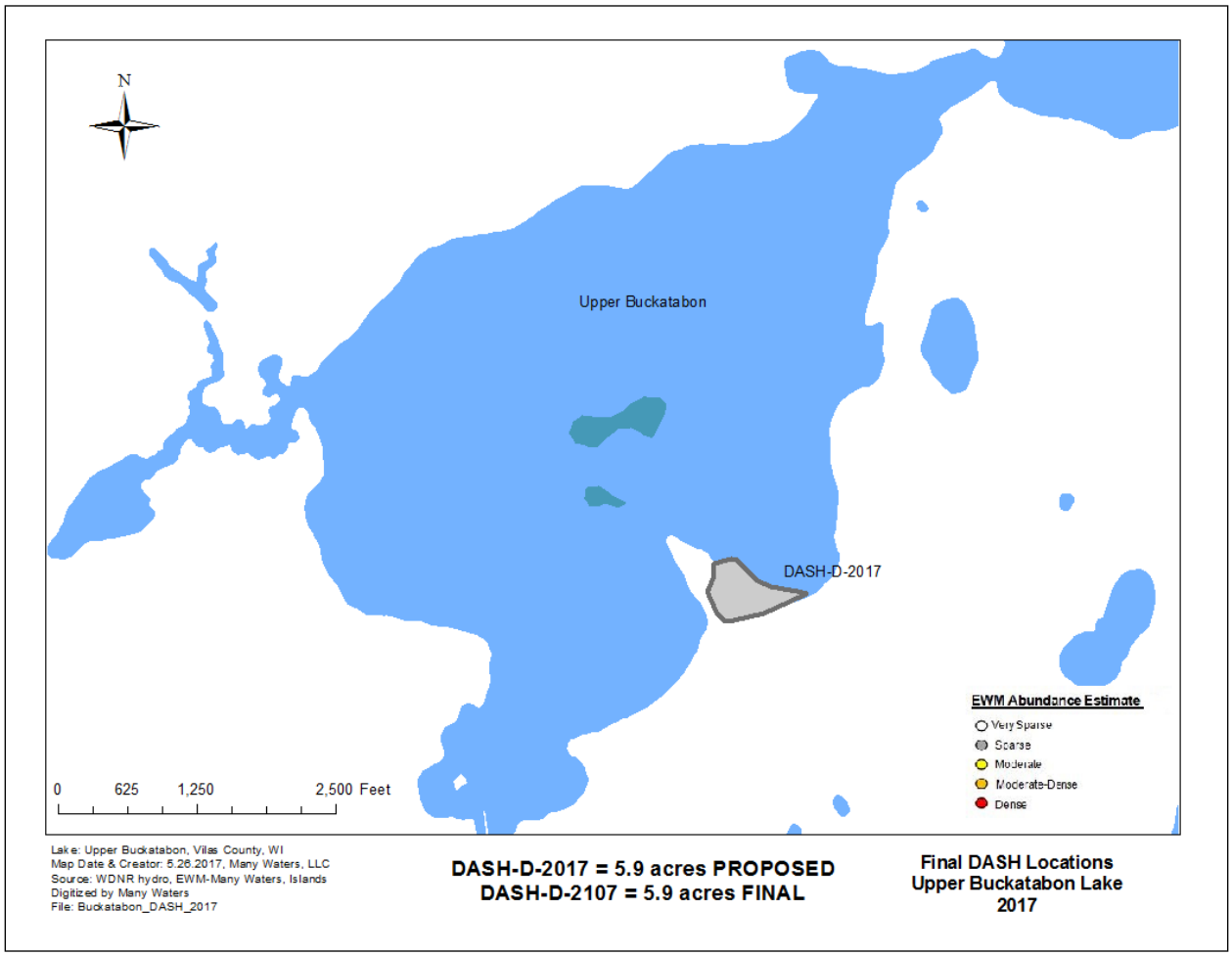


Table 4: Daily Summary of DASH Efforts

Date	Location	Size (acres)	DASH Boat Location		Dive Time (hrs)	EWM (lbs*)	Native Plants (lbs*)	Percent Incidental Native Species Harvest	Total (lbs*)
			Lat (NAD 83)	Long (NAD 83)					
6/29/2017	DASH D-2017	5.9	46.01245	89.34358	1.25	32.0	0.25	1%	32.25
			46.0125	89.3435	1.00	8.0	0.25	3%	8.25
			46.01224	89.34328	1.25	17.0	0.25	1%	17.25
6/30/2017	DASH D-2017	5.9	46.01224	89.34328	3.00	91.5	6.00	6%	97.50
7/6/2017	DASH D-2017	5.9	46.0121	89.34284	2.00	43.0	3.50	8%	46.50
7/7/2017	DASH D-2017	5.9	46.01205	89.34296	2.00	42.0	2.00	5%	44.00
			46.01176	89.34276	1.00	26.0	2.00	7%	28.00
			46.01197	89.34221	2.00	50.5	2.00	4%	52.50
7/8/2017	DASH D-2017	5.9	46.07207	89.34225	3.75	93.5	1.50	2%	95.00
					17.25	**403.50**	**17.75**	**4% (ave)**	**421.25**

Daily DASH Dive Log

June 29th 2017 Weather- Cloudy, 63˚F, light mist, SW wind 10-15 mph

We began on the north side of the work area and progressed to the south as we relocated the boat. Water clarity was good and overcast skies did no limit diver visibility. The vast majority of the area covered had firm, sand or gravel sediment and transitioned to softer sediments as the diver moved east. In three and half hours, the diver removed 57 pounds of EWM. Incidental harvest of native species included water celery (*V. americana*), common waterweed (*E. canadensis*), fern pondweed (*P. robbinsii*), coontail (*C. demersum*), small pondweed, (*P. pusillus*), northern watermilfoil (*M. sibericum*) and water marigold *(B. beckii*).

June 30th 2017 Weather- Cloudy, 70˚F, light rain, WNW winds 5-10 mph

Dive conditions remained very similar to the previous day. We continued with the plan to start at the north end of the work area and progress southward. In three hours of diving, a diver was able to removed 91.5 pounds of EWM. Incidental harvest on native plant species remained similar to previous efforts.

July 6th 2017 Weather- Cloudy, 70˚F, rain, WNW winds 5-10 mph

Dive work continued after Independence Day. Water clarity remained good; bottom sediment comprised of sand and gravel and transitioned to softer sediment as the diver moved to the east. In two hours, a diver was able to harvest 43 pounds of EWM. Incidental harvest on native plant species remained similar to previous efforts.

July 7th 2017 Weather- Sunny, 72˚F, north wind 5-10 mph

Diving efforts continued to progress south across the work area. Water clarity remained good and sunny conditioned aided diver visibility. The DASH boat repositioned three times as the divers worked. In five hours, diving efforts removed 118.5 pounds of EWM.

July 8th 2017 Weather- Sunny, 75˚F, west wind 5-10 mph

DASH work continued to the southeast region of the work area. Weather conditions as well as dive conditions were good and allowed a dive to dive for three and three quarter hours, removing 93.5 pounds of EWM.

Dive Efforts

Diving efforts continued to focus on scattered low-density EWM locations on both Upper and Lower Buckatabon.

Table 5: 2017 Summary of Dive Efforts.

Date	Dive Site	~ Number of EWM Plants Removed	Pounds* of EWM Removed
6/19/2017	Cove East of Outlet – Lower Buckatabon	19	2
7/13/52017	North Shore - Lower Buckatabon	9	2
	Northwest Shore - Upper Buckatabon	11	2
	South of Springs - Upper Buckatabon	120	12
7/25/2017	South of Springs - Upper Buckatabon	29	3.5
	Northeast of DASH Site D-17	152	22
7/26/2017	Northeast of DASH Site D-17	108	18.5
10/2/2017	Cove East of Outlet – Lower Buckatabon	18	3.5
10/4/2017	Northeast of Springs - Upper Buckatabon	11	3.5
	Northwest Shore - Upper Buckatabon	58	12
10/9/2017	Northwest Shore - Lower Buckatabon	12	3
	East Shore - Lower Buckatabon	1	<1
	North Shore - Lower Buckatabon	30	4.5
	North Island - Upper Buckatabon	9	3
		587	**91.5**

* wet weight

2017 EWM MANAGEMENT EVALUATION

An end of the year evaluation of management efforts took place on October 22nd 2017. The purpose of this survey was to visit all known managed sites, not survey for additional EWM locations. Evaluation methods collect information on the abundance and distribution of EWM using qualitative methods similar to those used during the lake wide monitoring surveys. A reduction in abundance of EWM across all dove sites was observed, whereas maintained level of EWM below recreational impairment levels was achieved within the DASH area. In 2016, this region contained polygon based mapping at moderate density EWM levels. In 2017, only point-based EWM mapping of mainly sparse to very sparse colonies existed with a few pockets of moderate density plants. No EWM was detected at all dive sites on Lower Buckatabon, minus one plant observed within the cove near the outlet.

Lake: Bucktabon Lakes, Vilas County, WI
Map Date & Creator: 1.9.2017 Many Waters, LLC
Survey Date: 10.22.2017
Source: WDNR hydro, EWM-Many Waters, Islands
Digitized by Many Waters
File: EOY_Bucky_2017

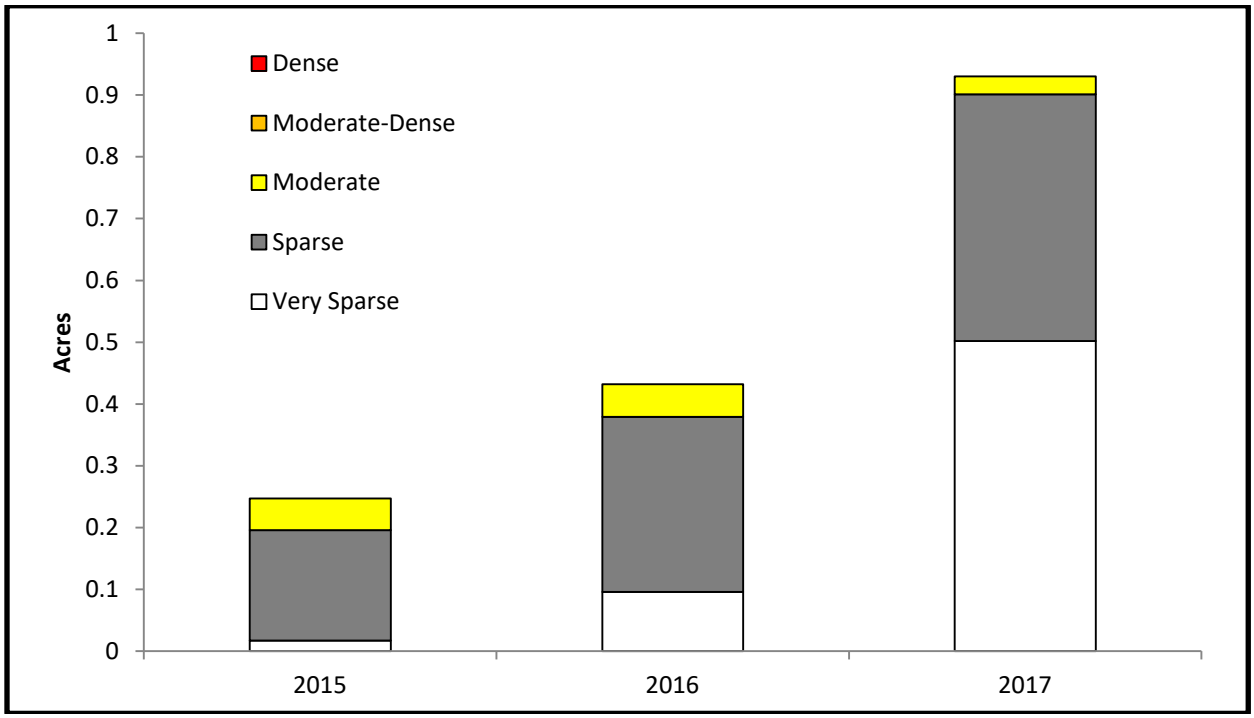
0 550 1,100 2,200 Feet

EWM Abundance Estimate

- Very Sparse
- Sparse
- Moderate
- Moderate-Dense
- Dense

End of the Year EWM Locations
Buckatabon Lakes
Vilas County, WI
2017

Figure 1: Change in EWM point based mapping acreage categorized by estimated abundance 2015-2017 – Upper and Lower Buckatabon Lakes Combined. Note: This is a visual estimate of exact extent, not total footprint.



DISCUSSION AND CONCLUSIONS

Seasonal monitoring and post management evaluations have shown over the course of three years a slight increase in the overall distribution of point based gps mapping of EWM across the Buckatabon Lakes and a slight decrease in overall abundance. However, since 2016, no larger polygon based mapped beds were detected on either of the Buckatabon Lakes. Overall, the present status of EWM on Buckatabon Lakes is at a low, non-nuisance level. Annual variations in the population of native and invasive plants will occur, regardless of management or chosen no management, however, a maintained reduction to point based mapping and mainly sparse to very sparse EWM abundance can be positively attributed to seasonal EWM management.

Short-term strategies to manage for EWM based on the end of the year evaluation include a continuation of the management strategies from 2015 and 2016. This would include seasonal monitoring, diving, DASH, and post management evaluations. Looking to the future and the "big-picture" on how to sustain the health of Buckatabon Lakes beyond current AIS control, a plan that details important ecological information specific to Buckatabon Lakes, identifies current and future threats, and provides a roadmap on how to sustain a healthy lake is sought. In December of 2017, the BLA submitted a WDNR surface water grant application for an AIS planning project to begin to address the larger picture. At this current time, it is unknown if this application was successful.

Appendix A

Watermilfoil Genetics Testing Results

Company/Entity	Many Waters, LLC
Total Samples Processed	4
Cost per Sample	$45
Set up Fee (if applicable)	$65
Total Cost	$290

Summary of DNA Data for Watermilfoil

Grand Valley State University's Robert B. Annis Water Resources Institute

ATTN:
Send Invoice to:
Barb Gajewski
Many Waters, LLC
2527 Lake Ottawa Road
Iron River, MI 49935
skih2o@hotmail.com
715-617-4688

Send Results to:
Barb Gajewski (skih20@hotmail.com)

Result Details (By Lake):

Lake Name: Lower Buckatabon

Date Received: 10/18/15

Number of Samples Sent: 2

Number of Samples Processed: 2

Comments: NA

Lake Name: Upper Buckatabon

Date Received: 10/18/15

Number of Samples Sent: 2

Number of Samples Processed: 2

Comments: NA

Genetic IDs:

Area/site	Sample #	ID
Lower Buckatabon/708 and 1117	1-2	Eurasian Watermilfoil (*Myriophyllum spicatum*)
Upper Buckatabon/93 and 94	1-2	Eurasian Watermilfoil (*Myriophyllum spicatum*)