Aquatic Invasive Plant Survey for Eurasian Watermilfoil and Curlyleaf Pondweed in Yellowtail Reservoir, Wyoming

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Preface

This report presents data collected by Mississippi State University and Weed Management Services in 2012 in the Wyoming portion of Yellowtail Reservoir, formed by the construction of Yellowtail Dam on the Bighorn River. Funding was provided by the Big Horn County Weed and Pest Control Board. We thank Ruth Zeller, BHCWPC Supervisor, for logistic assistance. Cassity Bromley (National Park Service, Bighorn National Recreation Area) and Beth Bear (Wyoming Department of Fish and Game) provided permitting and other assistance for the survey. Field assistance was provided by Bradley Sartain and John Mark Curtis, Mississippi State University. Any errors in presentation or fact are the responsibility of the authors.

Executive Summary

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Eurasian watermilfoil (*Myriophyllum spicatum* L.) and curlyleaf pondweed (*Potamogeton crispus* L.) are two non-native plants found throughout the U.S. Curlyleaf pondweed is found in Wyoming while Eurasian watermilfoil has not been reported. However, it is found in every state bordering Wyoming. Both are Montana-listed noxious aquatic plants that are increasingly spreading in Montana and the Pacific Northwest. Eurasian watermilfoil was identified in Noxon and Toston Reservoirs and the Jefferson River system in 2011; however, the source of the infestation was not determined. Curlyleaf pondweed was known to occur in the upper Missouri, Madison, East Gallatin, and Jefferson River systems, but limited data existed quantifying its actual distribution in the Missouri River watershed.

The Geosystems Research Institute and Weed Management Services conducted aquatic invasive plant one reservoir (Yellowtail) in Wyoming. The survey was conducted in July 2012 with 291 individual points sampled for aquatic plant species.

Within the assigned survey area, Eurasian watermilfoil and Curlyleaf pondweed were not observed. This region of Wyoming has a number of natural lakes, man-made impoundments, and rivers with varying degrees of access which will influence the invasion potential for a given water body. The reservoir surveyed during this inventory had a low community richness of native aquatic plants.

Future surveys should continue to monitor for new populations of Eurasian watermilfoil and Curlyleaf pondweed and should be directed towards high risk water bodies in Wyoming. These include aquatic sites directly associated with infested waters and water bodies that have access points that support motorized boat traffic.

Project Introduction

Understanding the dynamics driving macrophyte populations in a given water body has become increasingly important due to the introduction and spread of numerous non-native plant species. Non-native plants affect aesthetics, drainage, fishing, water quality, fish and wildlife habitat, flood control, human and animal health, hydropower generation, irrigation, navigation, recreation, and ultimately land values (Pimental et al. 2000, Rockwell 2003). The spread of non-native aquatic plants also impacts native plant communities and primary production in littoral zone areas of waterbodies. Littoral areas in freshwater lakes are the most productive regions within a body of water, and an important component of high productivity is a diverse native aquatic plant community (Wetzel 2001). The importance of plants in these areas are paramount as they contribute to the structure, function, and diversity of aquatic ecosystems, aid in nutrient cycling, produce food for aquatic organisms, and provide habitat for invertebrates and fish (Carpenter and Lodge 1986, Ozimek et al. 1990, Madsen et al. 2001). Littoral areas, are however, more prone to invasion by non-native plants as they experience more disturbance than other parts of a water body.

Two non-native aquatic plants that are becoming problematic in the Pacific Northwest are Eurasian watermilfoil (Eurasian watermilfoil) and curlyleaf pondweed Curlyleaf pondweed). Eurasian watermilfoil is an invasive vascular plant that has invaded freshwater lakes across the United States. The introduction of this species has likely resulted in the alteration of the complex interactions occurring in littoral habitats (Madsen 1997). Eurasian watermilfoil has been associated with declines in native plant species richness and diversity (Madsen et al. 1991a,b, Madsen et al. 2008), reductions in habitat complexity resulting in reduced macroinvertebrate abundance (Krull 1970, Keast 1984), and reductions in fish growth (Lillie and Budd 1992). Eurasian watermilfoil poses nuisance problems to humans by impeding navigation, limiting recreation opportunities, and increasing flood frequency and intensity (Madsen et al. 1991a). It is primarily spread by fragmentation and can be easily transported between water bodies by many vectors. Once established, it is very difficult to control. Curlyleaf pondweed also causes significant nuisance problems where it has become established (Bolduan et al. 1994, Catling and Dobson 1985, Woolf and Madsen 2003). It is widely considered to be an ecosystem transformer, like Myriophyllum spicatum, but this species tends to accelerate internal nutrient loading and eutrophication (James et al. 2002). Management of this species is often more difficult due to its life history strategy (turion production) and the limited availability of effective management options (Woolf and Madsen 2003).

Both species are listed on Montana's noxious weed list and are spreading throughout this region of the U.S. Eurasian watermilfoil was identified in the Jefferson River system in 2010. Curlyleaf pondweed was known to occur in the upper Missouri, Madison, East Gallatin, and Jefferson river systems, but little data existed regarding its actual distribution in other waterbodies. Pursuant to this, a systematic survey is needed to develop baseline information on the aquatic plant community. The survey would quantify the location and extent of Eurasian watermilfoil and Curlyleaf pondweed within lakes/reservoirs in Wyoming and determine the presence of other non-native aquatic plants such as flowering rush (Butomus umbellatus). Data such as these are necessary to guide future management decisions, determine funding needs, and coordinate control efforts. Preliminary inventories have identified other submersed aquatic plants in this water body, which will also be a factor in developing management protocol.

Objectives

1. Conduct aquatic plant surveys in Yellowtail Reservoir.

1. Reservoir Materials and Methods

Littoral zone point intercept surveys were conducted on Yellowtail Reservoir (Figure 1). Survey points were established in the littoral zone for the reservoir, which we designated as double the secchi depth and were based on surveys conducted in Montana. Survey methods followed those outlined by Madsen (1999), Madsen and Wersal (2009), Wersal et al. (2009), and Wersal et al. 2010), where a pre-determined grid of points at set distances from one another were surveyed in each water body. The grid spacing was dependent upon the total size of the reservoir. A systematic or random-systematic survey method is a better survey design when initially surveying a water body as it is more apt to find rare species, in contrast with a random design which will likely under-sample rare but ecologically important species such as Eurasian watermilfoil (Barbour 1999). A systematic survey design also maximizes survey efficiency.

Surveys were conducted by boat using GPS (Global Positioning System) technology to navigate to each point. A Trimble YUMA® computer with integrated GPS receiver was used to conduct and store survey data. At each survey point, a weighted plant rake was deployed to determine the presence of all plant species. Spatial survey data were recorded electronically using FarmWorks Site Mate® software. Site Mate® allowed for the navigation to specific survey points, as well as, the displaying and collecting of geographic and attribute data while in the field. Collecting data in this fashion reduces data entry errors and reduces post survey data processing time. Collected data were recorded in database templates. Voucher specimens were collected if a species was found for the first time and were dried and pressed.

In addition to plant presence/absence data, the depth at each point was recorded using a boat mounted depth finder or with a sounding rod in water depths of less than 10 ft. Water transparency was estimated using a sechhi disk at one to four locations throughout a given reservoir, depending on total size, between 1100 and 1300 hours.

Frequency of occurrence for each species in a water body was calculated by dividing the number of survey points that species was observed by the total number of points surveyed for a given water body, then multiplied by 100 to achieve a percent. Average species richness was estimated by calculating the sum of all species at a given survey point, and then calculating the mean across all survey points for a given water body. Species distributions are reported visually in a series of maps created for each water body surveyed.

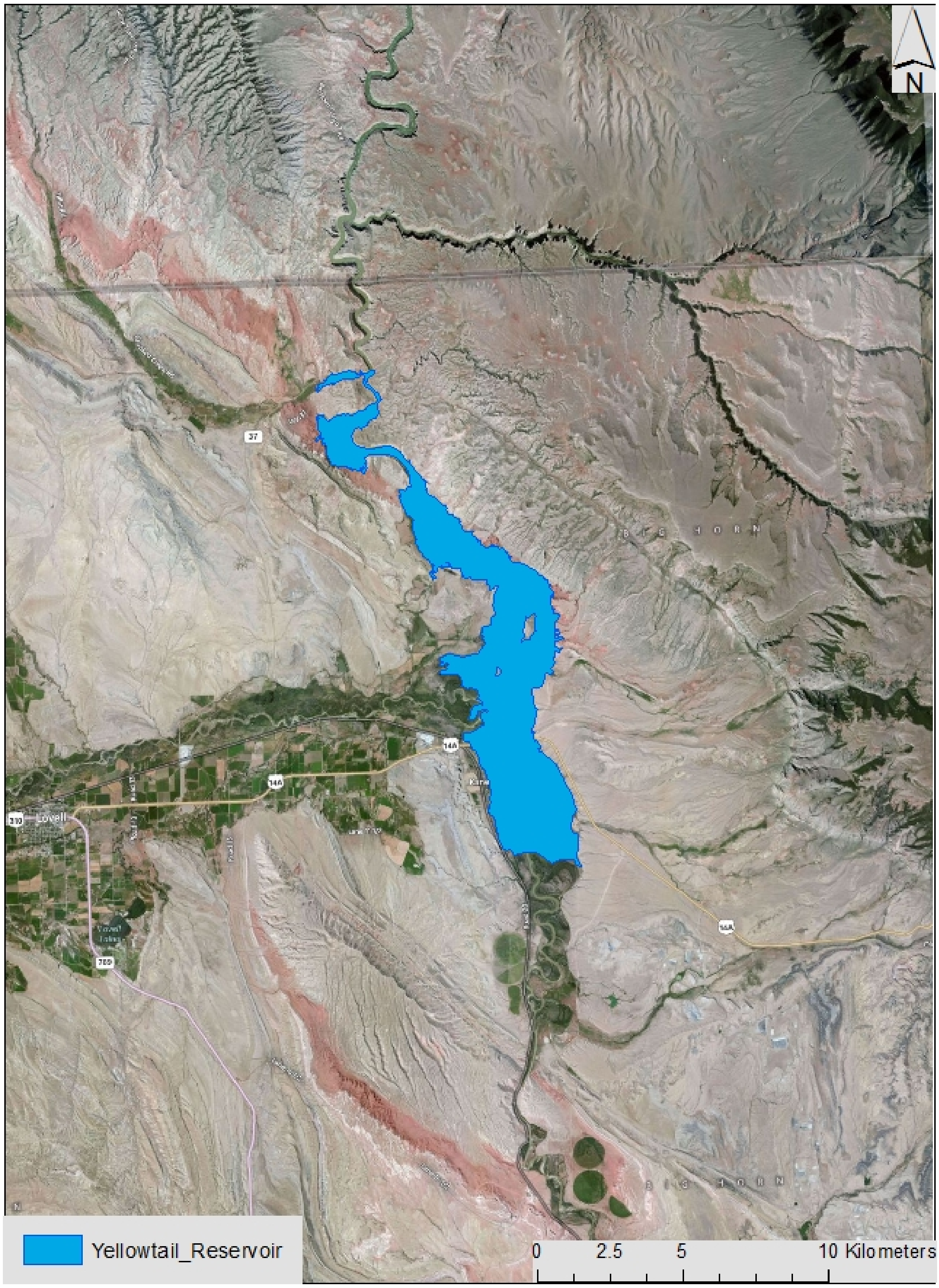

Figure 1. The survey area for 2012 encompassing Yellowtail Reservoir, WY. Surveys were conducted in July 2012.

1. Reservoir Results and Discussion

Lake Name: Yellowtail Reservoir, WY

Dates Surveyed: July 16-17, 2011

Secchi: 0.46 m (1.5 ft)

Points Surveyed: 291

Eurasian watermilfoil = Negative

Curlyleaf pondweed = Negative

Yellowtail Reservoir is a large shallow lake (Figure 1). The points at the southern end of the lake were inaccessible by boat. Points were surveyed to a water depth of 10 ft. with the maximum observed depth of plant growth being 5.2 ft. The deepest water depth measured during this survey was 26.9 ft. Of the 291 points surveyed, 10 (3.4%) had an aquatic plant species (Polygonnum hydropiperoides) present (Figure 4).

Table 1. Plant species list and percent occurrences for Yellowtail Reservoir, WY, July 2012.

Species	Common Name	Frequency of Occurrence (%)
Polygonum hydropiperoides	Swamp smartweed	3.4
Average Survey Depth (ft)		5.9 ft
Species Richness (avg. number per vegetated point)		1

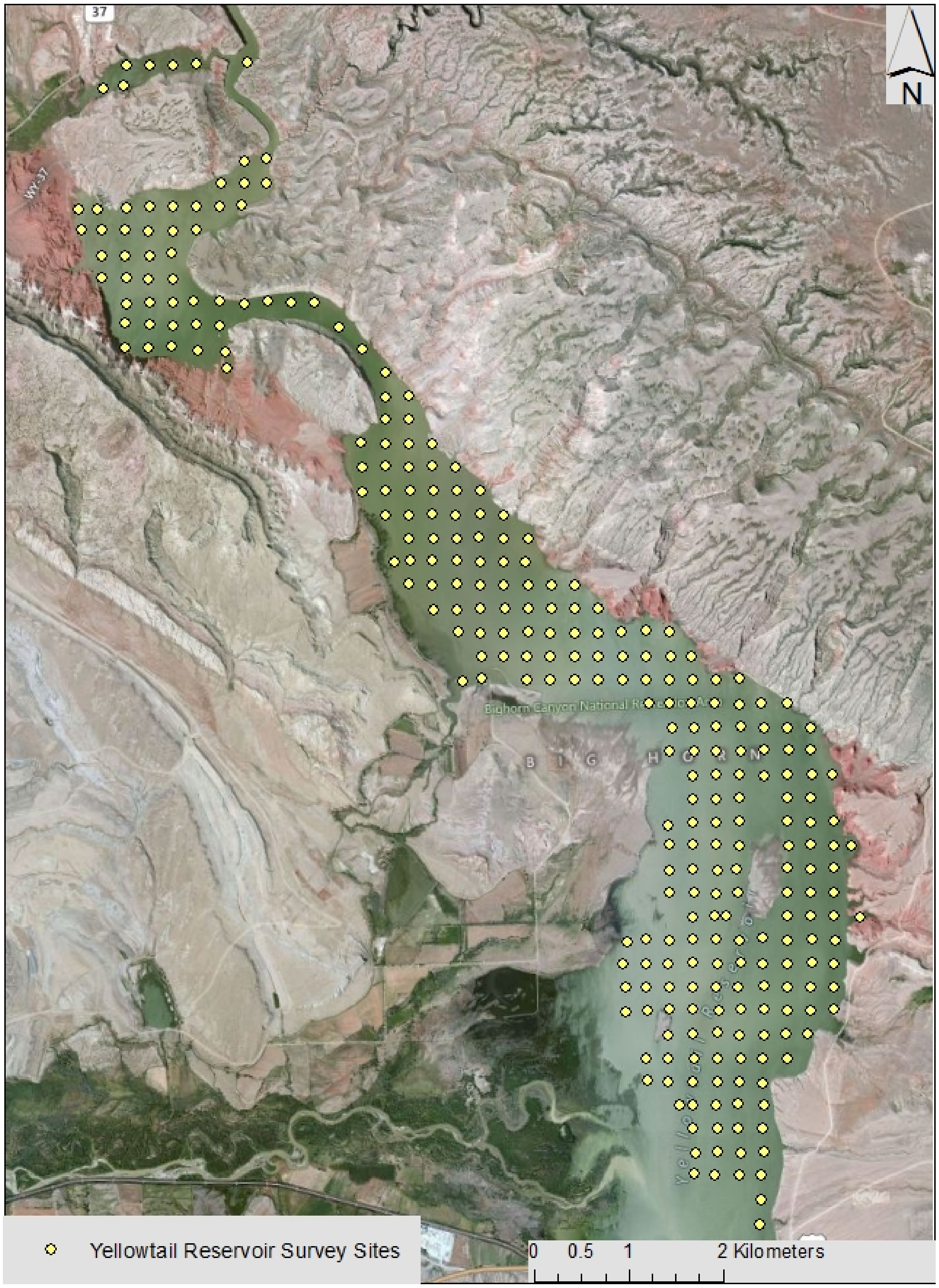

Figure 2. Survey points sampled on Yellowtail Reservoir during the littoral zone survey conducted in July 2012.

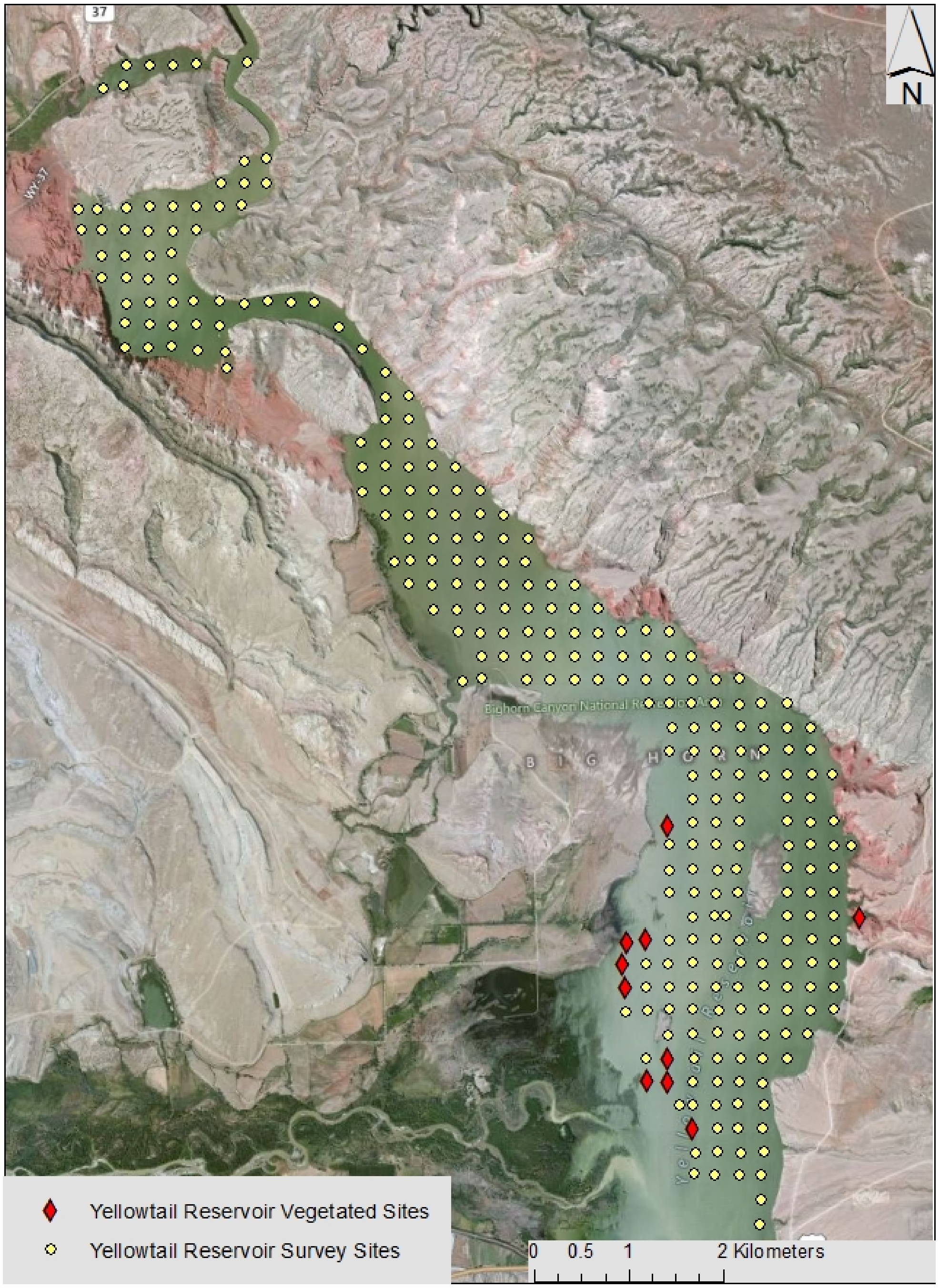

Figure 3. Vegetated survey points in Yellowtail Reservoir during the littoral zone survey conducted in July 2012.

Figure 4. The distribution of Polygonum hydropiperoides in Yellowtail Reservoir during the littoral zone survey conducted in July 2012.

2. Conclusions and Recommendations

The reservoir's aquatic plant community had poor species richness. Eurasian watermilfoil and Curlyleaf pondweed were not found in Yellowtail Reservoir. Utilizing the point intercept survey method to survey the littoral zone allowed for a more direct, quantitative approach in areas more likely to support aquatic plant growth.

Given the poor water quality and water level fluctuations over the course of the year, the probability of invasion by Eurasian watermilfoil and Curlyleaf pondweed is low. The primary means of spreading these species between water bodies is by motorized watercraft. Therefore, priority should be given to waterbodies that have improved access for motorized watercraft and are important recreation areas. Continued surveys and monitoring should be conducted on these waterbodies.

If populations of these species do become established in this reservoir, it is recommended that only control methods that have been shown to be effective via peer-reviewed literature and under similar use patterns should be evaluated for possible use. If data do not exist it may be necessary to conduct the necessary research to develop use patterns for a specific management technique in a given water body. It is much more cost efficient to manage a non-native species when the population is small.

- Develop a statewide survey protocol, similar to Idaho, to direct state agency personnel, contractors, or volunteers on a standardized survey method that is easily repeatable and quantifiable.

- Continued monitoring will assist in determining the spread of Eurasian watermilfoil and Curly-leaf pondweed, likely habitats for its infestation, and locations for active management.

- It is recommended that all aquatic plant management personnel, including divers, dive supervisors, herbicide applicators, and site scouts be required to undergo periodic aquatic plant identification training, specifically to differentiate between Eurasian watermilfoil and northern watermilfoil. As part of this training, it must be reinforced that no one can differentiate between northern watermilfoil and Eurasian watermilfoil from a boat unless the plants are topped out; proper identification requires a sample in the hand for analysis.

- An agreement should be established with a nationally recognized laboratory to verify milfoil identifications. The lab should have expertise in genetic assays of milfoil species and the ability to offer rapid identification.

- Appropriate research and demonstration projects should be identified that will improve the management of Eurasian watermilfoil and curly-leaf pondweed in waters of Wyoming. Suitable funding, internal or external, to the program can then be sought for research support. Other state programs have found that appropriate applied research is critical to management.

- Assessment is critical in identifying which management techniques are effective in controlling Eurasian watermilfoil and curly-leaf pondweed, and which techniques are not effective. This determination should be done objectively, quantitatively, and using statistical analysis.

- A regular assessment program will, over time, assist in selecting herbicides or other management techniques that are both effective in controlling aquatic plants, and cost-effective.

- We recommend that the State of Wyoming develop a decision matrix or decision tree that gives guidance on control techniques that are appropriate for a given set of site characteristics, size of plant infestation, and use restrictions. An example is shown in Table 2. While this may not be required in all situations, it will assist in developing management plans. This will assist in carrying out Early Detection and Rapid Response on likely invasive aquatic plant invaders to the state.

Table 2. Example of a decision matrix for management of Eurasian watermilfoil. Be advised that this is an example only, to demonstrate the concept (Madsen and Wersal 2008). A working decision matrix or decision tree should be developed by Wyoming agencies in cooperation with external expertise.

Site water exchange characteristics	Target plant (Eurasian watermilfoil) colony characteristic				
	Scattered individual plants	Small dense beds less than 2 acres	Dense beds from 2-5 acres	Dense beds from 5 to 25 acres	Dense beds over 25 acres
Very Short exposure time (<12 h)	Hand pulling Diver dredge	Diver dredge Benthic barrier Diquat Endothall	Diquat Endothall	Diquat Endothall	Drawdown 2,4-D Triclopyr
Short exposure time (12 – 24 h)	Hand pulling Diver dredge	Diver dredge Benthic barrier Diquat Endothall 2,4-D Triclopyr	Diquat Endothall 2,4-D Triclopyr	2,4-D Triclopyr	Drawdown 2,4-D Triclopyr
Moderate exposure time (24-72 h)	Hand pulling Diver dredge	Diver dredge Benthic barrier Diquat Endothall 2,4-D Triclopyr	Diquat Endothall 2,4-D Triclopyr	Diquat Endothall 2,4-D Triclopyr	Drawdown Diquat Endothall 2,4-D Triclopyr
Long exposure time (> 72 h)	Hand pulling Diver dredge 2,4-D Triclopyr	Diver dredge Benthic barrier Diquat Endothall 2,4-D Triclopyr	Diquat Endothall 2,4-D Triclopyr	Diquat Endothall 2,4-D Triclopyr	Drawdown Diquat Endothall 2,4-D Triclopyr Fluridone

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