Aquatic Plant Management Plan

Apple River Flowage

Polk County, Wisconsin

Draft August 2023

Sponsored By

Apple River Flowage Protection and Rehabilitation District

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In Memory of Dale Richardson – photo by Dave Schleusner

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EXECUTIVE SUMMARY

This Aquatic Plant Management Plan for the Apple River Flowage (the flowage) reviews and updates a strategy for managing aquatic plants by improving navigation while protecting native plant populations, managing Curly-leaf pondweed, and preventing establishment of invasive species. It will guide aquatic plant management from 2024 through 2028. The 2017 Aquatic Plant Management Plan included data about the plant community, watershed, and water quality of the flowage. It also reviewed a history of aquatic plant management on the flowage. The 2023 update does not repeat information in the 2017 plan, but rather provides new information and direction for the future.

Endangered Resource Services completed aquatic plant point intercept surveys in the summers of 2010, 2016, and 2022. There were only minor changes in aquatic plant growth between the three survey periods. The flowage has heavy growth of native plants that impeded navigation during summer months until a harvesting program began in 2012. These same native plants provide fish and wildlife habitat, stabilize bottom sediments, reduce the impact of waves against the shoreline, and prevent the spread of non-native invasive plants – all critical functions. The non-native plant, Curly-leaf pondweed, is present throughout much of the flowage. Eurasian water milfoil, an invasive plant of concern, was not found in the 2010, 2016, or 2022 survey.

This aquatic plant management plan, developed with input from an advisory committee including flowage property owners, will help the Apple River Protection and Rehabilitation District meet aquatic plant management goals. The implementation plan describes the actions that will be taken toward achieving these goals.

A special thank you is extended to the aquatic plant advisory committee for assistance with plan development. The membership will review both the plan and the budget at the meeting held August 19, 2023.

PLAN GOALS (2017)

IMPROVE WATER QUALITY ON THE APPLE RIVER FLOWAGE AND DOWNSTREAM ON THE APPLE RIVER.

PREVENT THE INTRODUCTION OF AQUATIC INVASIVE SPECIES.

MAINTAIN NAVIGATION FOR FISHING, BOATING, AND ACCESS TO LAKE RESIDENCES.

MAINTAIN NATIVE AQUATIC PLANT FUNCTIONS.

MINIMIZE ENVIRONMENTAL IMPACTS OF AQUATIC PLANT MANAGEMENT.

INTRODUCTION

The Aquatic Plant Management Plan for the Apple River Flowage (the flowage) is sponsored by the Apple River Protection and Rehabilitation District (ARPRD). This plan presents a strategy for managing aquatic plants by improving navigation while protecting native plant populations, managing Curly-leaf pondweed, and preventing establishment of invasive species through the year 2028. The 2017 Apple River Flowage Aquatic Plant Management Plan included data about the plant community, watershed, and water quality of the flowage. It also reviewed a history of aquatic plant management on the flowage. Based on this data, updated information, and public input, goals and strategies for the sound management of aquatic plants are presented here. This plan will guide the ARPRD and the Wisconsin Department of Natural Resources in aquatic plant management over the next several years (from 2024 through 2028).

This aquatic plant management plan is guided by public input, scientific data, and requirements from the Wisconsin Department of Natural Resources (WDNR). The plan is required by WDNR regulations for certain aquatic plant management activities and to obtain grants that fund aquatic invasive species management. The WDNR's aquatic plant management planning guidelines and Northern Region Aquatic Plant Management Strategy framed the development of the plan. WDNR sampling protocol and plant survey methods were also utilized in plan development.

More information about managing aquatic plants in Wisconsin is available from http://dnr.wi.gov/lakes/plants/ and in an *Aquatic Plant Management Companion Document* (Clemens, 2022).

PUBLIC INPUT FOR PLAN DEVELOPMENT

The ARPRD Aquatic Plant Management (APM) Advisory Committee provided input for the update of this plan which was first developed in 2011 and updated in 2017. The APM Advisory Committee met three times. At the first meeting on June 14, 2023, the committee reviewed aquatic plant management goals, plant survey results, existing management efforts, and discussed aquatic plant management concerns. At a second meeting on July 12, 2023 the committee updated objectives and action steps. The APM Advisory Committee concerns are reflected in the goals and objectives for aquatic plant management in this plan.

The ARPRD board announced the availability of the draft Aquatic Plant Management Plan for review with a public notice in the Amery Free Press the week of **August 7, 2023**. Copies of the plan were made available to the public on the ARPRD web site: arprd.org. **Comments will be accepted through September 11, 2023 including at the ARPRD annual meeting August 19, 2023.**

Resident Concerns

The Aquatic Plant Management Committee expressed a variety of concerns that are reflected in plan goals and objectives for aquatic plant management. Management concerns included importance of aquatic invasive species, especially zebra mussel prevention, maintaining navigation in common channels and to individual properties, continuing the harvesting operations, and providing aquatic invasive species information for lake residents.

Tribal Interests

Native American Tribal representatives have special interest and rights related to aquatic plant management in the Apple River Flowage because of the wild rice present. The Apple River Flowage is located within Tribal ceded territories. Draft and final copies will be distributed to the St. Croix Tribe Environmental Department and the Great Lakes Indian Fish and Wildlife Commission.

The Flowage

The Apple River Flowage (WBIC 2624200) is located in central Polk County, Wisconsin in the town of Lincoln and within the city limits of Amery. The flowage has a surface area of 639 acres, a maximum depth of 15 feet and an average depth of 6 feet. Most of the bottom sediments are organic muck. Combined with the shallow waters of the flowage, these mucky sediments promote heavy aquatic plant growth. In fact, aquatic plants cover nearly the entire surface of the flowage bottom with plants growing to a depth of 12.5 feet.[2] The Apple River Flowage is a nutrient rich water body with summer Secchi depth average of 5.8 feet in 2022. The Flowage was listed as an impaired water by the Wisconsin Department of Natural Resources in 2012 because of high phosphorus levels which lead to algae growth.[3]

The flowage is created by a dam within the city limits of Amery. The flowage extends about 7 miles upstream. Operation of the dam has raised the normal water level of the river approximately 8 or 9 feet at the dam-site. Flowage water levels can be lowered up to 6 feet with the present dam configuration.[4]

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[2] Berg, Matthew. Endangered Resource Services. Curly-leaf pondweed (*Potamogeton crispus*) Point-intercept and Bed Mapping Surveys, and Warm-water Macrophyte Point-intercept Survey Apple River Flowage - WBIC: 2624200 Polk County, Wisconsin. 2022.

[3] https://dnr.wisconsin.gov/topic/SurfaceWater/ConditionLists.html

[4] Wisconsin Department of Natural Resources. Office of Inland Lake Renewal. *Apple River Flowage Polk County. Feasibility Study Results; Management Alternatives.* 1979.

TABLE 1. FLOWAGE INFORMATION

Size (acres)	639
Mean depth (feet)	6
Maximum depth (feet)	18
Littoral zone depth (feet)	12.5
Average summer secchi depth (feet)	5.8

A flowage map is found on the following page as Figure 2. This map shows two public access sites on the flowage. One landing is located at the end of Birch Street in the city of Amery and the second is north of Amery at the end of River Shore Lane. There are no public access points to the north and west of Highway 46. The box culvert under Highway 46 restricts access to large boats because of low clearance. North Park on the north side of Amery has frontage on the flowage. There are also city-owned park lands just above the dam.

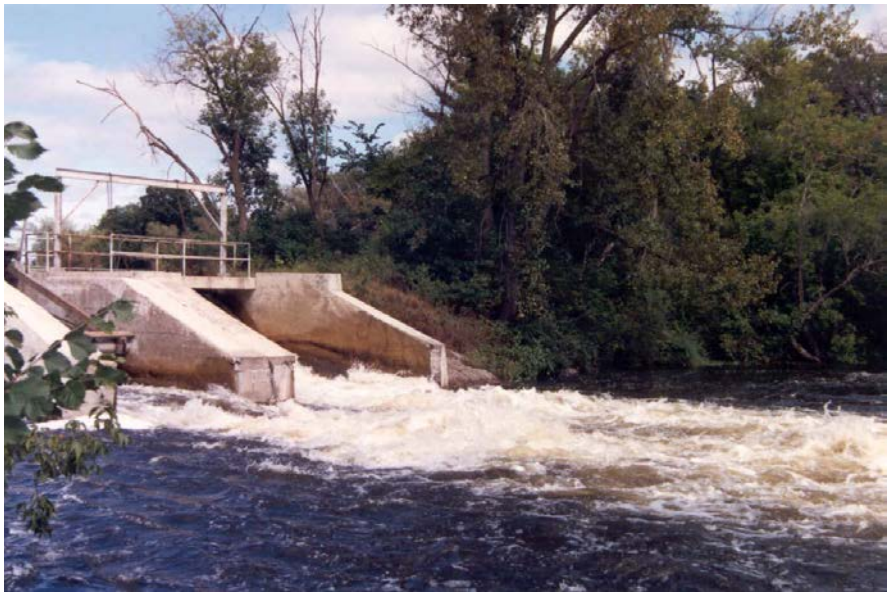

FIGURE 1. THE AMERY DAM

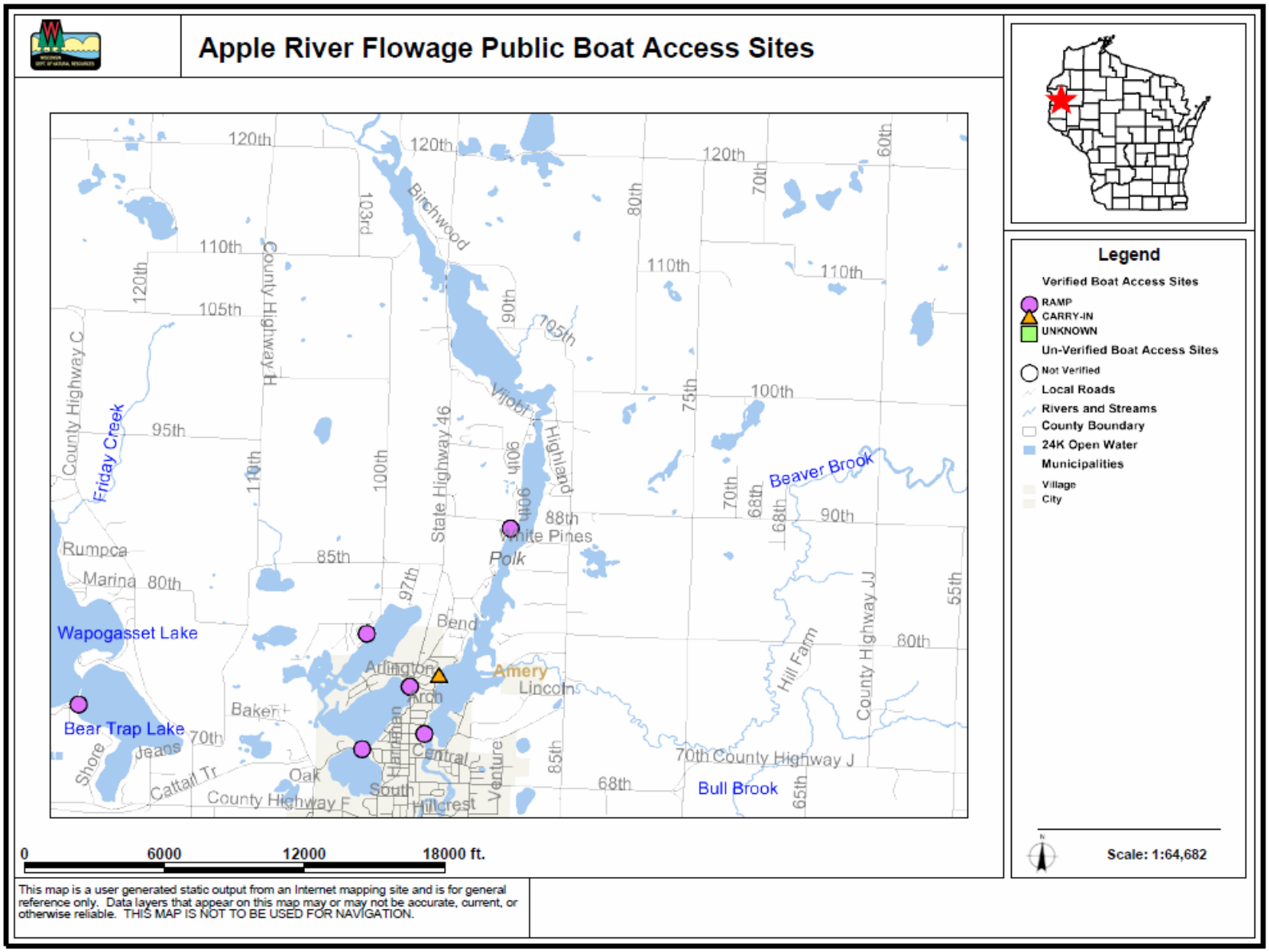

FIGURE 2. APPLE RIVER FLOWAGE PUBLIC ACCESS SITES

WATER QUALITY

Water quality is frequently reported by the trophic state or nutrient level of the lake. Nutrient-rich lakes are classified as eutrophic. These lakes tend to have abundant aquatic plant growth and low water clarity due to algae blooms. Mesotrophic lakes have intermediate nutrient levels and only occasional algae blooms. Oligotrophic lakes are nutrient-poor with little growth of plants and algae.

Secchi depth readings are one way to assess the trophic state of a lake. The Secchi depth is the depth at which the black and white Secchi disk is no longer visible when it is lowered into the water. Greater Secchi depths occur with greater water clarity. Secchi depth readings, phosphorus concentrations, and chlorophyll measurements can each be used to calculate a Trophic State Index (TSI) for lakes. TSI values range from 0 – 110. Lakes with TSI values greater than 50 are considered eutrophic. Those with values in the 40 to 50 range are mesotrophic. Lakes with TSI values below 40 are considered oligotrophic.

The average summer trophic state for the Apple River Flowage for the last 5 years was 52 (Eutrophic) and was determined using Secchi data. For a Reservoir lake, this is considered **Excellent**.[4]

Citizen lake monitoring volunteers have collected Secchi data from the flowage annually since 1986. Average July and August Secchi depths have ranged between 3 and 8 feet with the highest water clarity from about 1995 to 2004. Figure 3 illustrates the Secchi depth averages for the flowage. Figure 4 graphs the Trophic State Index, based upon Secchi depth, chlorophyll, dissolved oxygen, and total phosphorus results.

[4] https://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=2624200&page=waterquality

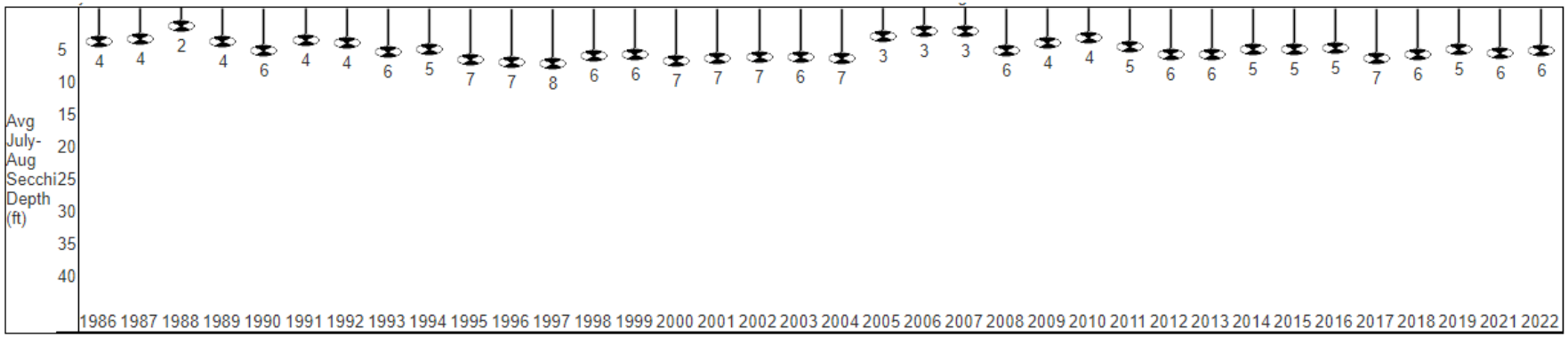

FIGURE 3. DEEP HOLE BASIN SUMMER AVERAGE SECCHI DEPTHS 1986-2022

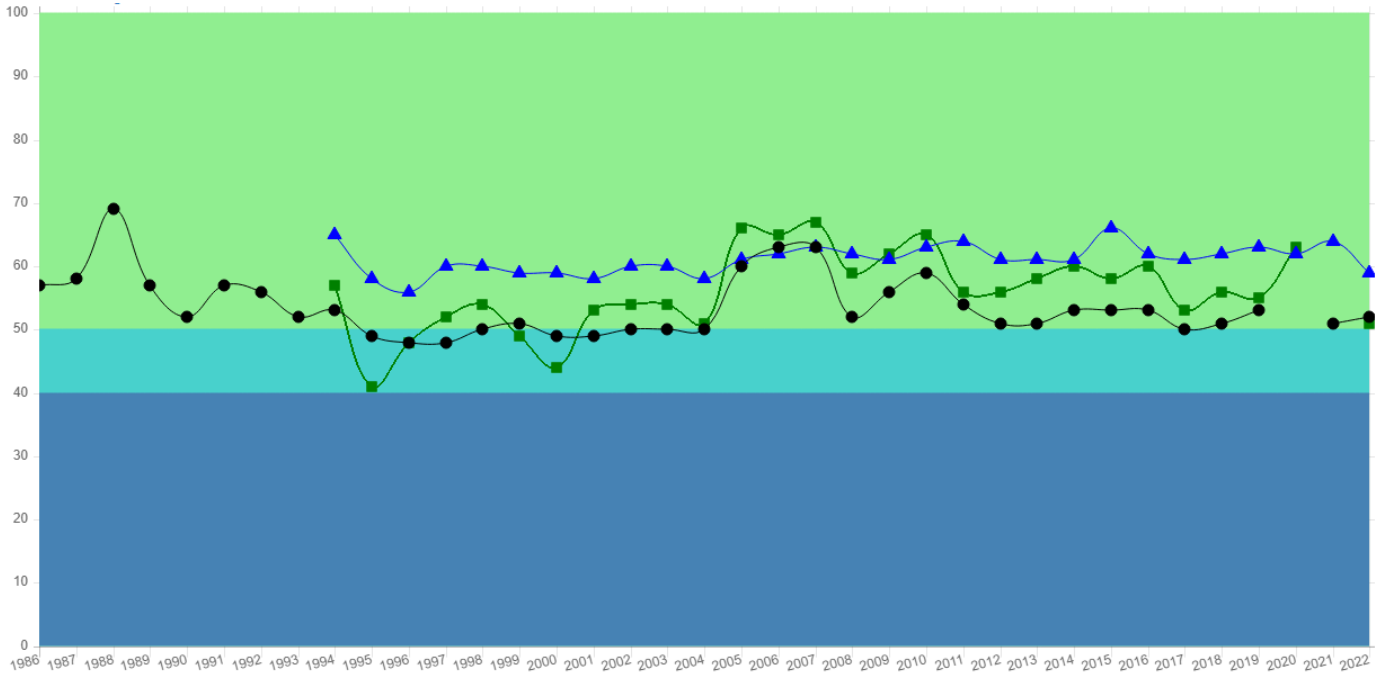

FIGURE 4. DEEP HOLE TROPHIC STATE INDEX 1986-2022

Aquatic plants play a critical role in maintaining water quality in the Apple River Flowage. This is a system with a large watershed, high volume of accumulated sediments, and high nutrient levels. Without aquatic plants present, nutrient-rich sediments will be re-suspended and water clarity can be expected to decrease dramatically. The figure below[5] illustrates that for shallow-water lakes and flowages, an aquatic plant dominated system is highly preferable to a flowage without aquatic plants. In fact, restoration efforts for shallow lakes frequently focus on re-establishing aquatic plants in order to improve water clarity.

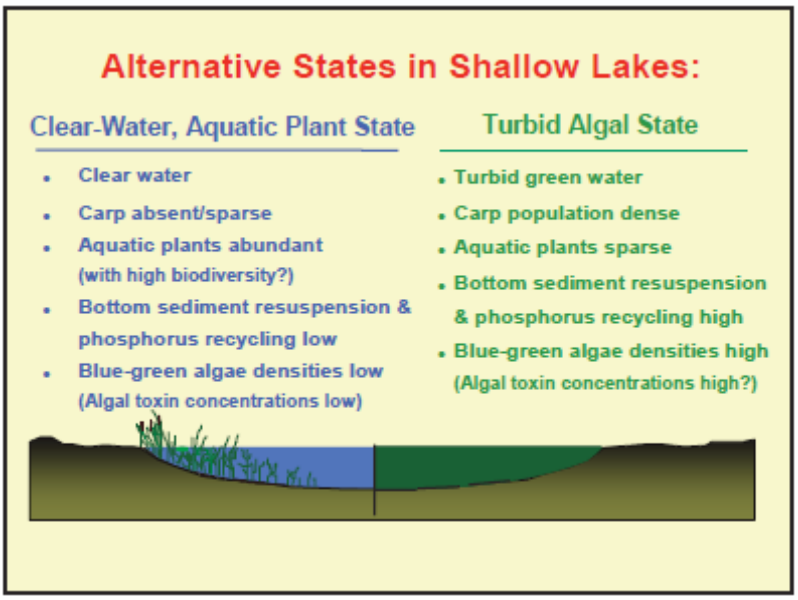

FIGURE 5. ALTERNATIVE STATES IN SHALLOW LAKES

Aquatic plant growth and light levels influence each other. With high water clarity, more light is available for plants to grow. With more plant growth, nutrients are tied up and unavailable for plant growth. With poor water clarity, light levels are poor and aquatic plant growth can be severely limited. When aquatic plant growth is limited, nutrients are available to fuel algae blooms.

[5] From Lake Wingra presentation adopted from Sheffer 1990.

Watershed Description

The Upper Apple River Watershed (SC06) drains to the Apple River Flowage. Because the Apple River ultimately drains to the St. Croix River, the 125,074-acre Apple River watershed is part of the larger St. Croix River Basin. The 2013 lake management plan identified 37,125 acres that constitute a focused lake management area. The largest land uses in the management area were row crop (32%) and forest (31%), with row crop contributing the greatest phosphorus load to the flowage (74%).

Apple River Flowage Lake Management Plan

The Polk County Land and Water Resources Department completed a lake management study and plan for the flowage in 2013. The plan includes:

- comprehensive information about the lake
- results of a public opinion survey
- lake level and precipitation data
- chemical and physical data for the flowage
- zooplankton and phytoplankton (algae) sample results
- shoreline survey results
- tributary monitoring results
- watershed land use and phosphorus loading
- lake modeling results.

Management goals are selected and an implementation plan developed to implement the following goals:

Goal 1: Reduce excessive watershed nutrient inputs to the flowage to improve water quality

Goal 2: Minimize the release of nutrients from within the Apple River Flowage to improve water quality

Goal 3: Protect, maintain, and enhance fish and wildlife habitat

Goal 4: Maintain and enhance the natural beauty of the Apple River Flowage

Goal 5: Evaluate the progress of lake management efforts through monitoring and data collection

Goal 6: Provide information and education opportunities to residents and users

Goal 7: Develop partnerships with a diversity of people and organizations

Goal 8: Implement the Aquatic Plant Management Plan

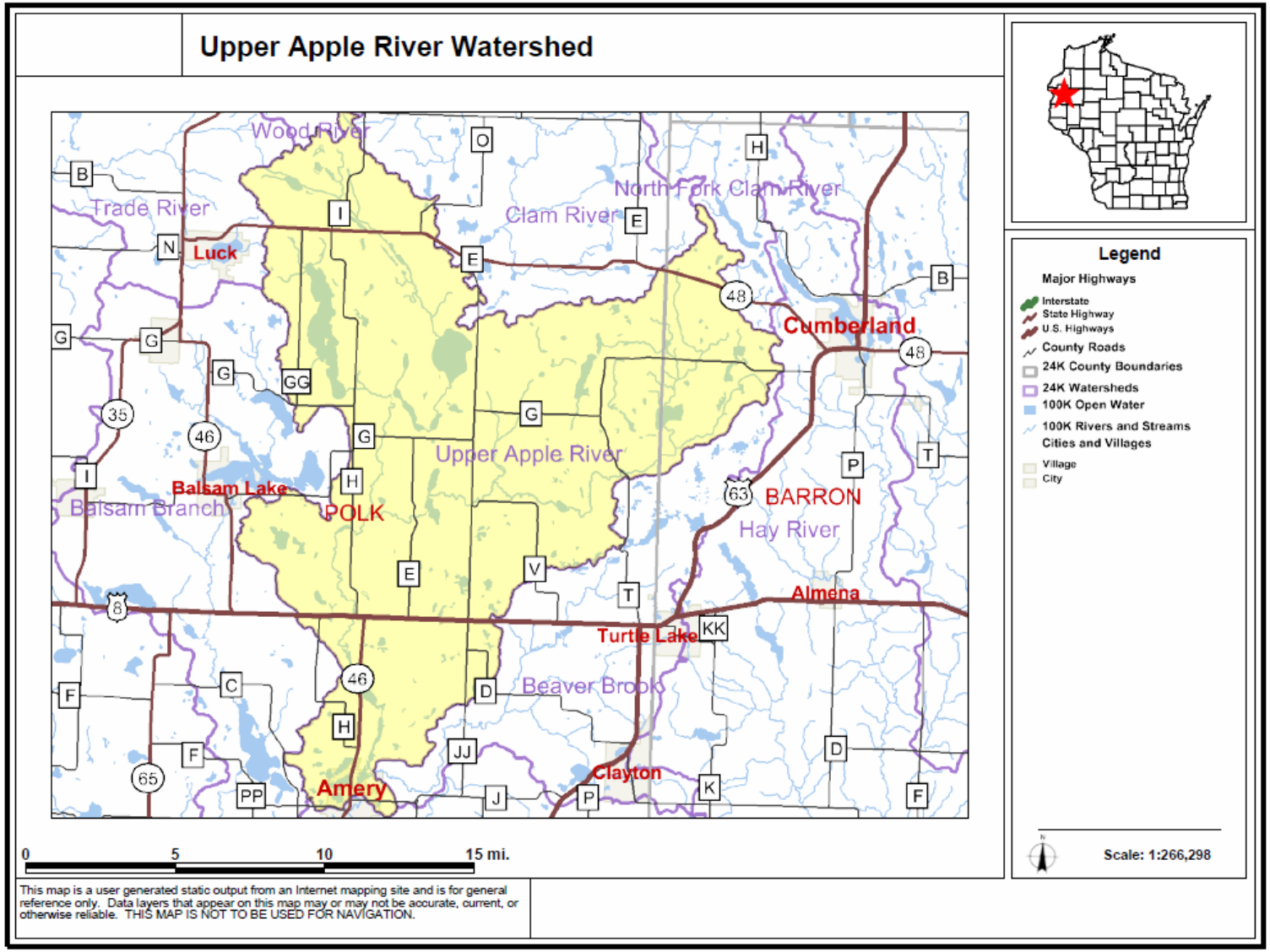

FIGURE 6. UPPER APPLE RIVER WATERSHED

Apple River Protection and Rehabilitation District

In November 1975 following the problems brought to the forefront with a flowage drawdown, the Polk County Board passed a resolution forming the Apple River Protection and Rehabilitation District in accordance with Chapter 33 of the Wisconsin Statutes. Flowage district parcels are shown in the map below. The district consists of 415 parcels. On August 25th, 1990 a new set of bylaws were passed titled "By-Laws Apple River Protection and Rehabilitation District."

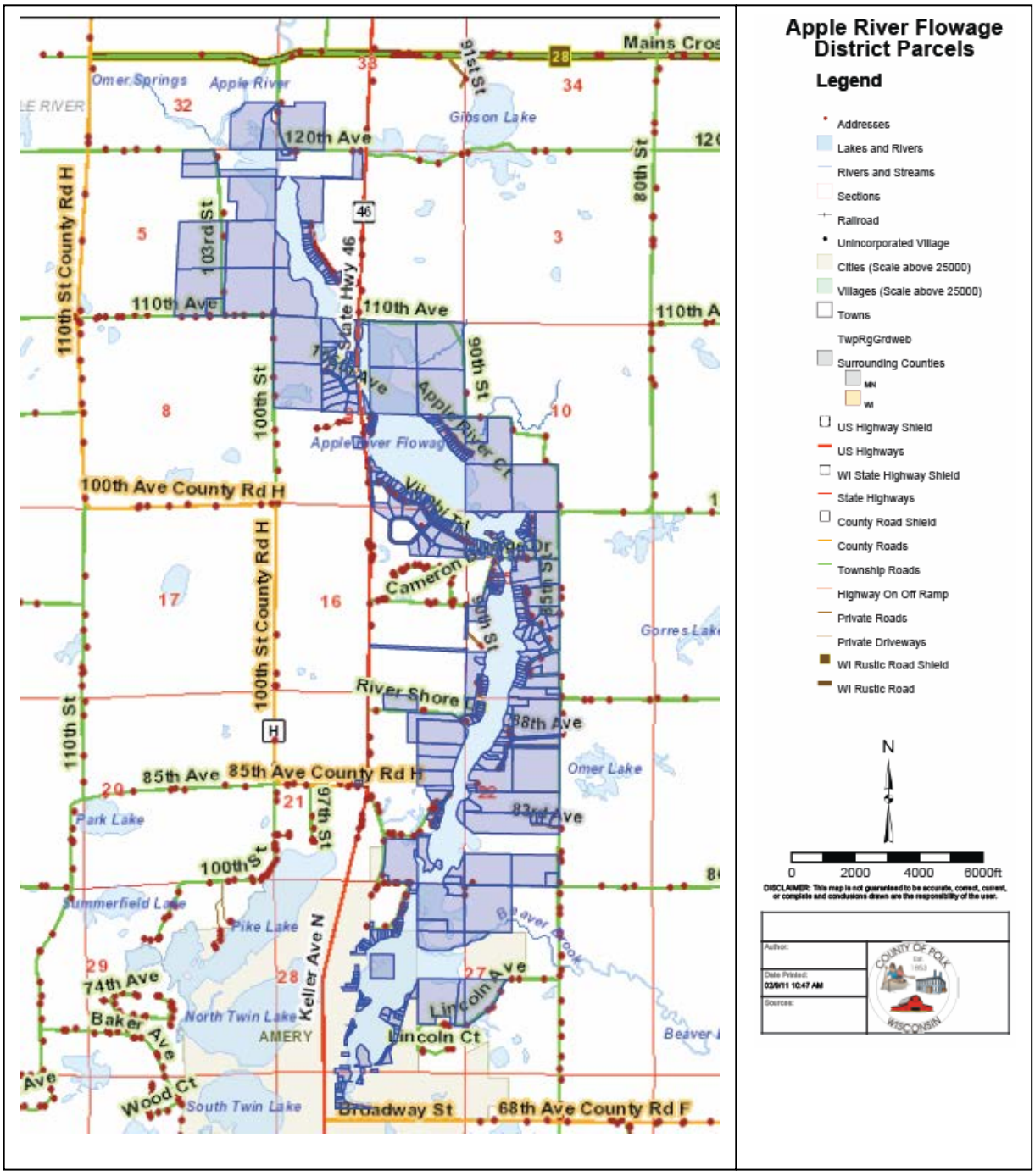

FIGURE 7. APPLE RIVER PROTECTION AND REHABILITATION DISTRICT PARCELS

Aquatic Habitats

Primary Human Use Areas

The Apple River Flowage is a popular fishing destination for both summer and winter fishing. Residential development follows road development around the flowage. Waterfront property owners and the general public utilize the flowage for a wide variety of activities including fishing, boating, swimming, and viewing wildlife.

Functions and Values of Native Aquatic Plants

Naturally occurring native plants are extremely beneficial to the flowage. They provide a diversity of habitats, help maintain water quality, sustain fish populations, and support common lakeshore wildlife such as loons and frogs.

Water Quality

Aquatic plants can improve water quality by absorbing phosphorus, nitrogen, and other nutrients from the water that could otherwise fuel nuisance algal growth. Some plants can even filter and break down pollutants. **Plant roots and underground stems help to prevent re-suspension of nutrient-rich bottom sediments. In the flowage, this is particularly important.** Stands of emergent plants (whose stems protrude above the water surface) and floating plants help to blunt wave action and prevent erosion of the shoreline. The rush, reed, and rice populations around the flowage are particularly important for reducing erosion along the shoreline, but these populations are also vulnerable to the nutrient loading and the resultant algae growth in the lakes. Dense wild rice is found near the Apple River inlet north and west of the Highway 46 Bridge, and scattered growth occurs in other areas.

Fishing

Habitat created by aquatic plants provides food and shelter for both young and adult fish. Invertebrates living on or beneath plants are a primary food source for many species of fish. Other fish, such as bluegills, graze directly on the plants themselves. Plant beds in shallow water provide important spawning habitat for many fish species.

Waterfowl

Plants offer food, shelter, and nesting material for waterfowl. Birds eat both the invertebrates that live on plants and the plants themselves.[6]

Protection against Invasive Species

Non-native invasive species threaten native plants in Northern Wisconsin. The most common are Eurasian water milfoil (EWM) and Curly-leaf pondweed (CLP). These species are described as opportunistic invaders. This means that they take over openings in the lake bottom where native plants have been removed. Without competition from other plants, these invasive species may successfully become established and spread in the lake. This concept of

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[6] Above paragraphs summarized from *Through the Looking Glass*. Borman et al. 1997.

opportunistic invasion can also be observed on land, in areas where bare soil is quickly taken over by weeds.

Removal of native vegetation not only diminishes the natural qualities of a lake, but it increases the risk of non-native species invasion and establishment. The presence of invasive species can change many of the natural features of a lake and often leads to expensive annual control plans. Allowing native plants to grow may not guarantee protection against invasive plants, but it can discourage their establishment. Native plants may cause localized concerns to some users, but as a natural feature of lakes, they generally do not cause harm.[7]

Sensitive Areas

The Wisconsin Department of Natural Resources completed sensitive area surveys to designate areas within aquatic plant communities which provide important habitat for game fish, forage fish, macroinvertebrates, and wildlife, as well as important shoreline stabilization functions. The Department of Natural Resources has transitioned to designations of *critical habitat areas* that include both *sensitive areas* and *public rights features*. The *critical habitat area* designation provides a holistic approach to ecosystem assessment and protection of those areas within a lake that are most important for preserving the very character and qualities of the lake. Protecting these *critical habitat areas* requires the protection of shoreline and in-lake habitat. The *critical habitat area* designation provides a framework for management decisions that impact the ecosystem of the lake.

Critical habitat areas include *sensitive areas* that offer critical or unique fish and wildlife habitat (including seasonal or life stage requirements) or offer water quality or erosion control benefits to the area (Administrative code 107.05(3)(1)(1)). The Wisconsin Department of Natural Resources is given the authority for the identification and protection of sensitive areas of the lakes. *Public rights features* are areas that fulfill the right of the public for navigation, quality and quantity of water, fishing, swimming, or natural scenic beauty.

Sensitive Area Study

A draft sensitive area study was completed by the Department of Natural Resources in the late 1990s / early 2000s and is included in the 2003 DNR/Polk County *Apple River Flowage Aquatic Plant Survey Report*. The sensitive area study is not included in DNR on-line records, and it is not clear if results are used for permitting in the flowage. Results were included in Appendix A of the 2017 Apple River Flowage Aquatic Plant Management Plan.

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[7] *Aquatic Plant Management Strategy. DNR Northern Region.* Summer 2007.

Apple River Flowage Fishery

The fishery of Apple River Flowage consists of bluegill, black crappie, pumpkinseed, yellow perch, largemouth bass, smallmouth bass, rock bass, muskellunge, and northern pike.[8]

The most recent fisheries survey was completed in 2011. Results of the survey indicated abundant bluegill, black crappie, and pumpkinseed populations with average size structure; a moderate density largemouth bass population with good size structure; and moderate density muskellunge and northern pike populations with good size structure.

[8] *Wisconsin Lakes Book*. 2009.

PLANT COMMUNITY

AQUATIC PLANT SURVEY RESULTS

Three aquatic macrophyte (plant) surveys were conducted in 2022 according to standard Wisconsin Department of Natural Resource methods. Endangered Resource Services completed early-season CLP point-intercept and bed mapping surveys May 25-26, and 30. These were followed by a warm-water point-intercept survey of all aquatic plants from July 6-7. For both surveys, harvester operations were suspended prior to data collection. The results discussed below, are summarized or taken directly from the aquatic macrophyte survey results.

The survey and data analysis methods and results for the aquatic macrophyte surveys are found in the following report: *Curly-leaf pondweed (Potamogeton crispus) Point-intercept and Bed Mapping Surveys, and Warm-water Macrophyte Point-intercept Survey Apple River Flowage - WBIC: 2624200. Polk County, Wisconsin*, conducted and prepared by Matthew S. Berg of Endangered Resource Services, LLC.

Using a standard formula based on a lake's shoreline shape and length, islands, water clarity, depth, and size, the Wisconsin Department of Natural Resources (WDNR) generated the sampling point grid of 672 points. Figure 8 shows the distribution of the sampling points in 2010.

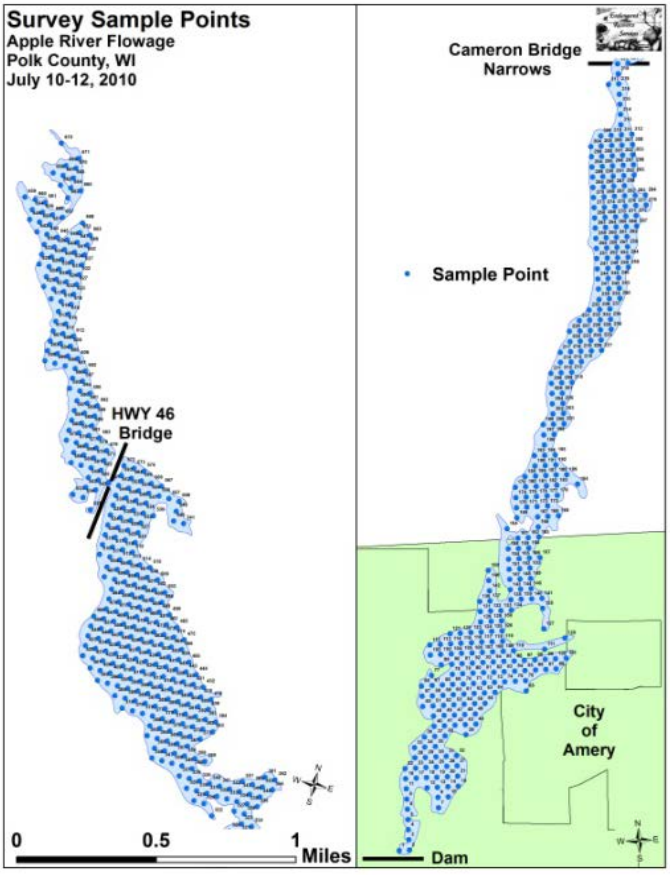


FIGURE 8. SAMPLING POINT GRID

During the July 2022 full point-intercept survey, aquatic plants were found growing at 620 sites (92.3% of the lake bottom and 93.1% of the 12.5ft littoral zone). The lake area with depths at which plants can grow is called the littoral zone. This was a significant increase in coverage compared to 2016 and 2010. Most of the flowage has a muck bottom (Figure 10). A sand bottom was found scattered along wave swept points and shoreline, while the majority of the gravel and cobble substrates occurred in scoured areas of the river channel.

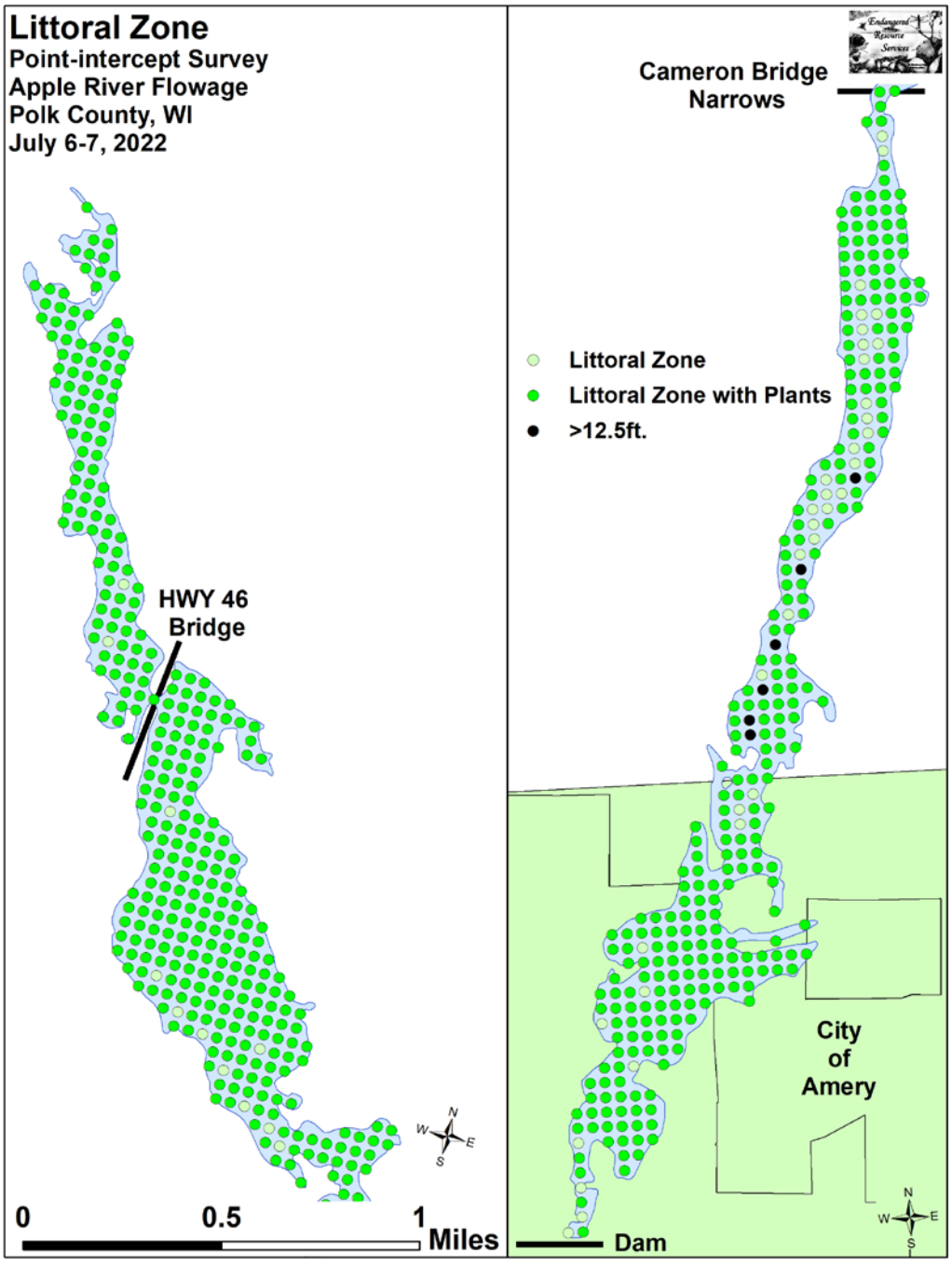


FIGURE 9. FLOWAGE LITTORAL ZONE

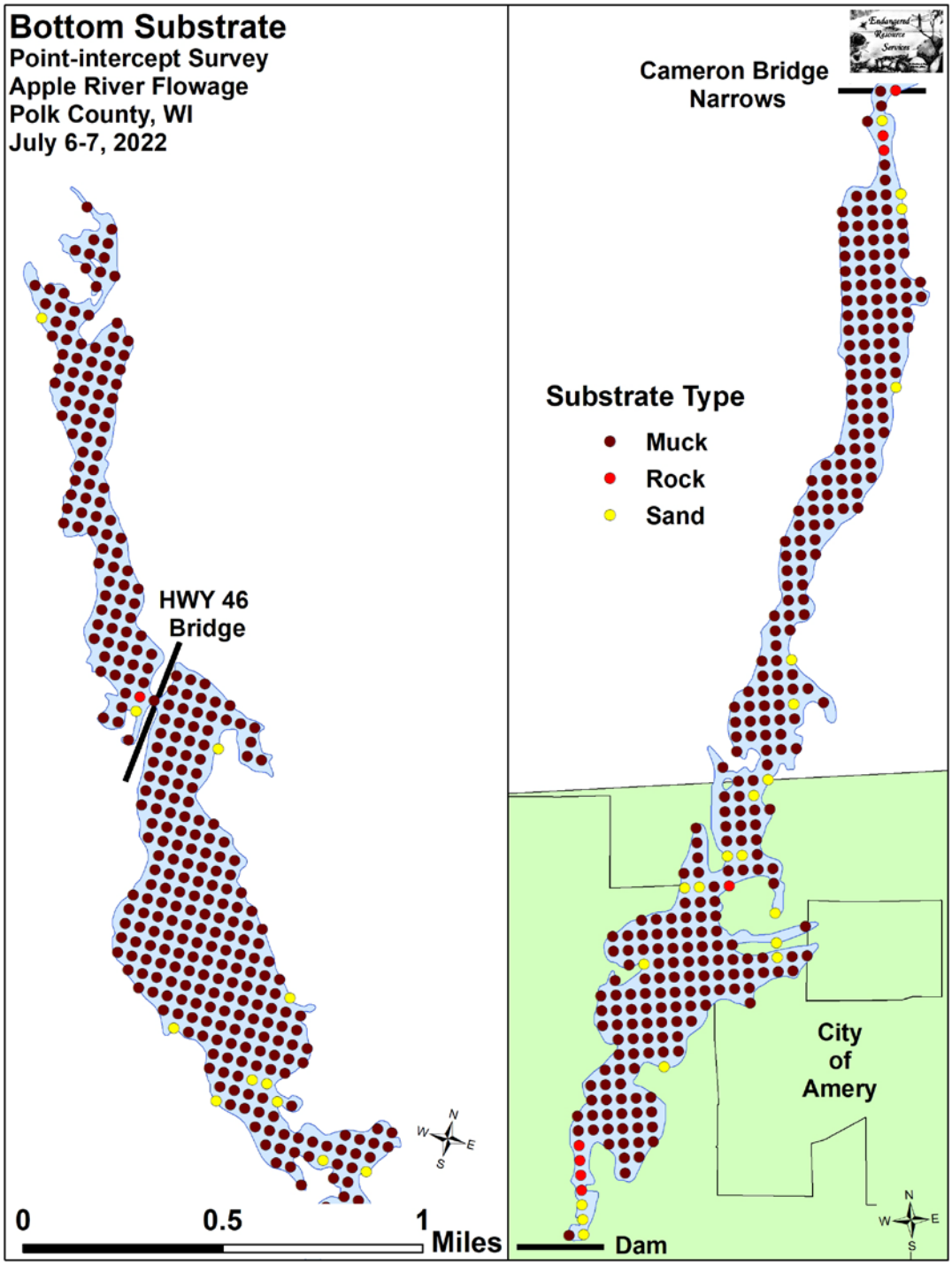


FIGURE 10. BOTTOM SEDIMENT TYPE

Plant diversity was moderately high in the flowage in 2022 with a Simpson Diversity Index of 0.86. The Simpson Diversity Index is a measure of the likelihood that a different species of plant will be found each time a grab sample is taken. The highest Simpson Diversity Index is 1.0. A total of 42 aquatic macrophyte species were found in and adjacent to the flowage during the 2022 study, up slightly from 37 species found in 2016 and 36 species found in 2010.

The shallow, mucky bays supported the highest richness (numbers of different) native species and the greatest overall growth of plants. Rocky and sandy areas had species not found elsewhere. Species richness dropped rapidly with increasing depth. Summary statistics from the summer surveys in 2010, 2016, and 2022 are reported in Table 2. Statistics by species for 2022 are reported in Table 3. A comparison of survey results is presented in detail in the plant survey report.

The July 2022 survey documented Coontail (87.74% of points with vegetation), Common watermeal (50.97%), Large duckweed (50.65%), and Small duckweed (50.48%) as the most common species with a combined relative frequency of 68.68% (Table 8).

The Floristic Quality Index (FQI) is an index developed by Dr. Stanley Nichols of the University of Wisconsin-Extension. This index is a measure of the plant community response to development and human influence on the lake. It takes into account the species of aquatic plants present and their tolerance for changing water quality and habitat characteristics. A plant's tolerance is expressed as a coefficient of conservatism (C). Native plants in Wisconsin are assigned a conservatism value between 0 and 10. A plant with a high conservatism value has more specialized habitat requirements and is less tolerant of disturbance and/or water quality changes. Those with lower values are more able to adapt to disturbance or changing conditions, and can therefore be found in a wider range of habitats. The FQI is calculated using the number of species present and these plants' species conservatism values. A higher FQI generally indicates a healthier aquatic plant community.

The 33 native index species found in the rake during the July 2022 survey (up from 28 in 2016 and 29 in 2010) produced a slightly above average mean Coefficient of Conservatism of 5.7 (identical to 2016/down from 5.9 in 2010), and a Floristic Quality Index of 32.7 (up from 30.2 in 2016 and 31.8 in 2010) that was much above the median FQI for this part of the state. The FQI mean for the Northern Central Hardwood Forests Region (Nichols 1999) was 20.9.

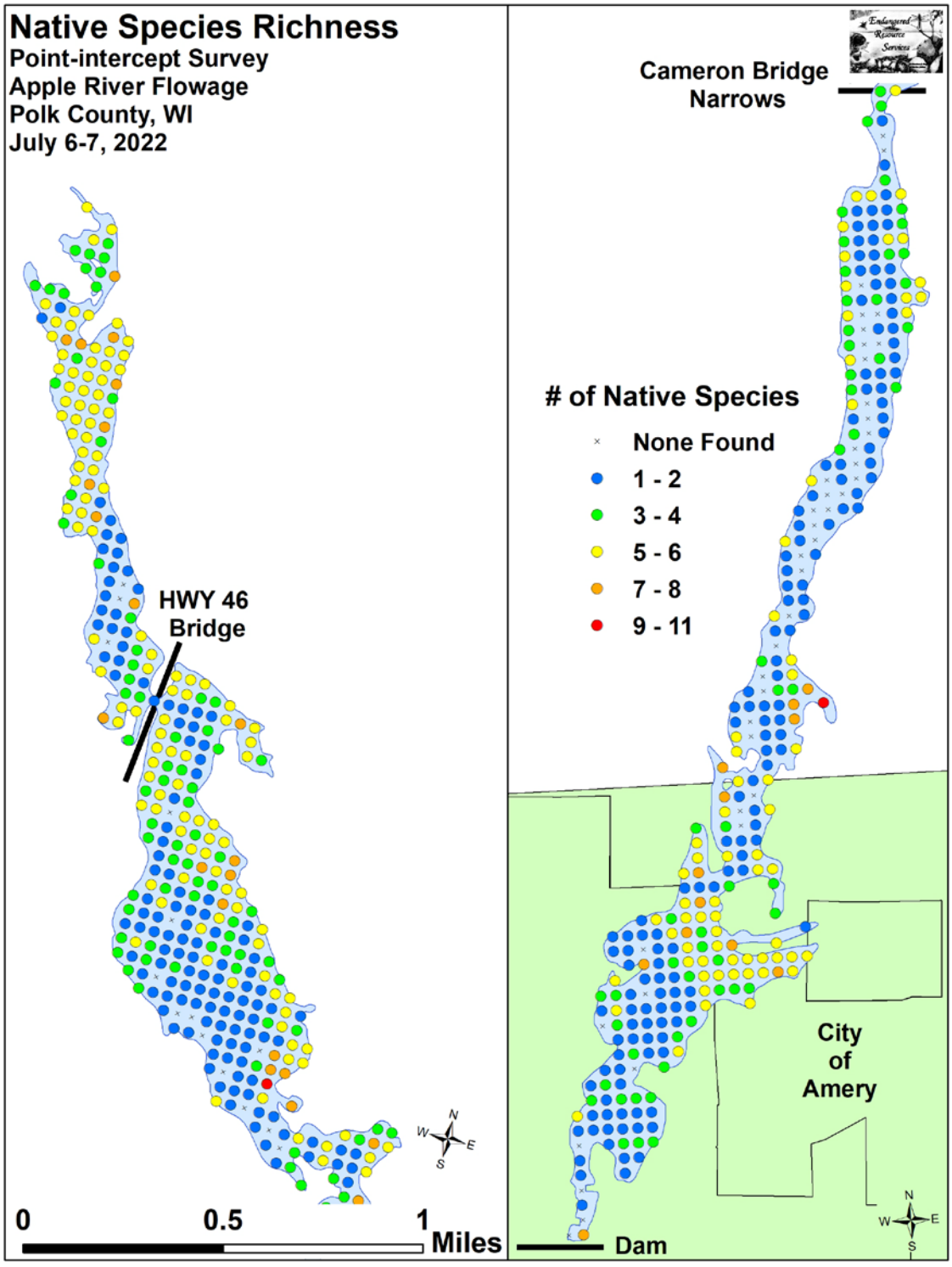


FIGURE 11. NATIVE SPECIES RICHNESS

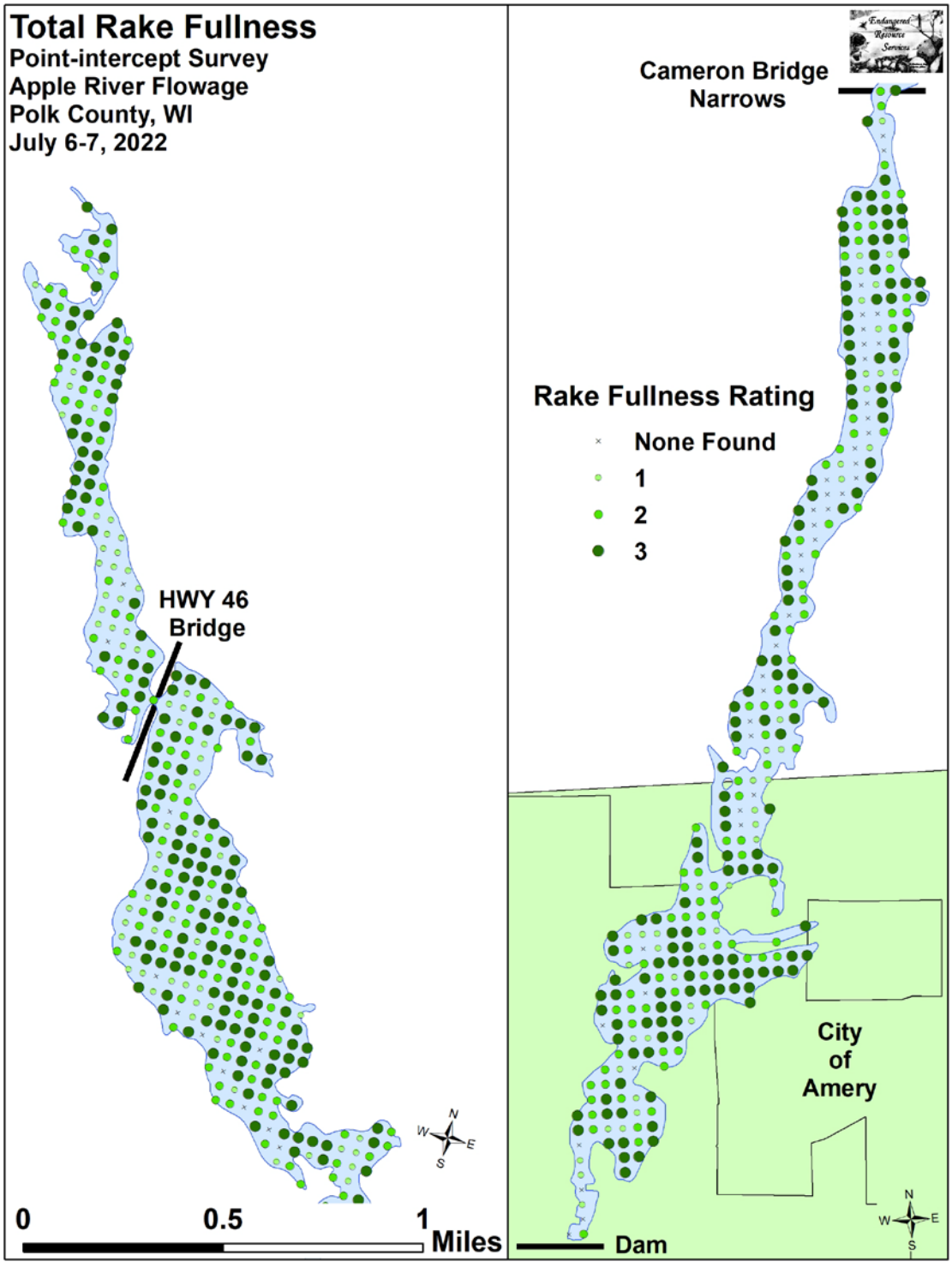


FIGURE 12. TOTAL RAKE FULLNESS

TABLE 2. AQUATIC PLANT SUMMARY STATISTICS

	2010	2016	2022
Total number of points sampled	671	672	672
Total number of sites with vegetation	588	597	620
Total number of sites shallower than the maximum depth of plants	669	671	666
Frequency of occurrence at sites shallower than maximum depth of plants	87.9	89.0	93.1
Simpson Diversity Index	0.87	0.86	0.86
Floristic Quality Index	31.8	30.2	32.7
Maximum depth of plants (ft)	14.0	13.5	12.5
Mean depth of plants (ft)	5.3	5.1	5.1
Median depth of plants (ft)	4.5	5.0	5.0
Number of sites sampled using a rake on a rope	0	0	0
Number of sites sampled using a rake on a pole	671	671	671
Average number of all species per site (shallower than max depth)	3.55	3.56	3.26
Average number of all species per site (veg. sites only)	4.04	4.00	3.50
Average number of native species per site (shallower than max depth)	3.51	3.51	3.17
Average number of native species per site (sites with native veg. only)	4.02	3.96	3.42
Species richness	30	33	37
Species richness (including visuals)	32	35	39
Species richness (including visuals and boat survey)	36	37	42
Mean rake fullness (veg. sites only)	2.27	2.08	2.30

TABLE 3. SPECIES FREQUENCY AND RAKE FULLNESS 2022

Species	Common Name	Total Sites	Relative Freq.	Freq. in Veg.	Freq. in Lit.	Mean Rake	Visual Sight.
Ceratophyllum demersum	Coontail	544	25.13	87.74	81.68	2.19	24
	Filamentous algae	403	*	65.00	60.51	1.77	0
Wolffia columbiana	Common watermeal	316	14.60	50.97	47.45	1.81	1
Spirodela polyrhiza	Large duckweed	314	14.50	50.65	47.15	1.77	1
Lemna minor	Small duckweed	313	14.46	50.48	47.00	1.25	1
Potamogeton zosteriformis	Flat-stem pondweed	230	10.62	37.10	34.53	1.43	53
Elodea canadensis	Common waterweed	90	4.16	14.52	13.51	1.37	1
Nymphaea odorata	White water lily	70	3.23	11.29	10.51	1.49	46
Potamogeton crispus	**Curly-leaf pondweed**	**57**	**2.63**	**9.19**	**8.56**	**1.02**	**11**
Potamogeton pusillus	Small pondweed	48	2.22	7.74	7.21	1.31	3
Zizania palustris	Northern wild rice	35	1.62	5.65	5.26	1.86	17
Potamogeton praelongus	White-stem pondweed	19	0.88	3.06	2.85	1.37	17
Potamogeton amplifolius	Large-leaf pondweed	15	0.69	2.42	2.25	1.53	5
Heteranthera dubia	Water star-grass	14	0.65	2.26	2.10	1.36	1
Sparganium eurycarpum	Common bur-reed	14	0.65	2.26	2.10	1.93	11
Lemna trisulca	Forked duckweed	11	0.51	1.77	1.65	1.00	2
Ranunculus aquatilis	White water crowfoot	10	0.46	1.61	1.50	1.40	1
Nitella sp.	Nitella	9	0.42	1.45	1.35	1.11	0
Nuphar variegata	Spatterdock	9	0.42	1.45	1.35	2.11	7
Sagittaria rigida	Sessile-fruited arrowhead	5	0.23	0.81	0.75	1.60	4
Typha* X *glauca	**Hybrid cattail**	**5**	**0.23**	**0.81**	**0.75**	**1.80**	**6**
	Freshwater sponge	4	*	0.65	0.60	1.00	0
Stuckenia pectinata	Sago pondweed	4	0.18	0.65	0.60	1.25	3
Zannichellia palustris	Horned pondweed	4	0.18	0.65	0.60	1.25	0

* Excluded from the relative frequency calculation **Exotic species in bold**

Table 3. (continued). SPECIES FREQUENCY AND RAKE FULLNESS 2022

Species	Common Name	Total Sites	Relative Freq.	Freq. in Veg.	Freq. in Lit.	Mean Rake	Visual Sight.
Chara sp.	Muskgrass	3	0.14	0.48	0.45	1.00	0
Myriophyllum sibiricum	Northern water-milfoil	3	0.14	0.48	0.45	1.33	2
Potamogeton friesii	Fries' pondweed	3	0.14	0.48	0.45	1.67	0
Potamogeton richardsonii	Clasping-leaf pondweed	3	0.14	0.48	0.45	1.00	5
Vallisneria americana	Wild celery	3	0.14	0.48	0.45	1.67	0
Eleocharis erythropoda	Bald spikerush	2	0.09	0.32	0.30	2.00	1
Phalaris arundinacea	**Reed canary grass**	**2**	**0.09**	**0.32**	**0.30**	**2.50**	**4**
Potamogeton robbinsii	Fern pondweed	2	0.09	0.32	0.30	1.00	1
Sagittaria latifolia	Common arrowhead	2	0.09	0.32	0.30	1.00	2
Carex comosa	Bottle brush sedge	1	0.05	0.16	0.15	1.00	1
Iris versicolor	Northern blue flag	1	0.05	0.16	0.15	2.00	2
Najas flexilis	Slender naiad	1	0.05	0.16	0.15	2.00	0
Potamogeton strictifolius	Stiff pondweed	1	0.05	0.16	0.15	1.00	0
Schoenoplectus tabernaemontani	Softstem bulrush	1	0.05	0.16	0.15	1.00	2
Solanum dulcamara	**Bittersweet nightshade**	**1**	**0.05**	**0.16**	**0.15**	**1.00**	**1**
Lythrum salicaria	**Purple loosestrife**	**	**	**	**	**	**2**
Potamogeton nodosus	Long-leaf pondweed	**	**	**	**	**	2
Myosotis scorpioides	**Common forget-me-not**	***	***	***	***	***	***
Potamogeton natans	Floating-leaf pondweed	***	***	***	***	***	***
Typha latifolia	Broad-leaved cattail	***	***	***	***	***	***

** Visual only *** Boat survey only **Exotic species in bold**

Significant Changes in Aquatic Plants (2016 to 2022)

From 2016 to 2022, 11 species experienced significant changes in distribution. Filamentous algae and Curly-leaf pondweed both saw highly significant increases; and Common bur-reed, Large-leaf pondweed, freshwater sponges, and Horned pondweed, all had significant increases. Conversely, Common watermeal, Small duckweed, Common waterweed, and Forked duckweed underwent highly significant declines; and Large duckweed experienced a moderately significant decline.

Although Flat-stem pondweed is found throughout the flowage, most of the dense beds in 2010 occurred in the "lake" region downstream from the HWY 46 Bridge and just south of the Cameron Bridge. The 2016 and 2022 surveys showed little change for this species in shallow water beds, but areas occurring in 4.5ft or more were often noticeably reduced or absent. Because it is a shallow-rooting species that sprouts from overwintering turions and does not readily regenerate, it is possible and perhaps likely that these significant declines are at least partially tied to the harvesting program.

Density and distribution of Curly-leaf pondweed and Coontail, the two most common spring and summer species on the flowage that are responsible for the greatest amount of navigation impairment, showed almost no changes since the original 2010 aquatic plant survey. This suggests that annual active management will be required to continue maintaining navigation channels into the foreseeable future.

Northern Wild Rice (*Zizania palustris*)

Wild rice is an aquatic plant with special significance to Native American Tribes. Wild rice is both ecologically and culturally important on the landscape. Rice beds provide diverse habitat for wildlife and fish, acting as brood rearing and nursery areas. Waterfowl also use rice beds as a food source for both the abundant seeds and the diverse invertebrate community found attached to stalks. An annual grass dependent on flowing water, rice can exhibit a fair amount of variation in abundance from year to year in the same bed. Densities can fluctuate from bumper crops to poor production years. Wild rice grows in shallow water. Beds will not expand out further than 4 feet deep, and most rice grows in water depths from 6 inches to 3 feet. Culturally rice has played a prized role in the lives of the Ojibwe and others who have realized the nutritional value of this important resource. Potential impacts to wild rice must be considered with any aquatic plant management method.

During the 2022 plant survey, wild rice was confined to two areas on the flowage (Figure 13) neither were deep enough to likely be accessed by the mechanical harvesters. Around the Beaver Brook Inlet, rice occurred at very low densities, and the plants that were present had been heavily cropped by geese making it doubtful that the majority of them would be able to set grain. Consequently, there was no potential for human harvest in this area.

On the upstream end of the flowage, a more or less continuous bed of moderate to high density rice covered at least 20 acres in the Apple River Inlet. This giant bed offered some human

harvest potential, but shallow water would have made poling a canoe through the majority of the area extremely difficult if not impossible.

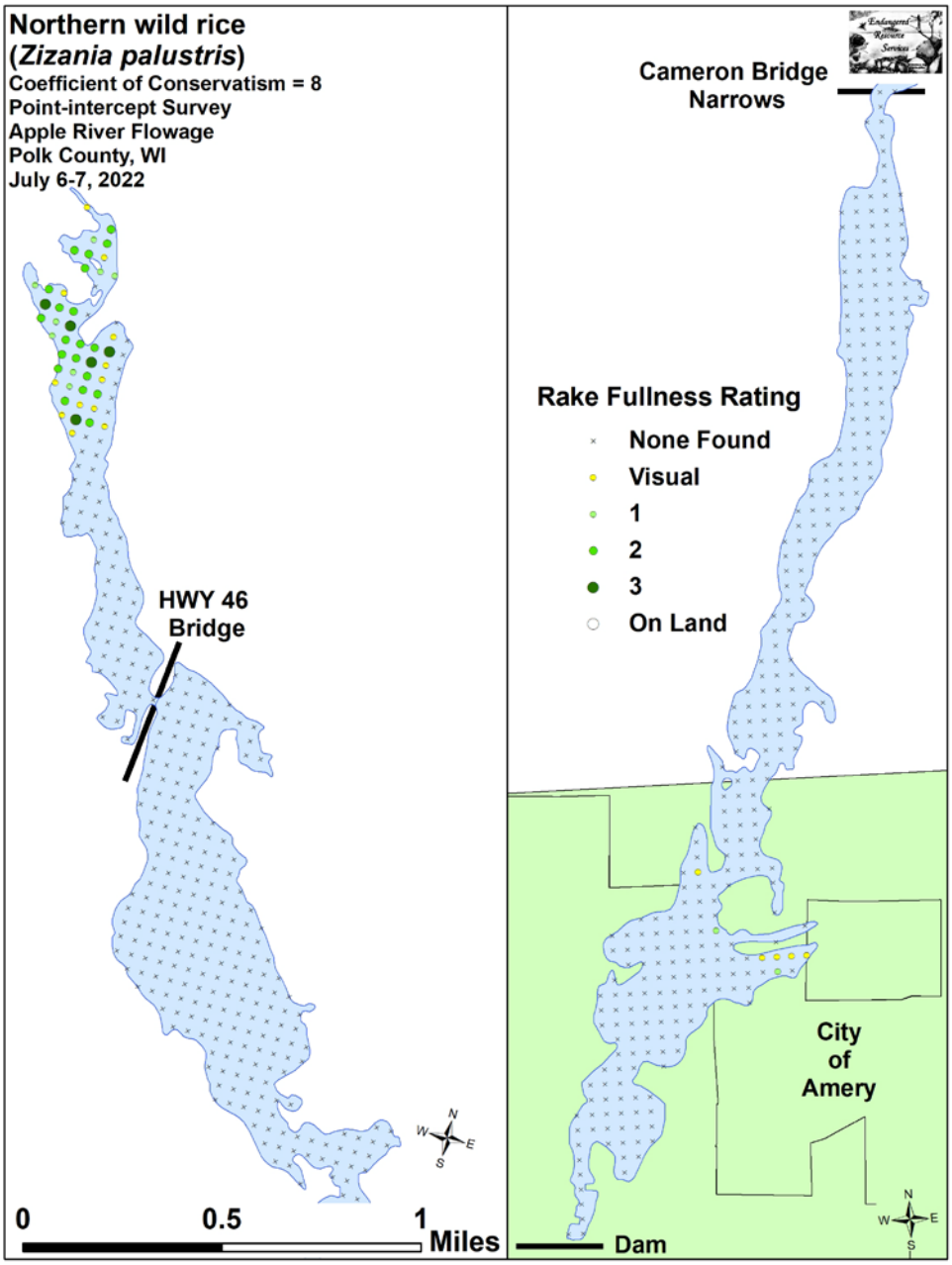


FIGURE 13. NORTHERN WILD RICE POINT INTERCEPT DISTRIBUTION (2022)

Aquatic Invasive Species

More information about invasive species is found in the APM Companion Document and on the DNR website.[9]

Eurasian water milfoil was not found on the flowage in 2022, but there is a high risk that Eurasian water milfoil and other aquatic invasive species may become established. As described previously, the flowage is a fishing destination. Many fishermen travel from the Twin Cities, Minnesota area, and access the lake at the boat landings. With Eurasian water milfoil present in many urban Twin Cities lakes, there is a risk of transporting plant fragments on boats and motors. EWM is also present in several lakes within Polk County and in nearby counties.[10]

Purple Loosestrife

Purple loosestrife showed little evidence of expansion since 2016. In 2022, there were plants along the eastern shoreline in the "lake" region downstream from the HWY 46 Bridge. Most of the plants were growing as individual stems or small isolated clusters.

Purple loosestrife

Common Forget-me-not

A few clusters of common forget-me-not plants were found scattered around cold-water springs, especially in the Apple River Inlet. Because this habitat is limited, there likely are not many additional places for this species to spread to on the flowage.

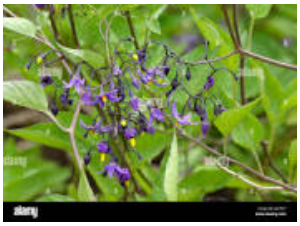
Common forget-me-not

Reed Canary Grass

Reed canary grass is well established around the perimeter of the flowage.

Bittersweet Nightshade

Bittersweet nightshade was scattered in and around the Beaver Brook Inlet. This species is likely of limited concern as there does not appear to be much habitat for it to expand into.



Bittersweet nightshade

[9] https://dnr.wisconsin.gov/topic/Invasives

[10] https://dnr.wi.gov/lakes/invasives/AISLists.aspx?species=EWM&location=49

Hybrid Cattail

Native to southern but not northern Wisconsin, narrow-leaved cattail (*Typha angustifolia*) and its hybrids with broad-leaved cattail are becoming increasingly common in northern Wisconsin where they tend to be invasive. There were several stands of these hybrids scattered throughout the flowage in 2016, and they appear to be expanding and crowding out other emergent species. By 2022, they had expanded to five points with six additional visual sightings. The majority of beds occurred north of the HWY 46 Bridge where they appeared to be taking over many shallow water habitats and crowding out other emergent species. Further downstream, they were less common, but still occasionally formed dense monotypic beds.

Curly Leaf Pondweed

Endangered Resource Services completed Curly-leaf pondweed bed mapping surveys in June 2011, May 2016, and May 2022. CLP growth dominates the flowage in early summer according to the survey report. Both a rake survey and bed mapping were completed.

For the bed mapping, CLP beds met two criteria: CLP plants made up greater than 50 percent of all aquatic plants in the area, and the CLP had canopied at the surface or was close enough to the surface that it would likely interfere with normal boat traffic. Areas that had a high amount of CLP, but were not canopied or were not dense enough to meet the "bed" criteria, were also mapped and identified as "high density CLP areas". These areas have the potential to form beds in the future.

The 2022 cold-water survey found CLP at 434 points (64.6% total surface area) with a mean rake fullness of 2.34. When compared with results from 2016 and 2010, **these data suggest the current management program has resulted in little change to CLP's overall population structure in the flowage.**

From the 2011 plant survey report:

> *Although found throughout the littoral zone, CLP achieved its greatest densities in sheltered bays with muck bottoms in water 3-7 feet deep. In general, the only place CLP wasn't found was in the deepest parts of the river channel, in water <1 foot deep where coontail filled the entire water column, and in most of the shallow northern wild rice (Zizania palustris) areas surrounding the Apple River Inlet.*

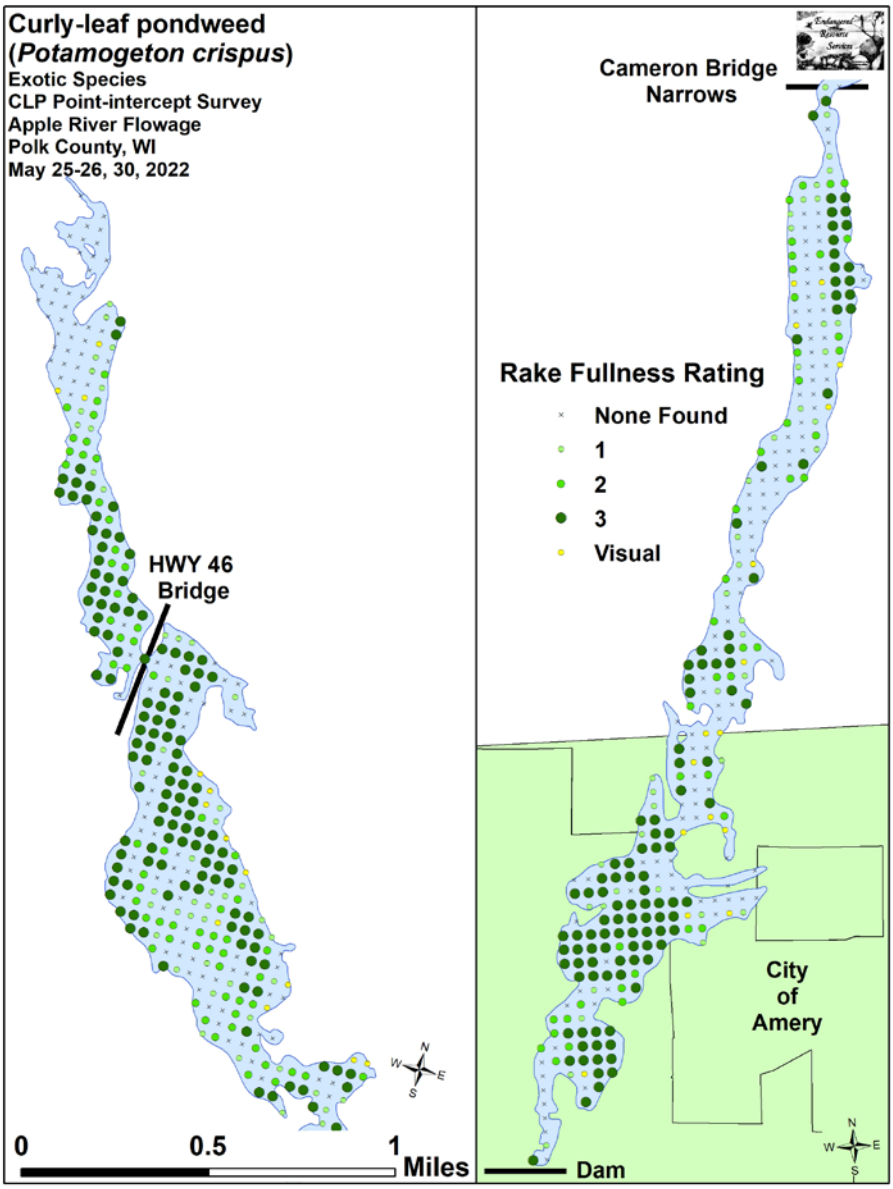


FIGURE 14. CURLY-LEAF PONDWEED RAKE DENSITY 2022

Maps below summarize the bed mapping results from the 2022 CLP survey. A detailed description of each of the beds and high density areas is included in the Endangered Resource Services Report.

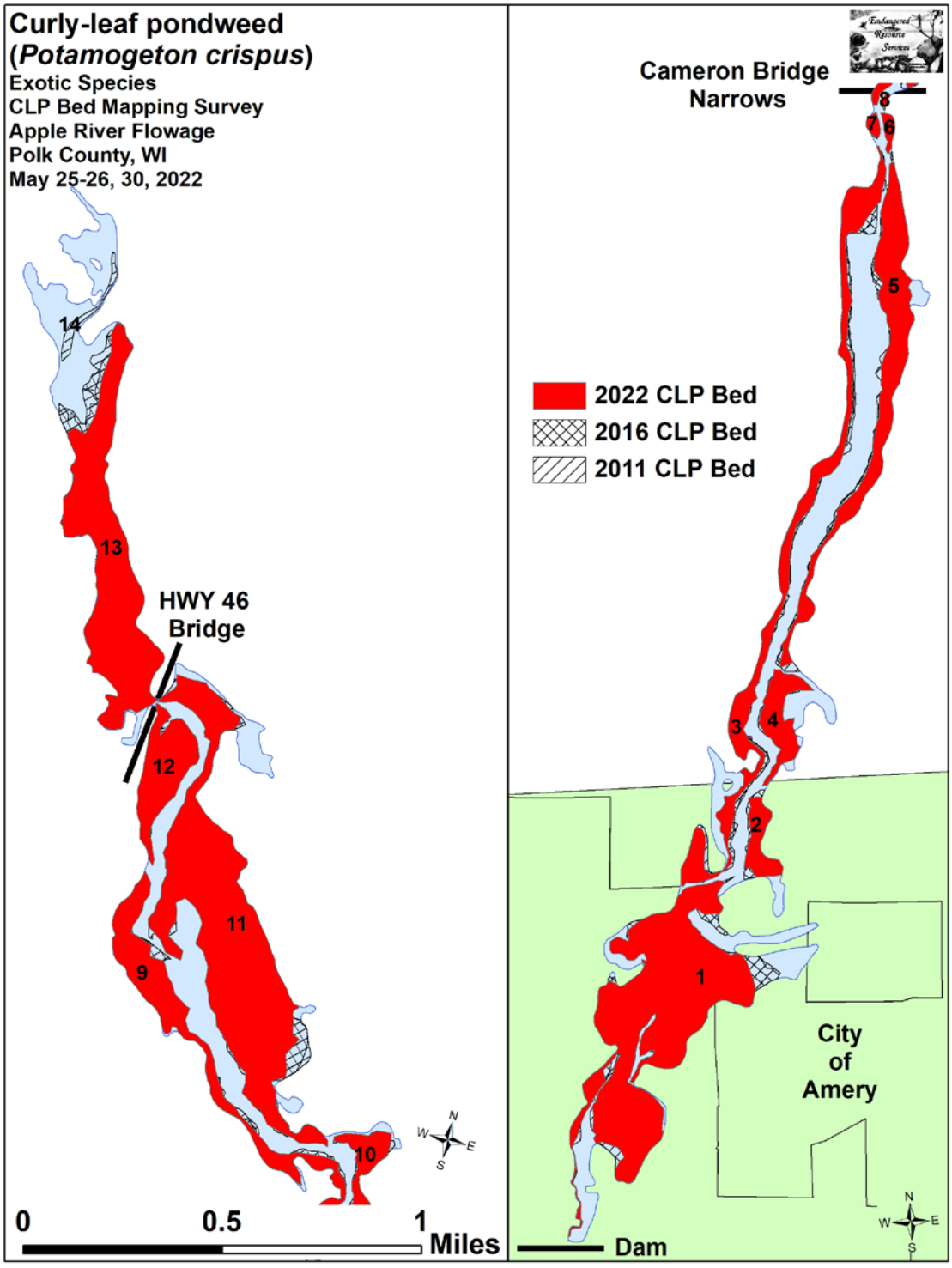


FIGURE 15. CURLY-LEAF PONDWEED BEDS AND HIGH DENSITY AREAS 2022

AQUATIC PLANT MANAGEMENT

This section reviews the potential management methods available and reports past management activities on the flowage. Potential management methods are included in a reference companion document to this plan.

PERMITTING REQUIREMENTS

The Department of Natural Resources regulates the removal of aquatic plants when chemicals are used, when plants are removed mechanically, and when plants are removed manually from an area greater than thirty feet in width along the shore. The requirements for chemical plant removal are described in Administrative Rule NR 107 – Aquatic Plant Management. A permit is required for any aquatic chemical application in Wisconsin. Additional requirements exist when a lake is considered an ASNRI (Area of Special Natural Resource Interest) due, in the case of the Apple River Flowage, to the presence of wild rice.

The requirements for manual and mechanical plant removal are described in *NR 109 – Aquatic Plants: Introduction, Manual Removal & Mechanical Control Regulations*. A permit is required for manual and mechanical removal except for when a riparian (waterfront) landowner manually removes or gives permission to someone to manually remove plants, (with the exception of wild rice) from his/her shoreline up to a 30-foot corridor. A riparian landowner may also manually remove the invasive plants Eurasian water milfoil, Curly-leaf pondweed, and purple loosestrife along his or her shoreline without a permit. Manual removal refers to the control of aquatic plants by hand or hand–held devices without the use or aid of external or auxiliary power.[11]

The *Department of Natural Resources Northern Region Aquatic Plant Management Strategy* (May 2007) requires documentation of impaired navigation or nuisance conditions before native plants may be managed with herbicides. Severe impairment or nuisance will generally mean that vegetation grows thickly and forms mats on the water surface.

[11] More information regarding DNR permit requirements and aquatic plant management contacts is found on the DNR web site: www.dnr.state.wi.us.

Past Aquatic Plant Management

The 1979 Office of Inland Lake Renewal study provided some general recommendations including consideration of harvesting or herbicide use to allow navigation. This study mentions that attempts at controlling nuisance vegetation with herbicides began in 1967 and continued since through 1978. However, the flowage district was not formed until 1975, and treatment records from that time period are not available.

Navigation Channels

Navigation channels were maintained by the ARPRD for many years. District records were found for harvesting aquatic vegetation from channels in 1985, 1986, and 1990 and from 1992 through 1997, although harvesting may have occurred in additional years. The harvesting contractor in each year reported was Aquatic Nuisance Control. It appears that herbicides were used to maintain navigation channels from 1993 through 2009. Harvesting and herbicide treatments during these periods were summarized in tables in the 2017 Apple River Aquatic Plant Management Plan.

Curly-Leaf Pondweed Treatment

Aquatic plant management permit applications and permits refer to requests and authorization for early season Curly-leaf pondweed (CLP) treatment. However, there is no record of treatment in any year that could have targeted Curly-leaf pondweed. Curly-leaf pondweed grows in the fall and spring, and then dies back by late June. Effective treatment measures to target Curly-leaf pondweed growth must be completed early in the season. Water temperatures between 50 and 60 degrees Fahrenheit are generally targeted. These temperatures tend to occur sometime in May in the Amery area. This timing is intended to kill CLP before its reproductive structures are formed. At the very least, herbicides treatments that supposedly target CLP in mid-June have no real effect when the plants die back in late June to early July. There are no records of aquatic herbicide treatment of navigation channels that occurred prior to mid-June. Unless treatment records are missing, there has been no herbicide treatment effectively targeting CLP to date on the Apple River Flowage.

Individual Corridors

In 1979 Aquatic Nuisance Control offered herbicide control to residents. There was no district funding involved. According to district records, some individual property owners contracted to have plants harvested in front of their properties at least in 1985, 1986, and 1990 and from 1992 to 1996. A table in the 2016 Apple River Aquatic Plant Management Plan reported permitted and reported herbicide treatments in front of individual properties from 1986 through 2009. The number of properties treated during this time period ranged from 2 to 26 sites and the acreage ranged from 0.20 acres to 3.57 acres. An application for herbicide treatment at four private sites was denied in 2010, and there are no records of DNR herbicide application permits since that time.

The DNR Northern Region released an Aquatic Plant Management Strategy (see APM companion document) in the summer of 2007 to protect the important functions of aquatic plants in lakes. As part of this strategy, the DNR prohibited management of native aquatic plants in front of individual lake properties after 2008 unless management was designated in an approved aquatic plant management plan.[12] Because of the importance of the native plant population for habitat, protection against erosion, and as a guard against invasive species infestation, plant removal with herbicides as an option for individual property owners must be carefully reviewed before permits are issued. The DNR will not allow removal after January 1, 2009 unless the "impairment of navigation" and/or "nuisance" conditions are clearly documented.

Monitoring for Invasive Species

The harvesting contractor checked the boat landings during summer months for the presence of Eurasian water milfoil and other invasive plants at least from 1994 to 1997. The 2003 report recommends volunteer monitoring of boat launches, beaches, and other access points at least every few weeks throughout the summer growing season.

Current Aquatic Plant Management

Flowage Harvesting 2012-2022

The 2011 Apple River Flowage Aquatic Plant Management Plan outlined ARPRD purchase and operation of a harvester to maintain navigation channels on the flowage. The ARPRD purchased and began operating an aquatic plant harvester in August 2012. Key considerations identified in the 2011 plan for harvesting on the flowage were 1) access for a harvester north and west of the Highway 46 Bridge, 2) availability of disposal/beneficial use sites for harvested plant materials, 3) cost of harvester purchase, 4) operation and maintenance, and 5) timing of harvesting. All of these issues were addressed in plan implementation.

Dave Schleusner, volunteer Operations Manager, oversees the harvesting operation on behalf of the ARPRD board. He also maintains equipment and operates the harvester. There are also five additional paid operators.

Access for harvester

Access points are shown in harvesting maps in Appendix B. Access for a harvester is available at public landing points south and east of the Highway 46 Bridge north of Amery. However, this bridge has a box culvert which provides only about 5.5 feet of clearance at normal water levels. As a result, two harvesters are used, one north and the other south of the Highway 46 Bridge. The ARPRD developed an access site north of Highway 46 Bridge at the Boles Farm. The site is privately owned and there are no long term agreements for its use.

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[12] Aquatic Plant Management Strategy. DNR Northern Region. Summer 2007.

Availability of disposal/beneficial use sites

Harvested aquatic plants can be land applied and/or composted as a soil amendment. County and state "do not transport" regulations restrict moving aquatic plants on roadways, but transport is allowed for disposal as part of a harvest or control activity conducted under an aquatic plant management permit issued under Ch. NR 109.

The ARPRD owns a truck for hauling and disposing of harvested aquatic plants. Harvested plants have been in demand and are used as soil amendment for farm fields, gardens, and site reclamation. The 2022 aquatic plant management permit application lists the "old city dump" and Dragonfly nursery as disposal sites. An additional 12 potential disposal sites are listed on the permit.

Cost of harvester purchase

The ARPRD purchased an Aquarius harvester (7 foot cutter blade), conveyor, and trailer in 2012 for $153,580. They received a $67,690 grant from the Wisconsin Waterways Commission for the purchase. The harvester loan was paid off in 2017.

A second harvester was purchased in April 2020 from Inland Lake Harvesters. The total cost for the harvester with a 10.5-foot cutter blade and conveyor was $221,328. A Wisconsin Waterways Commission grant paid $77,465 or 35% of the cost. The ARPRD obtained a loan for a portion of the purchase with an annual payment of $15,197 through 2028.

Operation and maintenance

A private accounting firm provides payroll service for ARPRD employees who operate and maintain harvesting equipment. Employment is seasonal. Volunteers also operate, maintain, and supervise harvesting operations. The ARPRD budgeted $33,274 in 2022 for harvesting operation.

Harvesting schedule

Harvesting begins on the flowage in mid to late-May and continues through late-August to early-September. This schedule depends upon ice-out time, weather, and resulting plant growth and die-back. The annual harvester permit application includes Curly-leaf pondweed and Coontail harvesting plans. Permit conditions limit harvesting depth to three feet and greater. Where wild rice is nearby, the minimum harvesting depth is five feet.

Curly-leaf pondweed is harvested between mid-May and the end of June. Once the Curly-leaf has been harvested, the crew begins on other species - primarily Coontail which is in abundance throughout the flowage. This weed tends to float, so it is a challenge for the harvesting team to stay ahead.

Harvesting has resulted in improved navigation in the flowage. A single 50 foot navigation channel is maintained along most of the length of the flowage. Additional 25 foot channels provide access to waterfront properties. Some areas of heavy use such as North Park and the Lincoln Boat Landing are also harvested. Maps of these areas are included in Appendix B.

Daily records of all harvesting activities are recorded and the Operations Manager periodically submits records to the Wisconsin DNR. A compilation of these records is included in Table 4.

TABLE 4. APPLE RIVER FLOWAGE HARVESTING 2012-2022

Year	Began	Ended	Days	Loads[13]	Weight (lbs.)
2012	August 10	Sept. 14	22	112	501,760
2013	May 28	August 29	67	566	2,535,680
2014	May 28	Sept. 5	63	513	2,302,857
2015	May 8	Sept. 9	68	500	2,244,500
2016	May 11	Sept. 9	75	564	2,531,796
2017	May 15	Sept. 20	80	368	1,656,000
2018	May 11	Sept. 25		351	1,579,500
2019	May 17	Sept. 21		346	1,557,000
2020	May 28	Sept. 18		388	1,746,000
2021[14]	May 6	Sept. 24			6,919,086
2022	May 20	Sept. 20		312	3,792,000

[13] Each load is approximately 275 ft^3 and 4489 pounds

[14] 2021 was the first year that two harvesters were used for a full season. It was a year of early and heavy plant growth.

Aquatic Invasive Species Monitoring

Volunteer Derrick Carlson made periodic checks for invasive species at areas of high public use such as the boat landings beginning in 2012.

Clean Boats, Clean Waters Program

The ARPRD implemented the Clean Boats, Clean Waters Program (CBCW) watercraft inspections and education for users at the Lincoln Landing beginning in 2012. Student staff were hired and trained in cooperation with the Amery Lakes District and payroll services were provided by the City of Amery. Student staff entered monitoring data into SWIMS. A private accounting firm is now hired to provide payroll services for the Clean Boats, Clean Waters Program.

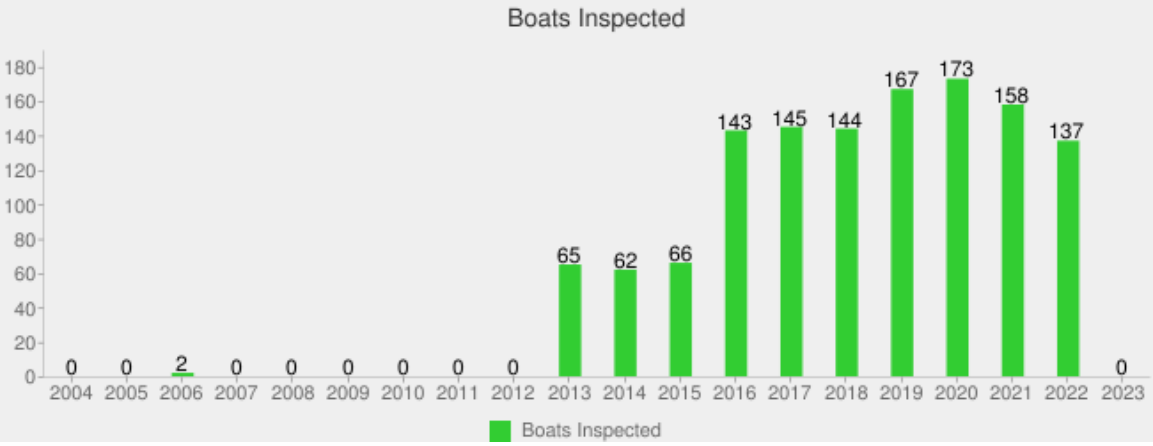


FIGURE 16. BOATS INSPECTED AT THE LINCOLN LANDING

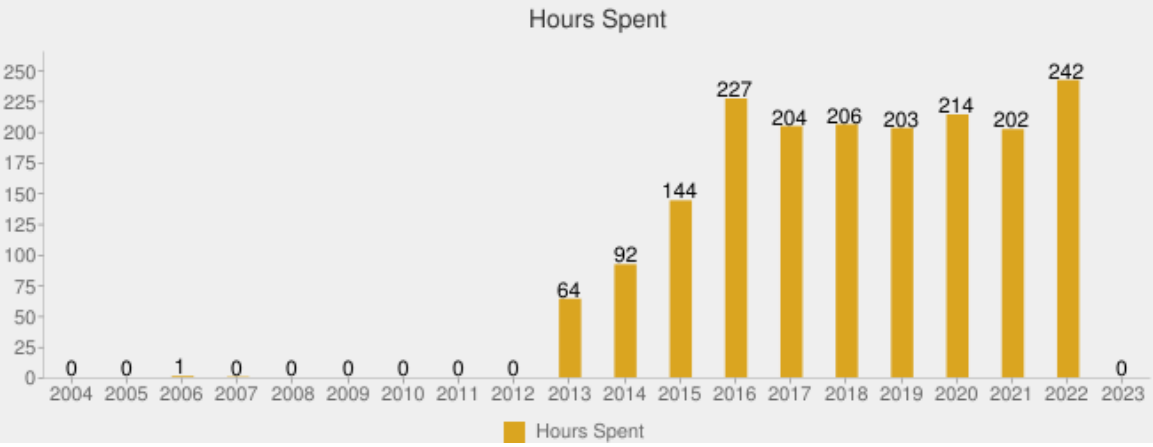


FIGURE 17. CLEAN BOATS, CLEAN WATERS HOURS 2013 - 2022

WDNR grant funding supported the CBCW program from 2012 – 2022 with 75% state funding up to $4,000.

Educational Activities

Public information is distributed at the annual meetings.

A map of the Apple River Flowage with AIS information was developed in cooperation with the Polk County Association of Lakes and Rivers. A sign was created and posted at the Lincoln Landing. The sign contains a mailbox in which AIS maps of the flowage were placed. About 200 maps are distributed each season.

The ARPRD distributes an annual newsletter to report district activities and provide water quality recommendations for residents.

Polk County Land and Water Resources Department (LWRD)

The Polk County Land and Water Resources Department will train volunteers through Clean Boats, Clean Waters workshops. County staff is also willing to provide plant identification assistance.

Plan Goals, Objectives, and Strategies

Selection of Management Strategies

The 2023 aquatic plant management plan advisory committee considered and reviewed the goals, objectives, and actions for aquatic plant management. These were originally established in 2012 and updated in 2017.

Plan goals, objectives, and strategies or actions are detailed below. The implementation plan or action plan details how action steps will be carried out over the next 2 year period.

Goals are broad statements of desired results. **Objectives** are the measurable accomplishments toward achieving a goal. Methods to evaluate progress toward plan objectives are listed below the objectives and are included in the implementation plan as "Evaluation Actions."

Actions are the steps taken to accomplish objectives and ultimately goals.

The **Action Plan** outlines a timeline, resources needed, funding sources, responsible parties and partners for each action item. The implementation plan will be updated as needed to reflect changing budgets, partners, and new information.

Funding Plan Implementation

Most of the cost of plan implementation is for harvesting equipment debt service and operation and maintenance. The cost of ARPRD harvesting operation is relatively low because of extensive volunteer time spent managing the program, maintaining equipment, and operating the harvester – an estimated 670 hours per year. There are paid harvester operators as well. Contracted harvesting would be considerably more expensive.

Payments for the harvester loan are $7,598.65 in June and August each year. The final payment will be in August 2028. This plan recommends setting aside a similar amount in a capital fund for harvesting equipment once the loan is paid off.

The ARPRD Board will carefully consider costs and seek to maintain current (2022) assessment rates. Grants will be sought when available.

Adaptive Management Approach

The plant management methods and procedures will be reviewed each year to see if they are effective and cost efficient at meeting plan goals and objectives. Changes may be made to the management approach based upon project results, the experience of other lake and river groups, and/or recommendations from the Department of Natural Resources. These changes will be reflected in updated action plans. Significant changes (especially those which change management objectives) will be documented as brief amendments to the aquatic plant management plan to be reviewed by the Apple River Protection and Rehabilitation District Board, the Aquatic Plant Management Committee, and the Department of Natural Resources.

PLAN GOALS

1. IMPROVE WATER QUALITY ON THE APPLE RIVER FLOWAGE AND DOWNSTREAM ON THE APPLE RIVER.[15]
2. PREVENT THE INTRODUCTION AND SPREAD OF AQUATIC INVASIVE SPECIES.
3. MAINTAIN NAVIGATION FOR FISHING, BOATING, AND ACCESS TO LAKE RESIDENCES.
4. MAINTAIN NATIVE AQUATIC PLANT FUNCTIONS.
5. MINIMIZE ENVIRONMENTAL IMPACTS OF AQUATIC PLANT MANAGEMENT.

PLAN GOALS, OBJECTIVES AND ACTIONS

1. IMPROVE WATER QUALITY ON THE APPLE RIVER FLOWAGE AND DOWNSTREAM ON THE APPLE RIVER.

Objectives

A. Manage Curly-leaf pondweed (CLP) to remove nutrients from the flowage and from the Apple River downstream of the flowage.

Actions[16]

1. Harvest CLP in navigation channels and areas of concentrated growth (CLP beds) when harvester is available.

Evaluation

- Record amounts of CLP harvested in daily records.
- Note where CLP beds are harvested each year to assess impact on CLP and native plant growth when point intercept survey occurs.

[15] Goal 1 is addressed primarily through the Apple River Flowage Lake Management Plan 2013.

2. Prevent the introduction and spread of aquatic invasive species.

Objectives

A. Boaters inspect, clean, and drain and decontaminate boats, trailers, and equipment.

B. Identify new aquatic invasive species as soon as possible after introduction to the flowage.

C. Rapidly and aggressively respond to new introductions of invasive species such as Eurasian water milfoil.

D. Remove purple loosestrife and other invasive species if found in and around the flowage.

Actions

1. Implement a Clean Boats, Clean Waters program (Objective A).
2. Investigate installation of decontamination stations with bleach solution and tools at the Town of Lincoln and Birch Street Landings (Objective A).
3. Monitor regularly for invasive species introduction at areas of high public use such as the boat landings using volunteers, divers, and/or other comprehensive, reliable methods (Objective B).
4. Follow the Aquatic Invasive Species Rapid Response plan (Appendix E). (Objective C)
5. Encourage owners to control small areas of purple loosestrife, common forget-me not, and nightshade. Consider biological control if larger infestations of purple loosestrife are discovered (Objective D).
6. Investigate and pursue available monitoring and control measures for priority invasive species such as Eurasian water milfoil and zebra mussels (Objective B, C).

3. MAINTAIN NAVIGATION FOR FISHING, BOATING, AND ACCESS TO LAKE RESIDENCES.

Objectives

A. Allow access along designated common navigation channels when dense aquatic plants impair navigation.

B. Collect free-floating plant fragments which create nuisance conditions.

C. Allow access through individual waterfront corridors when navigation becomes impaired (as determined by DNR).

4. MAINTAIN NATIVE AQUATIC PLANT FUNCTIONS.

Objectives

A. Minimize removal of rooted aquatic plants to stabilize bottom sediments, provide fish and wildlife habitat, minimize algae growth, and protect against establishment of invasive species.

B. Avoid herbicide use near wild rice, especially when in early stages of growth (June and early July).

C. Avoid cutting and uprooting wild rice seedlings.

D. Manage Curly-leaf pondweed to encourage the growth of native plants in specific areas of the flowage.

5. MINIMIZE ENVIRONMENTAL IMPACTS OF AQUATIC PLANT MANAGEMENT.

Objective

A. Use manual or mechanical methods over chemical methods to maintain navigation where effective, economically feasible, and uprooting of native plants and stirring of sediments can be minimized.

ACTIONS

COMMON NAVIGATION CHANNELS

HARVESTING IS SELECTED AS THE PREFERRED METHOD FOR BOTH NATIVE PLANT AND CURLY-LEAF PONDWEED NAVIGATION MANAGEMENT.

Maintain harvesting equipment

1. Maintain existing equipment (harvester, truck, etc.). First harvester purchased in 2012. Second harvester purchased in 2020.

2. Refurbish/replace existing equipment. Harvesters are expected to have a 10-year life, but can last longer with good maintenance.

Harvester access and offload sites

3. Pursue permanent harvester landing at the north end of the flowage.

Obtaining permits

4. Apply for a harvesting permit. The Apple River Protection and Rehabilitation District will secure a Wisconsin Department of Natural Resources Aquatic Plant Management Permit for harvester operations each year in February or March.

Disposal sites

Disposal sites are identified in harvesting permit applications. They include farm fields, city yard waste areas, and local nursery operations. There is good demand for the material collected.

Harvesting operating standards

5. Operate harvester – approximately from May to September.

   Cutting will occur only at depths ≥ 3 feet (or with experience a depth at which disturbance of plant roots and suspension of sediment is avoided).

   Cutting and harvesting (skimming) will be avoided near areas of wild rice growth, especially early in the summer (June and early July). If wild rice is nearby, harvesting depths will be ≥ 5 feet.

   Harvesters will be used to gather plant fragments (skimming) both along common navigation channels and in other nuisance areas. Coontail and duckweed are the target species along with fragments that may be created by harvester cutting. Nuisance areas will include deep waters where plant fragments limit navigation and other areas where

fragments accumulate. Cutters will not be used when plant fragments are gathered. Harvesting collected plant fragments (skimming) will only extend to 3 feet of water depth (not shallower). Harvesters may be used in the future to gather plant fragments for the purpose of flowage and downstream nutrient control.

Common channel locations and other harvesting locations are mapped in Appendix B. Current (2023) harvesting channels total about 79 acres. Channels width is up to 100 feet in the area directly south of the Highway 46 Bridge to the narrows above the Cameron Bridge. The channel north of the Highway 46 Bridge is 25 feet wide north of the end of Birchwood Road. Channels may be modified to better accommodate harvester use.

Harvesting will not be provided for individual access. Instead, secondary navigation channels from the main common channels will be offered if harvester time is available. Harvesting will occur no less than 3 feet in depth and will be for multiple residences only.

Monitoring

Harvester operators or flowage district representatives will monitor vegetative growth in designated navigation channels at least weekly for navigation impairment and height of aquatic plants (depth below surface) within each channel. This will serve to identify when harvesting is needed and how long the effects of harvesting last.

Nuisance reporting

A telephone contact is established for lake residents to report problems related to floating plant fragments. Dave Schleusner (715-554-7078) and Roland Peterson (763-571-4835) are the current harvesting contacts. These complaints will be investigated by harvester operators and/or flowage district representatives. Plant fragments will be collected as time and budget allows.

If a nuisance related to aquatic plants near a resident's access is reported, it will be clarified that the flowage district will pick up plant fragments if time allows, but not harvest for resident access. Options for resident access corridors will be provided.

Evaluation

A written log will record where cutting and harvesting and harvesting only (skimming) occurred and the acreage and species collected for each. Additional information to be recorded each day of harvesting: hours of operation, number of truckloads hauled, estimated tons of material hauled.

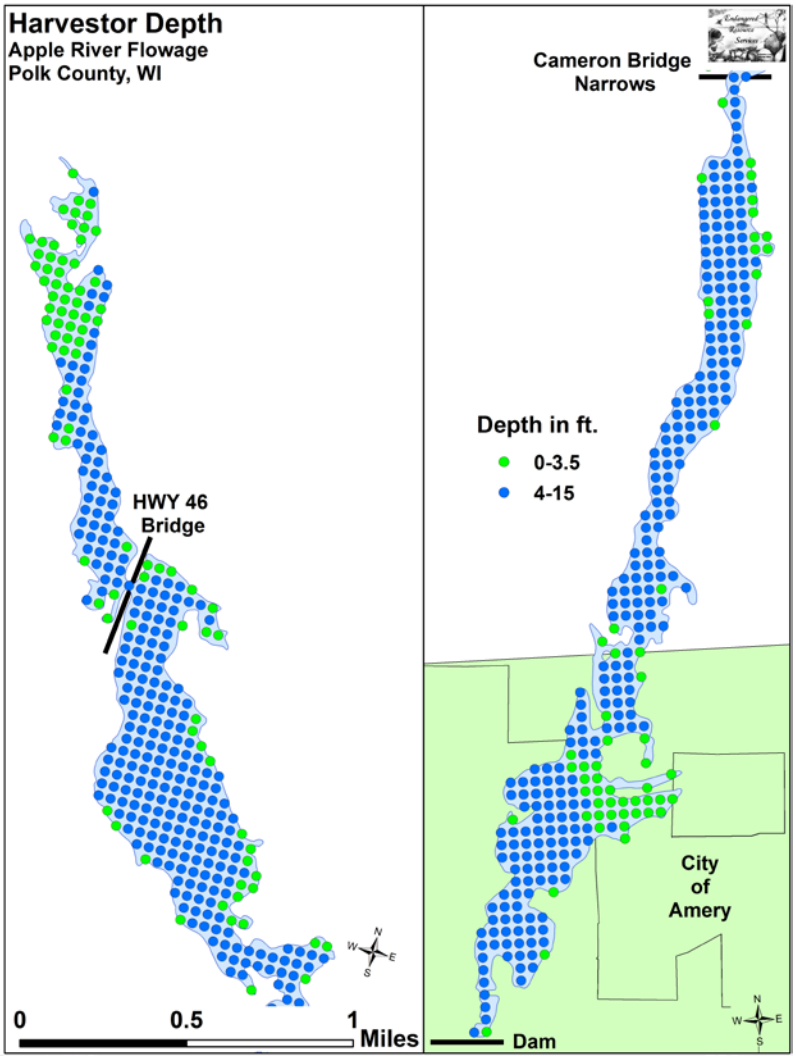


Figure 27. Approximate Flowage Depth

INDIVIDUAL ACCESS CORRIDORS

Property owners are responsible for paying the cost of individual access corridor maintenance. Secondary harvesting channels lessen the need for management for individual access.

Manual Removal

If residents wish to remove nuisance aquatic plants that limit access along their docks, they will be encouraged to do so with hand removal methods. No permit is required as long as corridors are cleared no more than 30 feet in width and no mechanized or chemical controls are used. These corridors must remain in the same location from year to year. No clearing may occur without a permit when wild rice is present. Homeowners or contractors may complete hand removal.[17]

Mechanical Removal

A Wisconsin Department of Natural Resources permit (NR109) is required for mechanical devices which remove or prevent the growth of aquatic plants. Such devices include weed rollers, aerators, lake groomers, mechanized mowers, and water circulators.

Weed Barriers

A Wisconsin Department of Natural Resources permit (Chapter 30/31) for placement of materials such as weed blankets on the lake bottom.

Chemical Removal

A Wisconsin Department of Natural Resources permit (NR 107) is required for any use of herbicides in the water. This includes those available through retail and on-line sources. Only a licensed applicator may apply liquid aquatic herbicides. The procedure for aquatic plant chemical permits for individual access corridors is shown on the following page.

Action

1. Re-establish an ARPRD Design Team to respond to property owner requests for permits for aquatic plant management in individual access corridors. The ARPRD Design team will work with DNR to evaluate navigational conditions prior to management.

[17] These are requirements in regulation NR 109.

PROCEDURE FOR INDIVIDUAL CORRIDOR PERMITTING AND MONITORING

A Wisconsin Department of Natural Resources Permit is required for application of chemicals in the water. http://dnr.wi.gov/lakes/plants/forms/

Document nuisance conditions (landowner/ herbicide contractor will provide in permit application in February/March)

- Indicate when plants cause problems and how long problems persist.
- Include dated photos of nuisance conditions from previous season.
- List depth at end of dock.
- Provide examples of specific activities that are limited because of presence of nuisance aquatic plants.
- Describe practical alternatives to herbicide use or harvesting that were considered. These might include:
  - Hand removal/hand raking of aquatic plants
  - Extending dock to greater depth
  - Altering the route to and from the dock
  - Use of another type of watercraft or motor, i.e., is the type of watercraft used common to other sites with similar conditions on this lake?
- Aquatic Herbicide/Harvesting Contractor to provide this information in permit application based on information from the landowner.

Verify/refute nuisance conditions and/or navigation impairment

- Landowners will document conditions with photographs and submit request for review by the ARPRD DESIGN TEAM. The design team will consist of trained lake volunteers who are familiar with options for individual corridor management.
- Landowner requests ARPRD DESIGN TEAM review of their property prior to submitting a permit application to DNR.
- The ARPRD DESIGN TEAM representative visits site, reviews documentation and provides a written opinion of navigation impairment i.e., is herbicide treatment or harvesting warranted? The design team will also provide other options for the owner to consider.
- Landowner decides which method to use.
- If herbicides are to be used, landowner/applicator applies for permit to WDNR including photographic documentation, identification of plants causing navigation problems, and ARPRD DESIGN TEAM evaluation. http://dnr.wi.gov/files/pdf/forms/3200/3200-004.pdf
- WDNR will contact herbicide contractor and owner with a notice to proceed with treatment or denial of permit application.

PUBLIC EDUCATION AND OUTREACH

Audience

Lake residents (full time and part time)

Lake users/visitors

Messages

Aquatic plant management plan

Why we are implementing the plan; who is doing it; when it will be completed.
Report progress toward plan goals and objectives.
Inform landowners of the process for applying for individual corridor permits.
It is against the law to apply herbicide in the lake without a permit.
Homeowners may use hand removal methods such as raking to open access to docks and shoreline in a designated area up to thirty feet wide on their waterfront.

Invasive species prevention

Identify Curly-Leaf Pondweed, Purple Loosestrife and Eurasian Water Milfoil with photos and descriptions.

List contacts to confirm invasive species identification

Explain methods to avoid spread of invasive species.

Show maps of Curly-Leaf Pondweed and Purple Loosestrife on the flowage.

Clean aquatic vegetation from boats and trailers.
Polk County and the state of Wisconsin prohibit transporting aquatic plants on boats and trailers. Decontamination is required when there is a system at a public access point. Fines may result if you don't obey the law.

Native plant values
Rooted aquatic plants are critical for holding sediments in place and preventing algae blooms.
Shallow lakes without aquatic plants are generally murky and algae-dominated.
Native plants prevent invasive species from getting established.
Residents should understand the need for a balance and not attempt to eliminate all aquatic plants.

Reducing runoff

Use of fertilizer with phosphorus on fields and lawns can cause algae growth in lakes. Shorelines can be managed/landscaped to reduce runoff.

Methods

Monitoring and Assessment

Aquatic Plant Surveys

Aquatic plant (macrophyte) surveys are the primary means for tracking achievement toward plan goals.

Action. Conduct whole lake aquatic plant surveys approximately once every five years to track plant species composition and distribution. The next survey is scheduled for 2027.

The whole lake surveys will be conducted in accordance with the guidelines established by the Wisconsin DNR. Any new species sampled will be saved, pressed, and mounted for voucher specimens.

Surface Water Species Grants

Department of Natural Resources Surface Water Grants are available to assist in funding some of the action items as indicated in the action plan. Grants provide up to 75% funding. Applications are accepted each year with a final digital deadline of November 15. Draft applications are due September 15. Native plant and filamentous algae management and navigation are not eligible grant activities.

Recreational Boating Grants

Recreational Boating Grants are available from the Wisconsin Waterways Commission through the Wisconsin Department of Natural Resources. Eligible expenses include “capital equipment to cut and remove aquatic plants that are nuisances.” Equipment may include cutting devices, barges with propelling motors, conveyors, and trailering devices. A DNR-approved aquatic plant management plan establishes eligibility for the grant program. The minimal harvestable area to qualify for the grants is 30 acres, and the ARPRD well exceeds this minimum. Cities, towns, and lake protection districts are all eligible applications for the program. The grant provides up to 50% of the cost of a harvester and related equipment. Grants can also be used to establish or improve public access points. Projects are evaluated by the Waterways Commission quarterly. Patrick Anderson is the regional DNR contact for the program (715-416-5020).

Appendix A. Rapid Response for Early Detection of Aquatic Invasive Species

<u>Definition: Aquatic Invasive Species (AIS)</u> are non-native plant and animal species that can out-compete and overtake native species damaging native lake habitat and sometimes creating nuisance conditions. AIS currently in the Apple River Flowage include Curly-leaf pondweed (CLP), Purple loosestrife, and Chinese mystery snail. Additional AIS threaten the lake and will be monitored throughout the lake by volunteers.

1. Develop and maintain a contingency fund for rapid response to EWM or other invasive species (ARPRD Board).

2. Conduct volunteer (AIS Volunteer Monitor) at designated public boat landings and other likely areas of AIS introduction. If a suspected plant is found, contact the AIS ID Volunteer.

3. Direct lake residents and visitors to contact the AIS ID Volunteer if they see a plant in the lakes they suspect might be Eurasian water milfoil (EWM) or another aquatic invasive species. Signs at the public boat landings, web pages, handouts at annual meeting, and newsletter articles will provide plant photos and descriptions, contact information, and instructions.

4. If a volunteer locates a likely AIS, instructions will request that the volunteer record the location of suspected AIS using GPS, if available, or mark the location with a small float. *Provide instructions on marking with float.* Note that cell phone applications are available to identify GPS point.

If a plant:

   a. Take a digital photo of the plant in the setting where it was found (if possible). Then collect 5 to 10 intact specimens. Try to get the root system, and all leaves as well as seed heads and flowers when present. Place in a zip lock bag with no water. Place on ice and transport to refrigerator.
   b. Inform AIS ID Volunteer or Board Contact.

If an animal other than a fish:

   a. Take a digital photo of the animal in the setting where it was found (if possible). Then collect up to five specimens. Place in a jar with water; put on ice and transport to refrigerator. Transfer specimen to a jar filled with rubbing alcohol (except for Jellyfish – leave in water).
   b. Inform AIS ID Volunteer or Board Contact.

5. The AIS ID Volunteer or Board Contact will tentatively confirm identification of plant or animal AIS with Polk County LWRD or lake management consultant then,

If a plant:

a. Fill out plant incident form http://dnr.wi.gov/lakes/forms/3200-125-plantincident.pdf
b. Contact WDNR staff, then deliver collected plants to the WDNR (810 W. Maple St., Spooner, WI 54801) as soon as possible (or to the location they specify).

If an animal:

a. Be sure the suspected invasive species has not been previously found on the waterbody
b. If a zebra mussel report to WDNR and Polk County
c. Fill out form 3200-126 – Aquatic Invasive Animal Incident Report

6. If identification is positive:
   a. Inform the person who reported the AIS and the board (EWM ID Volunteer), who will then inform Polk County LWRD, harvester operators, and lake management consultant. Harvesting will be suspended within 100 feet of where the AIS was found (if a plant).

   b. Mark the location of AIS with a more permanent marker. Special EWM buoys are available. (AIS ID Volunteers).

   c. Post a notice at the public landing (DNR has these signs available) and include a notice in the next newsletter. Notices will inform residents and visitors of the approximate location of AIS and provide appropriate means to avoid its spread (ARPRD Board).

7. Hire a consultant to determine the extent of the AIS introduction (ARPRD Board). A diver may be used. If small amounts of EWM or other invasive plants are found during this assessment, the consultant will be directed to identify locations with GPS points and hand pull plants found. All plant fragments will be removed from the lake when hand pulling.

8. Select a control plan in cooperation with the WDNR (ARPRD Board). The goal of the rapid response control plan will be eradication of the AIS. Additional guidance regarding EWM treatment is found in DNR's *Response for Early Detection of Eurasian Water Milfoil Field Protocol*.

Control methods may include hand pulling, use of divers to manually or mechanically remove the EWM from the lake bottom, application of herbicides, and/or other effective and approved control methods.

9. Implement the selected control plan including applying for the necessary permits. Regardless of the control plan selected, it will be implemented by persons who are qualified and experienced in the technique(s) selected.

10. ARPRD funds may be used to pay for any reasonable expense incurred during the implementation of the selected control plan, and implementation will not be delayed by waiting for WDNR to approve or fund a grant application.

11. The ARPRD Board will work with the WDNR to confirm, as soon as possible, a start date for an Early Detection and Rapid Response AIS Control Grant. Thereafter, the ARPRD shall formally apply for the grant.

12. Frequently inspect the area of the AIS to determine the effectiveness of the treatment and whether additional treatment is necessary (ARPRD Board, APM Monitor).

13. Review the procedures and responsibilities of this rapid response plan on an annual basis. Changes may be made with approval of the ARPRD Board.

EXHIBIT A[18]

APPLE RIVER PROTECTION AND REHABILITATION DISTRICT

AIS ID Volunteers	Derrick Carlson: 612-859-7672 dc@sigpubco.com
Board Contact	Roland (Pete) Peterson: (763) 571-4835 peter015@umn.edu

POLK COUNTY LAND AND WATER RESOURCES DEPARTMENT

AIS Coordinator (Katelin Anderson)	katelin.anderson@polkcountywi.gov 715.485.8637
Water Quality Specialist (Colton Sorensen)	colton.sorensen@polkcountywi.gov 715-485-8639

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Permits (Austin Dehn)	austin.dehn@wisconsin.gov
Grants and Lakes Coordinator (Tyler Mesalk)	tyler.mesalk@wisconsin.gov (715) 635-4227

APM MONITOR

Endangered Resource Services	Matt Berg: 715-483-2847 saintcroixdfy@gmail.com

DIVERS

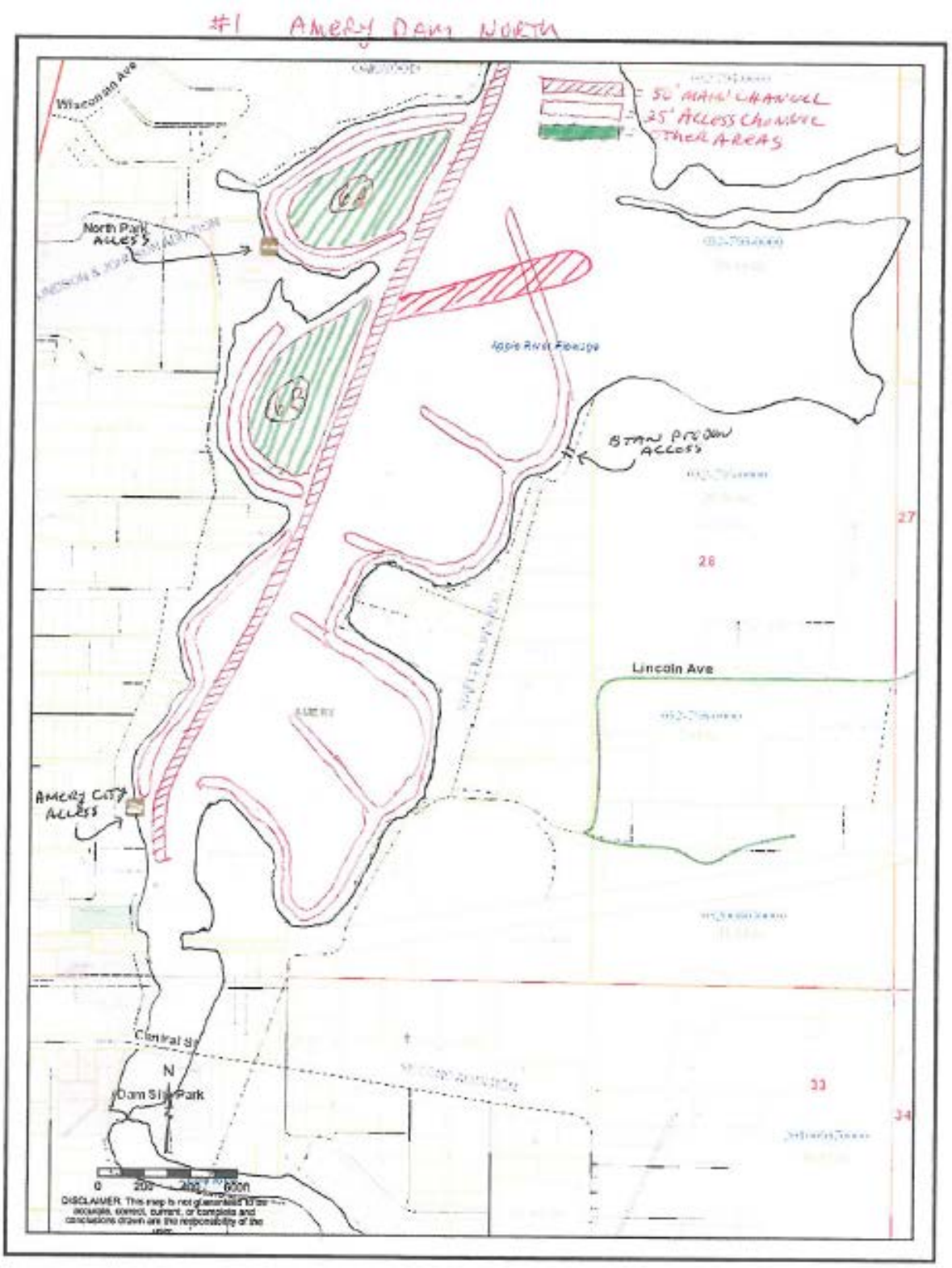
Endangered Resource Services	Matt Berg: 715-483-2847 saintcroixdfy@gmail.com
Ecological Integrity Services	Steve Schieffer: 715-554-1168 ecointegservice@gmail.com

ADDITIONAL REFERENCES

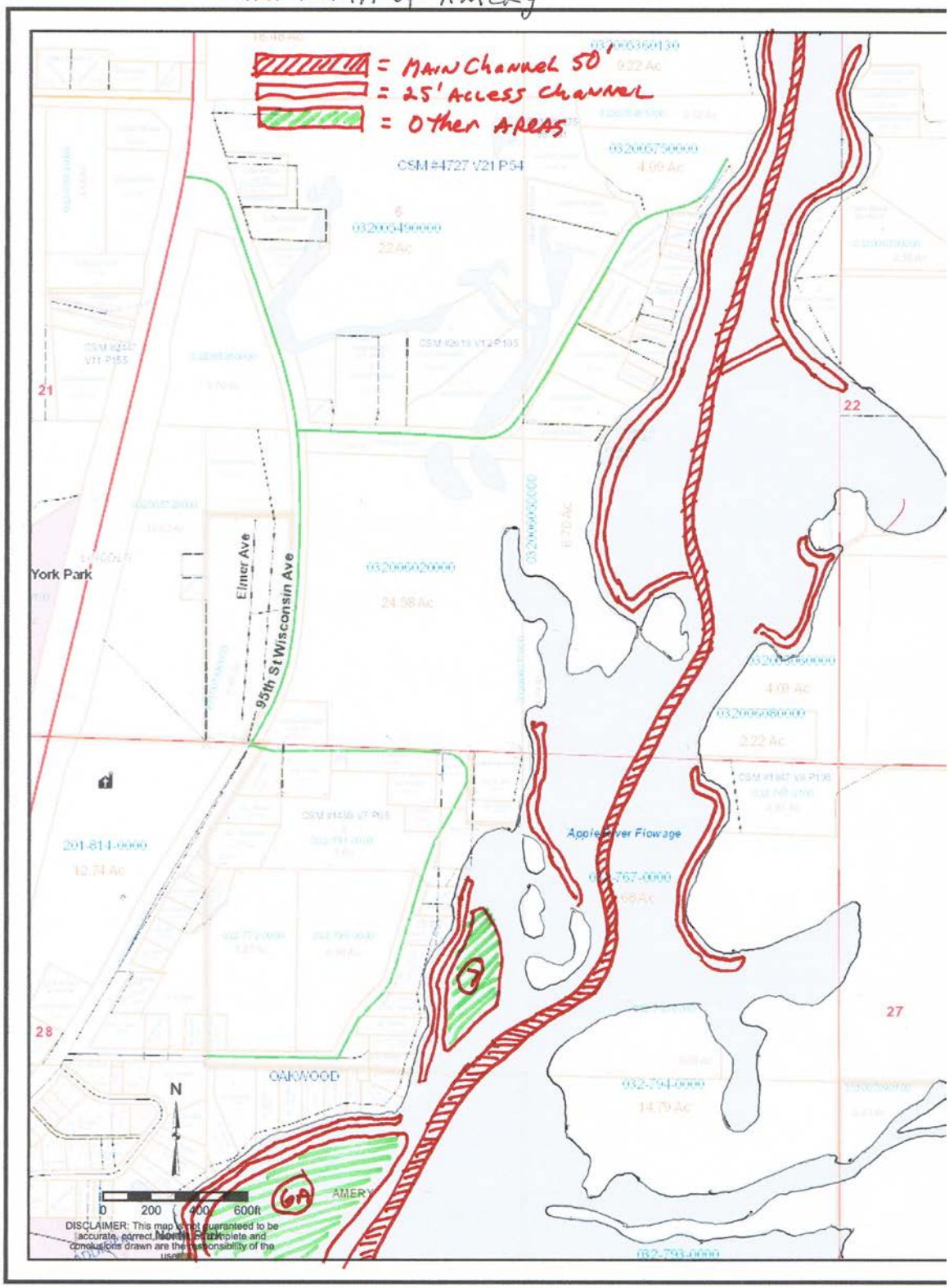
WDNR websites on AIS
http://dnr.wi.gov/lakes/invasives/GoalsNew.aspx?show=emerging
http://dnr.wi.gov/lakes/invasives/AISDiscoveryCommunicationProtocol.pdf

[18] This list will be reviewed and updated each year.

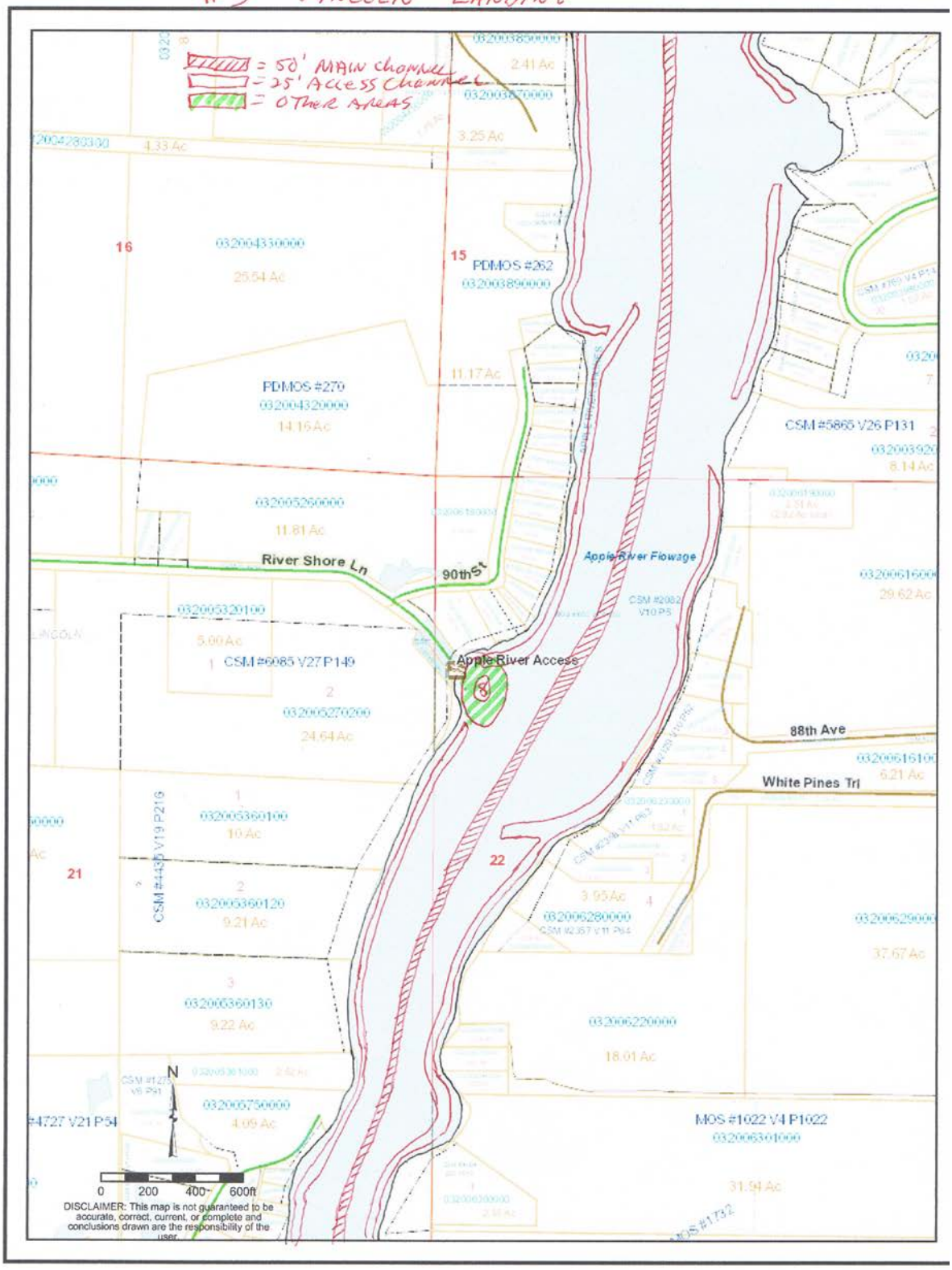
Appendix B. Harvesting Lanes and Areas

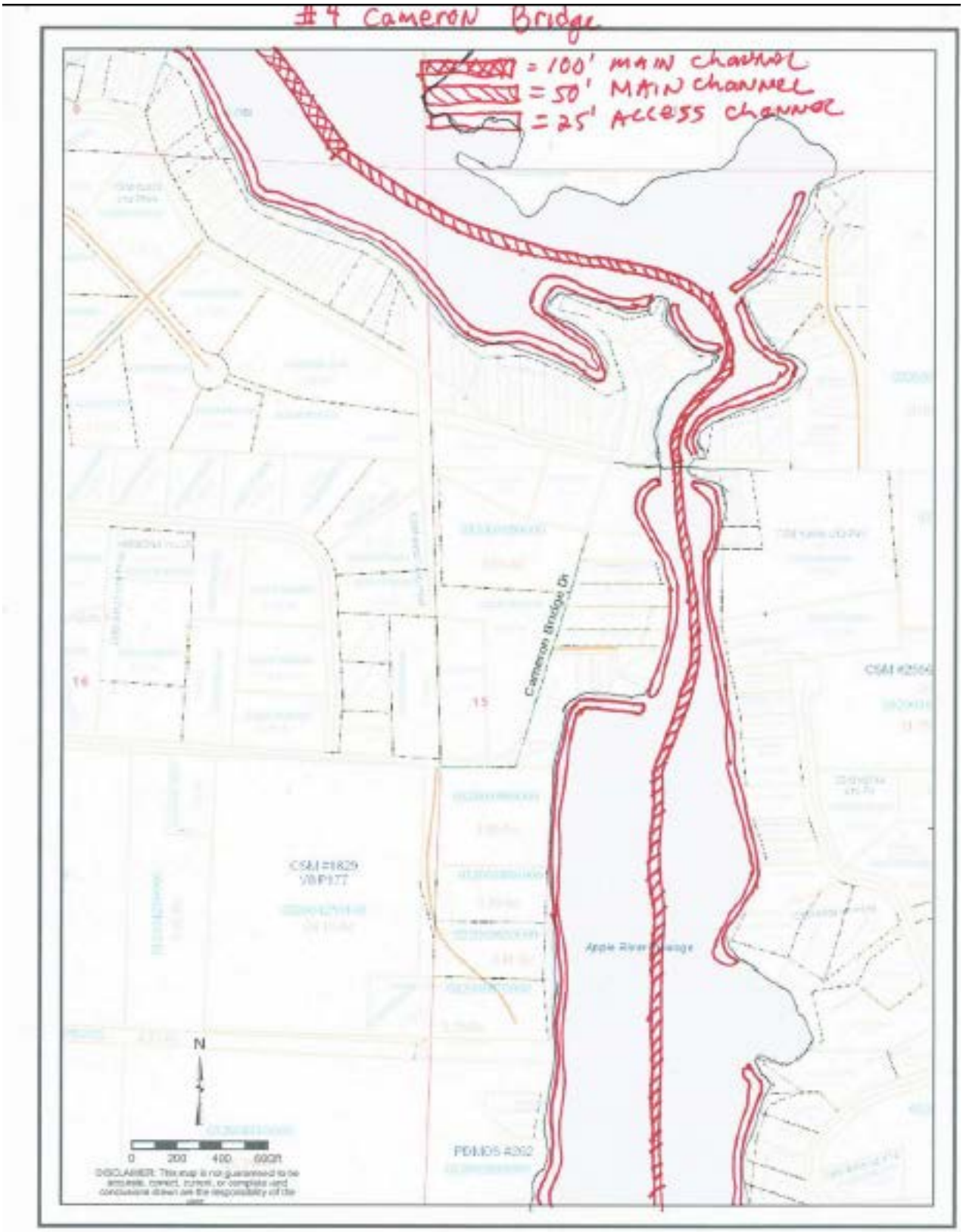


#2 NORTH of AMERY



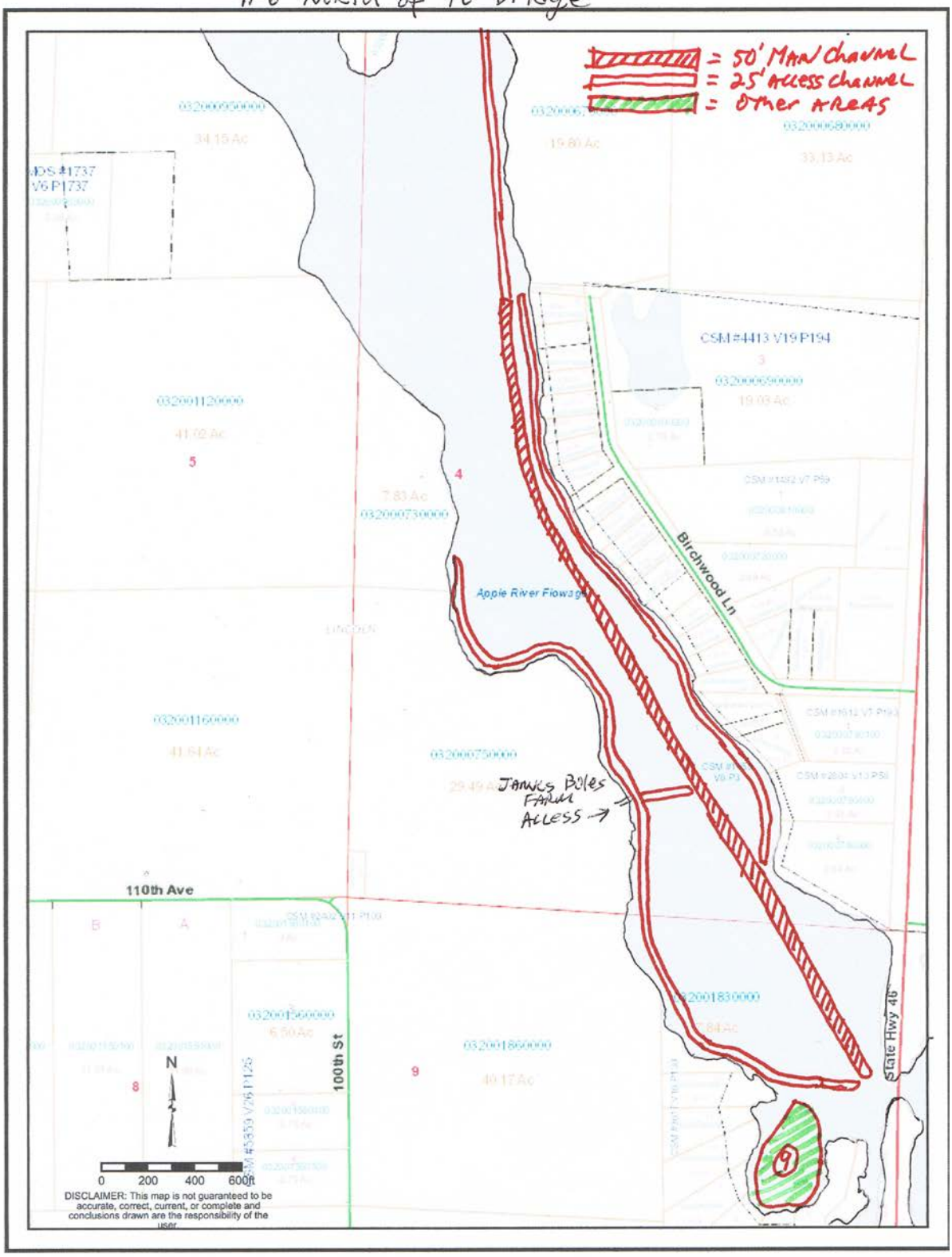
#3 LINCOLN LANDING




#4 Cameron Bridge
= 100' MAIN channel
= 50' MAIN CHANNEL
= 25' ACCESS channel
Cameron Bridge Dr
CSM #1829
VBP177
N
0 200 400 600ft


#5 VISOBI to Hwy 46 Bridge
= 100' MAIN CHANNEL
= 50' MAIN CHANNEL
= 25' ACCESS CHANNEL
State Hwy 46
Visoka Trl
0 200 400 800ft

#6 North of 46 Bridge



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