

BCWMC Aquatic Invasive Species Rapid Response Plan

Medicine Lake, Northwood Lake, Parkers Lake, Sweeney Lake, Twin Lake,
Westwood Lake, and Wirth Lake



Prepared for:
Bassett Creek Watershed Management Commission



February 2018

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Acronyms

Acronym	Description
AIS	Aquatic Invasive Species
AMLAC	Association of Medicine Lake Area Citizens
BCWMC	Bassett Creek Watershed Management Commission
CAMP	Citizen Assisted Monitoring Program
EPA	Environmental Protection Agency
EWM	Eurasian watermilfoil
MAISRC	Minnesota Aquatic Invasive Species Research Center
MnDNR	Minnesota Department of Natural Resources
MN	Minnesota
MPRB	Minneapolis Park and Recreation Board
TRPD	Three Rivers Park District
WDNR	Wisconsin Department of Natural Resources

1.0 Rapid Response to Aquatic Invasive Species (AIS) Detected in BCWMC Priority 1 Lakes

Aquatic species are adapted to habitats that are regularly or permanently inundated, including lakes, rivers, and many kinds of wetlands. Invasive species are those that, when moving into a new locale, spread rapidly, outcompete resident species and cause – or likely cause – ecological or economic harm or harm to human health (MAISRC, 2017). When new AIS infestations are detected, a prompt and coordinated containment and suppression/eradication response can reduce the potential establishment, spread, and harmful impacts of a species. This action results in lower cost and less resource damage than implementing a long-term control program after a species is established (Minnesota Department of Natural Resources, 2013). Effective rapid response to AIS is crucial to preventing establishment, minimizing ecological and economic impacts, and maximizing the effectiveness of efforts to contain, and if possible, eradicate newly introduced AIS. This AIS rapid response plan details the rapid response by BCWMC and other partnering entities to new infestations of AIS detected in BCWMC Priority 1 lakes. The plan is divided into three parts:

1. Overall framework for rapid response efforts
2. Rapid response to AIS detected in BCWMC Priority 1 lakes
3. Rapid response to key AIS: Eurasian watermilfoil, starry stonewort, and zebra mussels

This plan is only effective if an AIS is detected early, or before an AIS is distributed widely in the lake and/or its population is firmly established. Ideally, early detection monitoring activities are performed regularly by citizens, cities, park districts and other organizations. For its part, the BCWMC cooperates with other organizations to train groups or individuals on early detection of AIS in all waterbodies, including advertising training sessions, helping to recruit participants, assisting with venue coordination, reimbursing registration costs for Commissioners and active Citizen Assisted Monitoring Program (CAMP) volunteers, and providing some modest funding. Further, the BCWMC purchased 50 zebra mussel sampler plates for use by CAMP volunteers and lake residents on Priority 1 lakes and CAMP lakes. The BCWMC cooperates with other organizations and/or recruits and trains volunteers to detect zebra mussels on all Priority 1 lakes, aiming for at least one volunteer in each lake quadrant. Finally, routine BCWMC monitoring detects invasive plants, snails, spiny waterflea, and rusty crayfish in lakes and streams.

2.0 Overall Framework

The following overall framework guides the response of BCWMC, its member cities, and other partners for all newly detected AIS in BCWMC Priority 1 lakes. The framework outlines the actions required to contain, and if possible, eradicate newly introduced AIS. The framework includes the following actions:

1. Contact Minnesota Department of Natural Resources (MnDNR) Invasive Species Specialist to report possible introduction of AIS. MnDNR staff will verify the AIS infestation.
2. Communicate the AIS infestation to stakeholders (including those downstream), lake groups, and the general public.
3. Perform monitoring or hire contractor to perform monitoring to define the extent of the AIS infestation.
4. Determine whether isolation of the infestation is necessary for containment and effective treatment and, if so, isolate the AIS infestation.
5. Collaborate with MnDNR, Minnesota Aquatic Invasive Species Research Center (MAISRC), and stakeholders to determine appropriate rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS) and associated costs.
6. Work with MnDNR to obtain treatment/removal permit
7. Perform additional pre-treatment monitoring, if required by MnDNR permit.
8. Hire contractor to complete AIS rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS).
9. Fund the AIS treatment/removal.
10. Perform, or hire contractor to perform, post-treatment monitoring to determine treatment/removal effectiveness. [Note: The MnDNR may request multi-year post-treatment monitoring or end of year reporting. Post-treatment monitoring may be warranted for several years.]
11. Communicate information about the AIS treatment/removal and results of AIS treatment/removal efforts to stakeholders (including those downstream), lake groups, and the general public.
12. Design and implement education program to help prevent future AIS infestations.

3.0 AIS Rapid Response in BCWMC Priority 1 Lakes

The BCWMC classified specific waterbodies within the watershed as priority waterbodies based on the desired water quality standards and uses for those waterbodies. Priority lakes with public access or adjacent public land are classified as Priority 1 lakes (Figure 1). Priority 1 lakes include Medicine Lake, Northwood Lake, Parkers Lake, Sweeney Lake, Twin Lake, Westwood Lake, and Wirth Lake. This AIS Rapid Response Plan details the rapid response by BCWMC and other partnering entities to new infestations of key AIS detected in BCWMC Priority 1 lakes.

The response to infestation by newly introduced AIS may include isolation, chemical treatment, and/or manual removal. Chemical treatment is often the most effective action. However, when chemical treatment is not permitted by MnDNR, small infestations of up to 2,500 square feet will be managed by manual removal whenever feasible. In the future, additional options for treatment/removal may become available. The intent of this AIS rapid response plan is that the most effective available treatment/removal method would be used to rapidly respond to newly introduced AIS.

AIS rapid response efforts for BCWMC Priority 1 lakes are a partnership among stakeholders. This AIS rapid response plan defines the roles of the partnering entities that would work together to rapidly respond to a newly introduced AIS in BCWMC Priority 1 lakes. Meetings (telephone or in-person) were conducted with stakeholders to identify partner roles. Table 1 summarizes the partner entities, meeting participants, and meeting dates. Tables 2 through 8 provide the detailed partner roles for BCWMC Priority 1 lakes, as determined from the meetings. Partners will consider utilizing lake organizations to assist with communications, volunteer coordination, and other activities, as appropriate.

Table 1 Summary of partnering entities, meeting participants and meeting dates to determine partner roles for AIS rapid response in BCWMC Priority 1 Lakes

Priority 1 Lake	Partnering Entity	Meeting Participants	Meeting Date
Medicine Lake	City of Medicine Lake	Clint Carlson	11/14/2017
Medicine Lake and Parkers Lake	City of Plymouth	Derek Asche	11/16/2017
Medicine Lake and Parkers Lake	Three Rivers Park District (TRPD)	Brian Vlach	11/16/2017
Northwood Lake	City of New Hope	Megan Albert	11/14/2017
Sweeney Lake and Twin Lake	City of Golden Valley	Tom Hoffman	11/3/2017
Twin Lake	Minneapolis Park and Recreation Board (MPRB)	Rachael Crabb	1/4/2018
Westwood Lake	City of St. Louis Park	Erik Francis, Jim Vaughan, and Mark Oestreich	11/8/2017
Wirth Lake	City of Golden Valley	Tom Hoffman	12/8/2017
Wirth Lake	Minneapolis Park and Recreation Board (MPRB)	Rachael Crabb	11/13/2017 and 1/4/2018
All Priority 1 Lakes	MnDNR	Kylie Cattoor	11/9/2017
All Priority 1 Lakes	MnDNR	Keegan Lund	11/13/2017
All Priority 1 Lakes	MAISRC	Dr. Mike McCartney	11/6/2017 (and 12/7/2017, to specifically discuss Medicine Lake and zebra mussels)
All Priority 1 Lakes	Hennepin County	Tony Brough	11/8/2017
All Priority 1 Lakes	BCWMC	Meg Rattei	All meeting dates noted above

Table 2 AIS Rapid Response Plan for Medicine Lake

Activity	Partner Roles						
	BCWMC	City of Plymouth	City of Medicine Lake ¹	Hennepin County	TRPD	MnDNR	MAISRC ²
Notify MnDNR of AIS infestation (MnDNR verifies AIS infestation)	—	—	—	—	Contacts the MnDNR.	Verifies AIS infestation	—
Communicate the infestation to all stakeholders (including those downstream), Association of Medicine Lake Area Citizens (AMLAC), and the general public	Disseminates information provided by TRPD	Disseminates information provided by TRPD to AMLAC and the general public.	Disseminates information provided by TRPD	—	In conjunction with or immediately following MnDNR press release, communicates information about the infestation to all stakeholders and provides information to the City of Plymouth, the City of Medicine Lake, and BCWMC to communicate the infestation to AMLAC and the general public	MnDNR issues press release prior to or in conjunction with communication directly to stakeholders	—
Perform, or hire contractor to perform, monitoring to define the extent of the AIS infestation	Collaborates with TRPD, MnDNR, and MAISRC regarding monitoring design	—	—	—	Performs plant surveys and assists with zebra mussel sampling (snorkeling in shallow waters). TRPD would hire a contractor to perform zebra mussel SCUBA surveys	Collaborates with BCWMC, TRPD, and MAISRC	Collaborates ³ with BCWMC, TRPD and MnDNR regarding monitoring design and recommendations for a contractor. For zebra mussel surveys, possibly perform pre-treatment and post-treatment surveys on a contract basis
Determine whether isolation of the infestation is needed and, if so, isolate the infestation	Collaborates with TRPD, MnDNR, and MAISRC	—	—	—	Makes the decision after collaborating with BCWMC, MnDNR and MAISRC. If feasible, TRPD will implement the isolation	Collaborates with BCWMC, TRPD and MAISRC	Collaborates ³ with BCWMC, TRPD, and MnDNR
Collaborate with MnDNR, Minnesota Aquatic Invasive Species Research Center (MAISRC) ² , and stakeholders to determine appropriate rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS) and associated costs.	Collaborates with MnDNR, TRPD, City of Plymouth, City of Medicine Lake, and MAISRC.	Collaborates with MnDNR, TRPD, BCWMC, City of Medicine Lake, and MAISRC	Collaborates with MnDNR, TRPD, BCWMC, City of Plymouth, and MAISRC	—	Facilitates the implementation of a rapid response effort with collaboration and input from MnDNR, BCWMC, City of Plymouth, City of Medicine Lake, and MAISRC.	Collaborates with BCWMC, TRPD, City of Plymouth, City of Medicine Lake, and MAISRC	Collaborates ³ with BCWMC, TRPD, City of Plymouth, City of Medicine Lake, and MnDNR
Obtain MnDNR treatment/removal permit	Is copied on permit application and all communications	—	Is copied on permit application and all communications	—	Obtains treatment/removal permit from MnDNR	Works with TRPD to issue the permit	Collaborates ³ with TRPD and MnDNR as needed to provide technical information.

Table 2 AIS Rapid Response Plan for Medicine Lake (Continued)

Activity	Partner Roles						
	BCWMC	City of Plymouth	City of Medicine Lake ¹	Hennepin County	TRPD	MnDNR	MAISRC ²
Perform additional pre-treatment monitoring, if required by MnDNR permit	Collaborates with TRPD, MnDNR, and MAISRC regarding monitoring design	—	—	—	Performs plant surveys and assists with zebra mussel sampling (snorkeling in shallow waters). TRPD hires a contractor to perform zebra mussel SCUBA surveys	Collaborates with BCWMC, City of Plymouth, City of Medicine Lake, TRPD, and MAISRC regarding monitoring requirements of permit	Collaborates ³ with TRPD, City of Plymouth, City of Medicine Lake, and BCWMC regarding monitoring design and recommendations for a contractor. For zebra mussel surveys, possibly perform pre-treatment and post-treatment surveys on a contract basis
Hire contractor to perform AIS rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS)	—	—	—	—	Hires contractor	—	—
Fund the AIS treatment/removal	Partners with Hennepin County and TRPD to fund the AIS treatment/removal	—	—	Considers providing AIS rapid response grant funding, if available, to help fund the treatment or removal	Funds up to 17 percent of the project cost. TRPD contribution includes the value of all services provided for the project.	—	—
Perform, or hire contractor to perform, post-treatment monitoring to determine treatment/removal effectiveness	Collaborates with TRPD, MnDNR, and MAISRC regarding monitoring design	—	—	—	Performs plant surveys and assists with zebra mussel sampling (snorkeling in shallow waters). TRPD hires a contractor to perform zebra mussel SCUBA surveys	Collaborates with BCWMC, City of Plymouth, City of Medicine Lake, TRPD, and MAISRC regarding monitoring requirements of permit	Collaborates ³ with TRPD, City of Plymouth, City of Medicine Lake, and BCWMC regarding monitoring design and recommendations for a contractor. For zebra mussel surveys, possibly perform pre-treatment and post-treatment surveys on a contract basis
Communicate information about the AIS treatment/removal and results of AIS treatment/removal efforts to stakeholders (including those downstream), AMLAC, and the general public	—	Disseminates information provided by TRPD to AMLAC and the general public.	Disseminates information provided by TRPD	—	Provides information to the City of Plymouth, the City of Medicine Lake, BCWMC, MnDNR, and MAISRC	—	—
Design and implement education program to help prevent future infestation	Provides information to City of Plymouth and City of Medicine Lake	Disseminates information provided by BCWMC to AMLAC and the general public and may develop additional educational materials.	Disseminates information provided by BCWMC	—	Takes the lead on education activity at boat access and could present information at an AMLAC meeting coordinated by someone else (BCWMC or AMLAC)	—	—

¹The City of Medicine Lake would like to be informed about the work completed for each activity.

² MAISRC will be invited to participate in discussions, but it is understood that MAISRC will choose whether to participate, depending upon staff availability at the time of each request.

³Collaborate means to provide research support and advice.

Table 3 AIS Rapid Response Plan for Northwood Lake

Activity	Partner Roles				
	BCWMC	City of New Hope	Hennepin County	MnDNR	MAISRC ¹
Notify MnDNR of AIS infestation (MnDNR verifies AIS infestation)	The first entity to find or be notified of possible infestation contacts MnDNR and the City of New Hope	The first entity to find or be notified of possible infestation contacts MnDNR and the BCWMC	—	Verifies AIS infestation	—
Communicate the infestation to stakeholders (including those downstream), Friends of Northwood Lake, and the general public	Provides technical assistance to City of New Hope as needed	In conjunction with or immediately following MnDNR press release, communicates information about the infestation to all stakeholders, Friends of Northwood Lake, and the general public	—	MnDNR issues press release prior to or in conjunction with communication directly to stakeholders	—
Perform, or hire contractor to perform, monitoring to define the extent of the AIS infestation	Collaborates with City of New Hope, MnDNR, and MAISRC and provides technical assistance to City of New Hope as needed	Hires the contractor after collaborating with BCWMC, MnDNR, and MAISRC	—	Collaborates with BCWMC, City of New Hope, and MAISRC	Collaborates ² with BCWMC, City of New Hope, and MnDNR
Determine whether isolation of the infestation is needed and, if so, isolate the infestation	Collaborates with City of New Hope, MnDNR, and MAISRC	Makes the decision after collaborating with BCWMC, MnDNR, and MAISRC. If feasible, implement the quarantine. ³	—	Collaborates with BCWMC, City of New Hope, and MAISRC	Collaborates ² with BCWMC, City of New Hope, and MnDNR
Collaborate with MnDNR, MAISRC, and stakeholders to determine appropriate rapid response (e.g., chemical treatment or manual removal of AIS) and associated costs	Collaborates with City of New Hope, MnDNR, and MAISRC	The City will make a decision after collaborating with BCWMC, MnDNR, and MAISRC	—	Collaborates with BCWMC, City of New Hope, and MAISRC	Collaborates ² with BCWMC, City of New Hope, and MnDNR
Work with MnDNR to obtain treatment/removal permit	BCWMC works with MnDNR to obtain treatment/removal permit	Is copied on permit application and all communications	—	Works with BCWMC to issue the permit	Collaborates ² with BCWMC and MnDNR as needed to provide technical information.
Perform additional pre-treatment monitoring, if required by MnDNR permit	Collaborates with City of New Hope, MnDNR, and MAISRC and provides technical assistance to City of New Hope as needed	Hires the contractor after collaborating with BCWMC, MnDNR, and MAISRC	—	Collaborates with BCWMC, City of New Hope, and MAISRC	Collaborates ² with BCWMC, City of New Hope, and MnDNR
Hire contractor to perform AIS rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS)	Is copied on communications with contractor and reviews contract/quote before hire	Hires the contractor	—	—	—
Fund the AIS treatment/removal	BCWMC partners with the City of New Hope and Hennepin County to fund the treatment	Partners with BCWMC and Hennepin County to fund the treatment, provided funding is approved by the City Council	Considers providing AIS rapid response grant funding, if available, to help fund the treatment or removal	—	—
Perform, or hire contractor to perform, post-treatment monitoring to determine treatment/removal effectiveness	Collaborates with City of New Hope, MnDNR, and MAISRC and provides technical assistance to City of New Hope as needed	Hires the contractor after collaborating with BCWMC, MnDNR, and MAISRC	—	Collaborates with BCWMC, City of New Hope, and MAISRC	Collaborates ² with BCWMC, City of New Hope, and MnDNR
Communicate information about the AIS treatment/removal and results of AIS treatment/removal efforts to stakeholders (including those downstream), Friends of Northwood Lake, and the general public	Provides technical assistance to City of New Hope as needed	Communicates information about the infestation and management to all stakeholders, Friends of Northwood Lake, and the general public	—	—	—
Design and implement education program to help prevent future infestation	Provides information to City of New Hope	Disseminates information provided by BCWMC to Friends of Northwood Lake and the general public	—	—	—

¹ MAISRC will be invited to participate in discussions, but it is understood that MAISRC will choose whether to participate, depending upon staff availability at the time of each request.

²Collaborate means to provide research support and advice..

Table 4 AIS Rapid Response Plan for Parkers Lake

Activity	Partner Roles					
	BCWMC	City of Plymouth	TRPD	Hennepin County	MnDNR	MAISRC ¹
Notify MnDNR of AIS infestation (MnDNR verifies AIS infestation)	The first entity to find or be notified of possible infestation contacts MnDNR, the City of Plymouth and TRPD	The first entity to find or be notified of possible infestation contacts MnDNR, the BCWMC and TRPD	The first entity to find or be notified of possible infestation contacts MnDNR, the City of Plymouth and BCWMC	—	Verifies AIS infestation	—
Communicate the infestation to all stakeholders (including those downstream) and the public	Provides information to City of Plymouth	In conjunction with or immediately following MnDNR press release, disseminates information provided by BCWMC to all stakeholders and the public.	—	—	MnDNR issues press release prior to or in conjunction with communication directly to stakeholders	—
Perform, or hire contractor to perform, monitoring to define the extent of the AIS infestation.	Collaborates with City of Plymouth, MnDNR, TRPD, and MAISRC regarding monitoring design	Collaborates with BCWMC, MnDNR, TRPD, and MAISRC regarding monitoring design. Contract with TRPD to perform the monitoring whenever they are able. If TRPD are unavailable, the City hires a contractor to perform the monitoring	Collaborates with BCWMC, City of Plymouth, MnDNR, and MAISRC regarding monitoring design. TRPD performs the work on a contract basis whenever they are able	—	Collaborates with BCWMC, City of Plymouth, TRPD, and MAISRC	Collaborates ² with BCWMC, City of Plymouth, MnDNR, and TRPD regarding monitoring design.
Determine whether isolation of the infestation is needed and, if so, isolate the infestation	Makes a decision after collaborating with MnDNR, MAISRC, and TRPD. If feasible, implement the quarantine. ³	—	Collaborates with BCWMC, MnDNR, and MAISRC	—	Collaborates with BCWMC, MAISRC, and TRPD	Collaborates ² with BCWMC, MnDNR, and TRPD
Collaborate with MnDNR, MAISRC, and stakeholders to determine appropriate rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS) and associated costs	Makes the decision after collaborating with City of Plymouth, TRPD, MnDNR, and MAISRC	Collaborates with BCWMC, TRPD, MnDNR, and MAISRC	Collaborates with BCWMC, City of Plymouth, MnDNR, and MAISRC	—	Collaborates with BCWMC, City of Plymouth, MAISRC, and TRPD	Collaborates ² with BCWMC, City of Plymouth, MnDNR, and TRPD
Work with MnDNR to obtain treatment/removal permit	Works with MnDNR to obtain treatment/removal permit	—	Provides guidance and technical expertise	—	Works with BCWMC to issue the permit	Collaborates ² with BCWMC and MnDNR as needed to provide technical information.
Perform additional pre-treatment monitoring, if required by MnDNR permit	Collaborates with City of Plymouth, MnDNR, TRPD, and MAISRC regarding monitoring design	Collaborates with BCWMC, MnDNR, TRPD, and MAISRC regarding monitoring design. City of Plymouth contracts with TRPD to perform the monitoring whenever they are able. If TRPD are unavailable, the City hires a contractor to perform the monitoring	Collaborates with BCWMC, City of Plymouth, MnDNR, and MAISRC regarding monitoring design. Perform the work on a contract basis whenever they are able	—	—	—
Hire contractor to perform AIS rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS)	Hires contractor	—	—	—	—	—

Table 4 AIS Rapid Response Plan for Parkers Lake (Continued)

Activity	Partner Roles					
	BCWMC	City of Plymouth	TRPD	Hennepin County	MnDNR	MAISRC ¹
Fund the AIS treatment/removal	Partner with Hennepin County to fund treatment	Considers funding the monitoring.	—	Considers providing AIS rapid response grant funding, if available, to help fund the treatment or removal	—	—
Perform, or hire contractor to perform, post-treatment monitoring to determine treatment/removal effectiveness	Collaborates with City of Plymouth, MnDNR, TRPD, and MAISRC regarding monitoring design	Collaborates with BCWMC, MnDNR, TRPD, and MAISRC regarding monitoring design. City of Plymouth contracts with TRPD to perform the monitoring whenever they are able. If TRPD are unavailable, the City hires a contractor to perform the monitoring	Collaborates with BCWMC, City of Plymouth, MnDNR, and MAISRC regarding monitoring design. Performs the work on a contract basis whenever they are able	—	Collaborates with BCWMC, City of Plymouth, TRPD, and MAISRC regarding monitoring requirements of permit	Collaborates ² with BCWMC, City of Plymouth, MnDNR, and TRPD regarding monitoring design.
Communicate information about the AIS treatment/removal and results of AIS treatment/removal efforts to all stakeholders (including those downstream) and the public	Provides information to City of Plymouth	Disseminates information provided by BCWMC.	Provides monitoring data to City of Plymouth or presents the data to the public at an event coordinated by City of Plymouth	—	—	—
Design and implement education program to help prevent future infestation	Provides information to City of Plymouth	Disseminates information provided by BCWMC and may develop additional materials.	—	—	—	—

¹ MAISRC will be invited to participate in discussions, but it is understood that MAISRC will choose whether to participate, depending upon staff availability at the time of each request.

²Collaborate means to provide research support and advice.

Table 5 AIS Rapid Response Plan for Sweeney Lake

Activity	Partner Roles					
	BCWMC	City of Golden Valley	Hennepin County	MPRB	MnDNR	MAISRC ¹
Notify MnDNR of AIS infestation (MnDNR verifies AIS infestation)	—	Notifies MnDNR, BCWMC and MPRB	—	—	Verifies AIS infestation	—
Communicate the infestation to all stakeholders (including those downstream), Sweeney Lake Homeowners Association, and the general public	—	In conjunction with or immediately following MnDNR press release, communicates the infestation to all stakeholders, Sweeney Lake Homeowners Association, and the general public.	—	—	MnDNR issues press release prior to or in conjunction with communication directly to stakeholders	—
Perform, or hire contractor to perform, monitoring to define the extent of the AIS infestation.	Provides technical assistance such as monitoring design and recommendations for a contractor	Hires a contractor	—	Provides technical assistance, as needed.	Collaborates with the City of Golden Valley, BCWMC, and MAISRC	Collaborates ² with City of Golden Valley, BCWMC, and MnDNR regarding monitoring design.
Determine whether isolation of the infestation is needed and, if so, isolate the infestation	Makes decision after collaborating with MnDNR, MAISRC, and City of Golden Valley	Collaborates with MAISRC, BCWMC, and MnDNR. (The City of Golden Valley prefers that MnDNR take the lead to implement the quarantine ³ , but would implement the quarantine ³ if necessary.)	—	—	Collaborates with MAISRC, BCWMC, and City of Golden Valley. Possibly take the lead in implementing quarantine ³	Collaborates ² with MnDNR, BCWMC, and City of Golden Valley
Collaborate with MnDNR, MAISRC, and stakeholders to determine appropriate rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS) and associated costs	Collaborates with MnDNR, MAISRC, and City of Golden Valley	Makes the decision after considering the recommendations from BCWMC, MAISRC, and the MnDNR.	—	—	Collaborates with MAISRC, BCWMC, and City of Golden Valley	Collaborates ² with MnDNR, BCWMC, and City of Golden Valley
Work with MnDNR to obtain treatment/removal permit	Works with MnDNR to obtain treatment/removal permit	Is copied on permit application and all communications	—	—	Works with BCWMC to issue permit	Collaborates ² with BCWMC and MnDNR as needed to provide technical information.
Perform additional pre-treatment monitoring, if required by MnDNR permit	Provides technical assistance such as monitoring design and recommendations for a contractor.	Hires a contractor	—	—	Collaborates with City of Golden Valley, BCWMC, and MAISRC regarding monitoring requirements of permit.	Collaborates ² with City of Golden Valley, BCWMC, and MnDNR regarding monitoring design.
Hire contractor to perform AIS rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS)	Provides technical assistance with contract development	Hires the contractor	—	—	—	—
Fund the AIS treatment/removal	Partners with City of Golden Valley and Hennepin County to fund the treatment	Partners with BCWMC and Hennepin County to fund the treatment	Considers providing AIS rapid response grant funding, if available, to help fund the treatment or removal	—	—	—
Perform, or hire contractor to perform, post-treatment monitoring to determine treatment/removal effectiveness	Provides technical assistance such as monitoring design and recommendations for a contractor.	Hires a contractor	—	—	Collaborates with the City of Golden Valley, BCWMC, and MAISRC regarding monitoring requirements of permit.	Collaborates ² with City of Golden Valley, BCWMC, and MnDNR regarding monitoring design

Table 5 AIS Rapid Response Plan for Sweeney Lake (Continued)

Activity	Partner Roles					
	BCWMC	City of Golden Valley	Hennepin County	MPRB	MnDNR	MAISRC ¹
Communicate information about the AIS treatment/removal and results of AIS treatment/removal efforts to stakeholders (including those downstream), Sweeney Lake Homeowners Association, and the general public	—	Provides information to all stakeholders, the Sweeney Lake Homeowners Association, and the general public.	—	—	—	—
Design and implement education program to help prevent future infestation	Provides any available education materials to City of Golden Valley	Takes the lead, but collaborates with BCWMC, MnDNR, and MAISRC. Disseminates information to the Sweeney Lake Homeowners Association and the general public.	—	Provides assistance, as appropriate.	Provides any available education materials to City of Golden Valley	May provide available education materials to City of Golden Valley

¹ MAISRC will be invited to participate in discussions, but it is understood that MAISRC will choose whether to participate, depending upon staff availability at the time of each request.

²Collaborate means to provide research support and advice.

Table 6 AIS Rapid Response Plan for Twin Lake

Activity	Partner Roles					
	BCWMC	City of Golden Valley	Hennepin County	MPRB	MnDNR	MAISRC ¹
Notify MnDNR of AIS infestation (MnDNR verifies AIS infestation)	—	Notifies MnDNR, BCWMC and MPRB	—	—	Verifies AIS infestation	—
Communicate the infestation to all stakeholders (including those downstream) and the public	—	In conjunction with or immediately following MnDNR press release, communicates the infestation to all stakeholders and the public.	—	—	MnDNR issues press release prior to or in conjunction with communication directly to stakeholders	—
Perform, or hire contractor to perform, monitoring to define the extent of the AIS infestation.	Provides technical assistance such as monitoring design and recommendations for a contractor	Hires a contractor unless MPRB performs monitoring.	—	Collaborates with the City of Golden Valley, BCWMC, MnDNR and MAISRC. May perform monitoring.	Collaborates with the City of Golden Valley, BCWMC, MPRB, and MAISRC	Collaborates ² with City of Golden Valley, BCWMC, and MnDNR regarding monitoring design.
Determine whether isolation of the infestation is needed and, if so, isolate the infestation	Makes decision after collaborating with the City of Golden Valley, MPRB, MnDNR, and MAISRC	Collaborates with MAISRC, BCWMC, MPRB, and MnDNR. (The City prefers that MnDNR take the lead to implement the quarantine ³ , but would implement the quarantine ³ if necessary.)	—	Collaborates with the City of Golden Valley, BCWMC, MnDNR, and MAISRC	Collaborates with MAISRC, BCWMC, MPRB, and City of Golden Valley. Possibly take the lead in implementing quarantine ³	Collaborates ² with MnDNR, BCWMC, MPRB, and City of Golden Valley
Collaborate with MnDNR, MAISRC, and stakeholders to determine appropriate rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS) and associated costs	Collaborates with MnDNR, MAISRC, MPRB, and City of Golden Valley	Makes the decision after considering the recommendations from BCWMC, MAISRC, MPRB, and the MnDNR.	—	Collaborates with the City of Golden Valley, BCWMC, MnDNR, and MAISRC	Collaborates with MAISRC, BCWMC, MPRB, and City of Golden Valley	Collaborates ² with MnDNR, BCWMC, MPRB, and City of Golden Valley
Work with MnDNR to obtain treatment/removal permit	Works with MnDNR to obtain treatment/removal permit	Is copied on permit application and all communications	—	Is copied on permit application and all communications	Works with BCWMC to issue permit	Collaborates ² with BCWMC and MnDNR as needed to provide technical information.
Perform additional pre-treatment monitoring, if required by MnDNR permit	Provides technical assistance such as monitoring design and recommendations for a contractor.	Hires a contractor unless MPRB performs monitoring	—	Collaborates with the City of Golden Valley, BCWMC, MnDNR and MAISRC. May perform monitoring.	Collaborates with City of Golden Valley, BCWMC, MPRB, and MAISRC regarding monitoring requirements of permit.	Collaborates ² with City of Golden Valley, BCWMC, and MnDNR regarding monitoring design.
Hire contractor to perform AIS rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS)	Provides technical assistance with contract development	Hires the contractor	—	—	—	—
Fund the AIS treatment/removal	Partners with the City of Golden Valley and Hennepin County to fund the treatment	Partners with BCWMC and Hennepin County to fund the treatment	Considers providing AIS rapid response grant funding, if available, to help fund the treatment or removal	—	—	—
Perform, or hire contractor to perform, post-treatment monitoring to determine treatment/removal effectiveness	Provides technical assistance such as monitoring design and recommendations for a contractor.	Hires a contractor unless MPRB performs monitoring	—	Collaborates with the City of Golden Valley, BCWMC, MnDNR and MAISRC. May perform monitoring.	Collaborates with the City of Golden Valley, MPRB, BCWMC, and MAISRC regarding monitoring requirements of permit.	Collaborates ² with City of Golden Valley, BCWMC, and MnDNR regarding monitoring design..

Table 6 AIS Rapid Response Plan for Twin Lake (Continued)

Activity	Partner Roles					
	BCWMC	City of Golden Valley	Hennepin County	MPRB	MnDNR	MAISRC ¹
Communicate information about the AIS treatment/removal and results of AIS treatment/removal efforts to stakeholders (including those downstream) and the public	—	Provides information to all stakeholders and the public.	—	—	—	—
Design and implement education program to help prevent future infestation	Provides any available education materials to the City	Takes the lead, but collaborates with BCWMC, MPRB, MnDNR, and MAISRC. Disseminates information to the public.	—	Provides any available education materials to City of Golden Valley	Provides any available education materials to City of Golden Valley	May provide available education materials to City of Golden Valley

¹ MAISRC will be invited to participate in discussions, but it is understood that MAISRC will choose whether to participate, depending upon staff availability at the time of each request.

²Collaborate means to provide research support and advice.

Table 7 AIS Rapid Response Plan for Westwood Lake

Activity	Partner Roles				
	BCWMC	City of St. Louis Park/Westwood Hills Nature Center	Hennepin County	MnDNR	MAISRC ¹
Notify MnDNR of AIS infestation (MnDNR verifies AIS infestation)	The first entity to find or be notified of possible infestation contacts MnDNR and the City of St. Louis Park	The first entity to find or be notified of possible infestation contacts MnDNR and the BCWMC	—	MnDNR verifies AIS infestation	—
Communicate the infestation to all stakeholders (including those downstream) and the public	—	In conjunction with or immediately following MnDNR press release, communicates the infestation to all stakeholders and the public.	—	MnDNR issues press release prior to or in conjunction with communication directly to stakeholders	—
Perform, or hire contractor to perform, monitoring to define the extent of the AIS infestation.	The entity taking the lead depends on the scale of the project. If a small project, the City performs the monitoring or hires a contractor. If a larger project, BCWMC hires a contractor to perform the monitoring.	The entity taking the lead depends on the scale of the project. If a small project, the City performs the monitoring or hires a contractor. If a larger project, BCWMC hires a contractor to perform the monitoring	—	Collaborates with the City, BCWMC, and MAISRC	Collaborates ² with City of St. Louis Park, BCWMC, and MnDNR regarding monitoring design.
Determine whether isolation of the infestation is needed and, if so, isolate the infestation	BCWMC, City of St. Louis Park (including Westwood Hills Nature Center staff), and MnDNR make a uniform decision after collaborating as needed with MAISRC. The City implements the quarantine ³ if a small project; BCWMC implements if a large project.	BCWMC, City of St. Louis Park (including Westwood Hills Nature Center staff), and MnDNR make a uniform decision after collaborating as needed with MAISRC. The City implements the quarantine ³ if a small project; BCWMC implements if a large project.	—	BCWMC, City of St. Louis Park (including Westwood Hills Nature Center staff), and MnDNR make the decision after collaborating as needed with MAISRC.	Collaborates ² with MnDNR, BCWMC, and City
Collaborate with MnDNR, MAISRC, and stakeholders to determine appropriate rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS) and associated costs	BCWMC, City of St. Louis Park (including Westwood Hills Nature Center staff), MnDNR, and MAISRC collaborate—the project size will determine whether the City or BCWMC would take the lead. If a small project, the City makes the decision after considering recommendations from BCWMC, MnDNR, and MAISRC. If it will be a bigger project, BCWMC makes the decision after considering recommendations from the City, MnDNR and MAISRC.	BCWMC, City of St. Louis Park (including Westwood Hills Nature Center staff), MnDNR, and MAISRC will collaborate—the project size will determine whether the City or BCWMC would take the lead. If a small project, the City makes the decision after considering recommendations from BCWMC, MnDNR, and MAISRC. If it will be a bigger project, BCWMC makes the decision after considering recommendations from the City, MnDNR and MAISRC.	—	Collaborates with MAISRC, BCWMC, and City of St. Louis Park	Collaborates ² with MnDNR, BCWMC, and City of St. Louis Park
Work with MnDNR to obtain treatment/removal permit	Works with MnDNR to obtain treatment/removal permit for large projects	Works with MnDNR to obtain treatment/removal permit for small projects	—	Works with BCWMC or City of St. Louis Park to issue permit	Collaborates ² with BCWMC City of St. Louis Park, and MnDNR to provide technical information.
Perform additional pre-treatment monitoring, if required by MnDNR permit	The entity taking the lead depends on the scale of the project. If a small project, the City performs the monitoring or hires a contractor. If a larger project, BCWMC hires a contractor to perform the monitoring.	The entity taking the lead depends on the scale of the project. If a small project, the City performs the monitoring or hires a contractor. If a larger project, BCWMC hires a contractor to perform the monitoring.	—	Collaborates with the City, BCWMC, and MAISRC regarding monitoring requirements of permit.	Collaborates ² with City of St. Louis Park, BCWMC, and MnDNR regarding monitoring design.

Table 7 AIS Rapid Response Plan for Westwood Lake (Continued)

Activity	Partner Roles				
	BCWMC	City of St. Louis Park/Westwood Hills Nature Center	Hennepin County	MnDNR	MAISRC ¹
Hire contractor to perform AIS rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS)	The entity taking the lead depends on the scale of the project. If a small project, the City hires the contractor to perform the treatment/ removal. If a larger project, it would be a collaborative effort with BCWMC taking the lead.	The entity taking the lead depends on the scale of the project. If a small project, the City hires the contractor to perform the treatment/ removal. If a larger project, it would be a collaborative effort with BCWMC taking the lead.	—	—	—
Fund the AIS treatment/removal	BCWMC partners with Hennepin County and the City of St. Louis Park to fund larger projects.	Seeks Hennepin County AIS rapid response monies if available. If grant monies are not available and the project is small, the City funds it. For larger projects, the City partners with BCWMC and Hennepin County to fund the project.	Considers providing AIS rapid response grant funding, if available, to help fund the treatment or removal	—	—
Perform, or hire contractor to perform, post-treatment monitoring to determine treatment/removal effectiveness	The entity taking the lead depends on the scale of the project. If a small project, the City performs the monitoring or hires a contractor. If a larger project, BCWMC hires a contractor to perform the monitoring.	The entity taking the lead depends on the scale of the project. If a small project, the City performs the monitoring or hires a contractor. If a larger project, BCWMC hires a contractor to perform the monitoring.	—	Collaborates with the City, BCWMC, and MAISRC regarding monitoring requirements of permit.	Collaborates ² with City of St. Louis Park, BCWMC, and MnDNR regarding monitoring design
Communicate information about the AIS treatment/removal and results of AIS treatment/removal efforts to stakeholders (including those downstream) and the public	Collaborates with the City of St. Louis Park and MnDNR	Communications about the AIS infestation and management after collaboration with the BCWMC and MnDNR.	—	Collaborates with BCWMC and City of St. Louis Park	—
Design and implement education program to help prevent future infestation	Collaborative effort between City and BCWMC.	Collaborative effort between City and BCWMC to educate the public. The City takes the lead to educate City staff. The City collaborates with BCWMC to obtain available education materials to disseminate via their website, Facebook, or Twitter.	—	Provides any available education materials to the City of St. Louis Park	May provide available education materials to City of St. Louis Park

¹ MAISRC will be invited to participate in discussions, but it is understood that MAISRC will choose whether to participate, depending upon staff availability at the time of each request.

²Collaborate means to provide research support and advice.

Table 8 AIS Rapid Response Plan for Wirth Lake

Activity	Partner Roles					
	BCWMC	City of Golden Valley	MPRB ³	Hennepin County	MnDNR	MAISRC ¹
Notify MnDNR of AIS infestation (MnDNR verifies AIS infestation)	The first entity to find or be notified of possible infestation contacts MnDNR, the City of Golden Valley and MPRB.	The first entity to find or be notified of possible infestation contacts MnDNR, the BCWMC and MPRB	The first entity to find or be notified of possible infestation contacts MnDNR, the City of Golden Valley and BCWMC	—	MnDNR verifies AIS infestation	—
Communicate the infestation to all stakeholders (including those downstream) and the public	In conjunction with or immediately following MnDNR press release, collaborates with MPRB, City of Golden Valley, and MnDNR. Takes the lead unless MPRB requests to take the lead.	In conjunction with or immediately following MnDNR press release, collaborates with BCWMC, MPRB, and MnDNR	In conjunction with or immediately following MnDNR press release, collaborates with BCWMC, City of Golden Valley, and MnDNR. May request to take the lead.	—	MnDNR issues press release prior to or in conjunction with communication directly to stakeholders	—
Perform, or hire contractor to perform, monitoring to define the extent of the AIS infestation.	Collaborates with City of Golden Valley, MPRB, BCWMC, MAISRC, and MnDNR. Takes the lead unless MPRB requests to take the lead.	Collaborates with BCWMC, MPRB, MnDNR, and MAISRC	Collaborates with BCWMC, and MnDNR. May request to take the lead.	—	Collaborates with MPRB, City of Golden Valley, BCWMC, and/or MAISRC	Collaborates ² with City of Golden Valley, BCWMC, MPRB, and MnDNR regarding monitoring design.
Determine whether isolation of the infestation is needed and, if so, isolate the infestation	Collaborates with City of Golden Valley, MPRB, MnDNR, and MAISRC. Takes the lead unless MPRB requests to take the lead.	Collaborates with BCWMC, MPRB, MnDNR, and MAISRC	Collaborates with BCWMC, City of Golden Valley, MnDNR, and MAISRC. May request to take the lead.	—	Collaborates with MPRB, BCWMC, City of Golden Valley, and MAISRC	Collaborates ² with MPRB, BCWMC, City of Golden Valley, and MAISRC
Collaborate with MnDNR, MAISRC, and stakeholders to determine appropriate rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS) and associated costs	Collaborates with City of Golden Valley, MPRB, MnDNR, and MAISRC. Takes the lead unless MPRB requests to take the lead.	Collaborates with BCWMC, MPRB, MnDNR, and MAISRC	Collaborates with BCWMC, City of Golden Valley, MnDNR, and MAISRC. May request to take the lead.	—	Collaborates with MAISRC, BCWMC, and MPRB	Collaborates ² with MnDNR, BCWMC, and MPRB
Work with MnDNR to obtain treatment/removal permit	Collaborate with MPRB. Takes the lead unless MPRB requests to take the lead.	—	Collaborates with BCWMC. May request to take the lead.	—	Works with BCWMC or MPRB to issue permit	Collaborates ² with BCWMC or the MPRB, and MnDNR as needed to provide technical information.
Perform additional pre-treatment monitoring, if required by MnDNR permit	Collaborates with City of Golden Valley, MPRB, MnDNR, and MAISRC. Takes the lead unless MPRB requests to take the lead.	Collaborates with BCWMC, MPRB, MnDNR, and MAISRC	Collaborates with BCWMC, City of Golden Valley, MnDNR, and MAISRC. May request to take the lead.	—	Collaborates with MPRB, City of Golden Valley, BCWMC, and/or MAISRC regarding monitoring requirements of permit.	Collaborates ² with City of Golden Valley, BCWMC, MPRB, and MnDNR regarding monitoring design.
Hire contractor to perform AIS rapid response treatment/removal (e.g., chemical treatment or manual removal of AIS)	Collaborates with City of Golden Valley, MPRB, MnDNR, and MAISRC. Takes the lead unless MPRB requests to take the lead.	—	Collaborates with BCWMC, City of Golden Valley, MnDNR, and MAISRC. May request to take the lead.	—	Collaborates with BCWMC, City of Golden Valley, MPRB, and MAISRC.	—

Table 8 AIS Rapid Response Plan for Wirth Lake (Continued)

Activity	Partner Roles					
	BCWMC	City of Golden Valley	MPRB ³	Hennepin County	MnDNR	MAISRC ¹
Fund the AIS treatment/removal	Partnership with Hennepin County and MPRB for projects that support MPRB interests and are consistent with their policies. BCWMC will partner with Hennepin County for projects MPRB chooses not to participate in.	Possible partnership in funding the treatment	Partnership with Hennepin County and BCWMC for projects that support MPRB interests and are consistent with their policies. MPRB would take the lead on such projects. MPRB has an AIS response fund and could pay up front costs and then cost share later. MPRB may choose not to participate in some projects.	AIS rapid response grant funding may be available to help fund the treatment or removal	—	—
Perform, or hire contractor to perform, post-treatment monitoring to determine treatment/removal effectiveness.	Collaborates with City of Golden Valley, MPRB, MnDNR, and MAISRC. Takes the lead unless MPRB requests to take the lead.	Collaborates with BCWMC, MPRB, MnDNR, and MAISRC	Collaborates with BCWMC, City of Golden Valley, MnDNR, and MAISRC. May request to take the lead.	—	Collaborates with MPRB, City of Golden Valley, BCWMC, and/or MAISRC regarding monitoring requirements of permit.	Collaborates ² with City of Golden Valley, BCWMC, MPRB, and MnDNR regarding monitoring design.
Communicate information about the AIS treatment/removal and results of AIS treatment/removal efforts to stakeholders (including those downstream) and the public	Collaborates with City of Golden Valley, MPRB, MnDNR, and MAISRC. Takes the lead unless MPRB requests to take the lead.	Collaborates with BCWMC, MPRB, MnDNR, and MAISRC	Collaborates with BCWMC, City of Golden Valley, MnDNR, and MAISRC. May request to take the lead.	—	Partnership between MPRB, BCWMC, and MnDNR	—
Design and implement education program to help prevent future infestation	Collaborates with City of Golden Valley, MPRB, MnDNR, and MAISRC. Takes the lead unless MPRB requests to take the lead.	—	Collaborates with BCWMC, City of Golden Valley, MnDNR, and MAISRC. May request to take the lead. MPRB could share its education resources (such as an “AIS trunk”) with BCWMC to amplify the message.	—	Provides any available education materials to BCWMC or MPRB, whichever takes the lead.	May provide available education materials to BCWMC or MPRB, whichever takes the lead.

¹ MAISRC will be invited to participate in discussions, but it is understood that MAISRC will choose whether to participate, depending upon staff availability at the time of each request.

²Collaborate means to provide research support and advice.

³ MPRB currently has a separate AIS rapid response plan that includes Wirth Lake. Contracts and plans already in place through MPRB could be utilized in conjunction with (or in place of) the above activities.

4.0 Rapid Response to Key AIS: Zebra Mussels, Starry Stonewort, and Eurasian Watermilfoil

Zebra mussels, starry stonewort, and Eurasian watermilfoil are considered key AIS species because of their high risk of spread to uninfested BCWMC Priority 1 lakes. Eurasian watermilfoil is currently present in Medicine Lake, Parkers Lake, and Wirth Lake, but not in the remaining four Priority 1 lakes. Zebra mussels are currently present in Medicine Lake, but not in the remaining six Priority 1 lakes. Although not present in BCWMC waterbodies, starry stonewort is currently present in 11 Minnesota lakes and has spread quickly during the two years since its first MN sighting in Lake Koronis (Stearns County, MN). Hence, these three species pose a high infestation risk to uninfested BCWMC Priority 1 lakes. The detailed rapid response plans below for each species will help the BCWMC, cities, and other organizations to be poised to respond to an infestation efficiently and effectively.

4.1 Zebra Mussels

Zebra mussels (*Dreissena polymorpha*) are one of the most widespread invasive freshwater animals in the world. Their huge populations attach to hard surfaces, clog intake pipes for water treatment and power generating plants, encrust boat motors and hulls, may greatly reduce lakefront property values, and their sharp shells cut swimmers feet. Ecologically, they filter enormous quantities of microscopic algae, alter energy flow through aquatic systems, smother and cause extinctions of native bivalves, and promote toxic blue-green algal blooms through their selective filtration (MAISRC, 2017b and Vanderploeg et al, 2001). According to MAISRC staff, zebra mussels are one of the worst aquatic invasive species, in terms of their ecological impact, as they completely “re-route” the food chain in the water body.



**Pictured above, zebra mussels found in Medicine Lake on November 2, 2017.
(Photo Credit: Keegan Lund, MnDNR)**

Zebra mussels are native to Eastern Europe and Western Russia. They were first found in North America in 1988 (MAISRC, 2017b).

Zebra mussels are ¼ to 1 ½ inch-long bivalve (2-shelled) mollusks. They have a D- or wedge-shaped shell, which is often marked by alternating brown and yellow bands in a zigzag pattern. They live on lake and river bottoms, rocks, aquatic plants, docks, lifts, and boats to which they attach using small dark fibers called “byssal threads” (MAISRC, 2017b).

Each mussel is either male or female, and they release eggs (500,000 or more per female per year) or sperm into the water. Fertilization yields a tiny (<1/10th millimeter) larvae called a veliger. Veligers feed on algae and grow for about 3 weeks, drifting in the plankton, during which time wind and currents can transport them over large distances. After this, they settle down and attach to the lake or river bottom, and after about 12 to 18 months, they grow to reproductive size. Reproduction begins each spring when the water temperature reaches 53° F and continues through mid-August. (MAISRC, 2017b).

Zebra mussels are spread by larvae (veligers) transported down connected streams and waterways, and overland via mussels attached to vegetation and to surfaces of recreational boats, trailers, docks, and lifts. Veliger larvae may also be transported in the “residual water” remaining inside boat compartments when trailered boats are moved between waterways (MAISRC, 2017b).

MnDNR approves permits for rapid response management of zebra mussels on a case-by-case basis. A MnDNR committee, with input from MAISRC, considers a number of variables prior to making a decision as to whether or not management will be permitted. The MnDNR generally permits management if the infestation is localized and isolated to a small area. The MnDNR also looks at whether or not the zebra mussel population is reproducing. If reproduction has occurred, the MnDNR is less likely to permit treatment since zebra mussels may have spread throughout the lake.

To determine the extent of a zebra mussel infestation in a lake, a “meandering” zebra mussel survey is completed. Zebra mussels inhabit the littoral area of the lake (up to about 15 feet). Hence, the survey area is confined to the littoral area of the lake. The survey includes SCUBA diving searches in deeper waters and snorkeling searches in shallower waters. Potential zebra mussel substrates (e.g., sticks, rocks, plants, docks) are examined to determine whether or not zebra mussels are present. The survey is termed “meandering” because the surveyors meander through the littoral area to thoroughly search for zebra mussels rather than sample specific points or transects. The survey results are reviewed by the MnDNR committee who then determines whether or not management will be permitted.

When the MnDNR permits chemical treatment of zebra mussels, they also require isolation or quarantine of the infested area. A lethal treatment requires zebra mussels to be exposed to a lethal dose of the chemical for several days. Unless the treatment area is quarantined by vinyl curtains, mixing by untreated lake waters would reduce the dose to less than the lethal threshold and zebra mussels would not be killed.

Two chemical products are currently registered with the Environmental Protection Agency (EPA) and permitted for chemical treatment of zebra mussels. Earthtec QZ, a copper product, is effective and the most economical. A second product, Zequanox, is more expensive than Earthtec QZ and generally does not attain a complete kill. Although either product could be used for a zebra mussel treatment, Earthtec QZ is the preferred product due to its greater effectiveness and lower cost.

A third product, potash, effectively treats zebra mussels, but is not currently registered with the EPA. It could be used for zebra mussel treatment with permission from the EPA. The process for gaining permission is to apply for a Section 18 Special Emergency Exemption from EPA. Because this process is not expected to be rapid, this product would not be suitable for a rapid response zebra mussel treatment.

The rapid response to a new zebra mussel infestation is as follows:

- 1) Hire a contractor to perform a “meandering” zebra mussel survey of adults to determine locations where they are found.
- 2) If the zebra mussel infestation is localized in a few locations and a candidate for a rapid response treatment, apply for a MnDNR treatment permit.

- 3) If MnDNR issues the permit, apply for Hennepin County Rapid Response Grant monies.
- 4) Work with MAISRC to complete a detailed survey of the treatment areas to determine pre-treatment zebra mussel density.
- 5) Isolate the zebra mussel treatment area(s), contract with applicator, and perform treatment in May. Earthtech QZ would probably be used for the treatment. Treatment dose is determined by MnDNR during the permitting process.
- 6) Work with MAISRC to complete a detailed survey of the treatment areas to determine post-treatment zebra mussel density. Treatment effectiveness is determined from a comparison of pre-treatment and post-treatment zebra mussel density.
- 7) Review hydrologic connections with downstream waterbodies to determine if other waterbodies can be protected.
- 8) If post-treatment zebra mussel survey indicates zebra mussels are present and, hence, additional treatment is needed, repeat steps 2 through 6.

4.2 Starry Stonewort

Starry stonewort (*Nitellopsis obtusa*) is an invasive green alga that is native to parts of Europe and Asia. It was first found in North America in 1978. It can grow tall and dense, forming mats on the surface that interfere with recreation and potentially displace native plant species (MAISRC, 2017c).

Starry stonewort is dioecious, meaning that individuals are either male or female – unlike many plants and algae that have both male and female reproductive parts. The best evidence to date indicates that the populations in the United States are all male, although there may be undiscovered females. This means that starry stonewort reproduction in the United States is vegetative and the spread of starry stonewort is probably through human movement of fragments from lake to lake. In particular, starry stonewort produces small, star-shaped structures called “bulbils” that allow it to reproduce vegetatively (clonally). It was first recorded in Minnesota in 2015 and by 2017 was found in 11 lakes (MAISRC, 2017c; Larkin et al., 2017).



Starry stonewort, pictured above, is an invasive green alga. Star-shaped structures called “bulbils” allow it to reproduce vegetatively. (Photo Credit: MAISRC)

MnDNR approves permits for rapid response management of starry stonewort on a case by case basis. A MnDNR committee considers a number of variables prior to making a decision as to whether or not

management will be permitted. The MnDNR generally permits management if the infestation is localized and isolated to a small area.

Management measures include hand removal and chemical treatment. A copper related algaecide plus additives to enhance treatment effectiveness are used for the chemical treatment. Products used for chemical treatment of starry stonewort include Earthtech QZ, Komeen Crystal, Captain XTR, Stingray plus Diquat, and Stingray plus Clipper 50.

Bulbils buried in the sediment cannot be controlled with a chemical treatment. The sediment prevents chemical contact with the bulbils and contact is necessary for the chemical to kill them. To attain complete control of starry stonewort, hand removal of the bulbils using diver-assisted suction harvesting (DASH) is recommended, if permitted by the MnDNR.

The rapid response to a starry stonewort infestation is detailed as follows:

- 1) Hire a contractor to perform an aquatic plant survey to determine locations where starry stonewort is found.
- 2) If the infestation is localized in a few locations and a candidate for a rapid response treatment, collaborate with MAISRC and the MnDNR to design a chemical treatment or manual removal program as well as a monitoring program.
- 3) Apply for a MnDNR permit.
- 4) If the MnDNR issues the permit, apply for Hennepin County Rapid Response Grant monies.
- 5) Contract with SCUBA divers to complete hand removal of plants and/or bulbils or contract with applicator to perform treatment. Chemical treatment would be a copper algaecide plus additives to enhance treatment effectiveness. Treatment dose is determined by the MnDNR during the permitting process. Bulbils buried in sediment are removed using diver-assisted suction harvesting (DASH).
- 6) Perform post-treatment point-intercept aquatic plant survey to evaluate removal/treatment effectiveness.
- 7) Review hydrologic connections with downstream waterbodies to determine if other waterbodies can be protected.
- 8) If post-treatment point-intercept aquatic plant survey indicates additional removal/treatment is needed, repeat steps 2 through 6.

4.3 Eurasian Watermilfoil

Eurasian watermilfoil (*Myriophyllum spicatum*) is an invasive aquatic plant that is native to northern Europe and Asia. It was introduced to North America in the early 1940's (MAISRC, 2017d).

Eurasian watermilfoil (EWM) reproduces from fragments and seeds. Although reproduction from seeds was thought to be uncommon, the presence of hybrids and viable seeds suggests that sexual reproduction can be important. Plants flower once they grow to the surface in June through September. The plant will also produce autofragments in the summer; small branches that break off the plant and form roots which can establish new plants. Any fragment of the plant stem that includes a node (whorl of leaves) can produce a new viable plant. Eurasian watermilfoil stores carbohydrates in the lower stems and root crowns which enables the plant to survive over the winter, even with low or no light under the ice. In the spring when water temperatures approach 50 to 60 degrees Fahrenheit, the plant will begin growing out of the root crowns and sometimes overwintering stems and grow toward the surface. The plants often form a canopy throughout the summer that shades out native plants (MAISRC, 2017d).



EWM, pictured above, autofragments in the summer; small branches that break off the plant and form roots establish new plants. (Photo Credit: Matthew Berg, Endangered Resource Services, LLC.)

EWM is spread most commonly by inadvertent transport by boaters, however some waterbodies appear to have been infested by natural means (downstream transport or waterfowl) (MAISRC, 2017d).

EWM's fast growth rate, up to 2 inches per day in spring and summer, its ability to spread rapidly by fragmentation, and its ability to effectively block out sunlight needed for native plant growth often result in monotypic stands. Monotypic stands of EWM provide only a single habitat, and threaten the integrity of aquatic communities in a number of ways. For example, dense stands disrupt predator-prey relationships by fencing out larger fish, and reducing the number of nutrient-rich native plants available for waterfowl. EWM spreads rapidly and can grow to dominance in as little as two years (Wisconsin Department of Natural Resources (WDNR), 2012).

Dense stands of EWM also inhibit recreational uses like swimming, boating, and fishing. Cycling of nutrients from sediments to the water column by EWM may lead to deteriorating water quality and algae blooms of infested lakes (WDNR, 2012).

EWM is known to hybridize with northern watermilfoil, a native species. This hybrid watermilfoil is also considered invasive (MAISRC, 2017d).

A EWM treatment/removal permit is easily obtained from MnDNR whenever the treatment area is less than 15 percent of the littoral area of the lake. The littoral area is the area of the lake that is up to 15 feet in depth.

A pre-treatment plant survey would be performed to delineate the treatment/removal area. Once the treatment/removal area is delineated, the best course of action for treatment/removal would be determined. An on-line permit application would be completed and the treatment/removal map would be attached to the treatment application. Once the permit is issued, treatment/removal could occur.

Treatment/removal would consist of either hand removal or chemical treatment. Hand removal would be used when determined to be the best course of action (e.g., feasible, less expensive). When chemical treatment is the best course of action, Procellacor, a new herbicide expected to be available in 2018, is the recommended herbicide for a rapid response treatment of EWM. Assuming its advertised performance proves true:

- EWM could be treated at any time during the growing season because Procellacor is not expected to harm native plants.
- Quarantine is not needed because it is very fast acting and, consequently, dilution from untreated waters would not be expected to reduce treatment effectiveness.

The rapid response to a Eurasian watermilfoil infestation is as follows:

- 1) Hire a contractor to perform an aquatic plant survey to determine locations where Eurasian watermilfoil is found.
- 2) Design a treatment/removal program and post-treatment/removal monitoring program.
- 3) Apply for a MnDNR permit.
- 4) Apply for Hennepin County Rapid Response Grant monies.
- 5) Hire SCUBA divers to complete hand removal or hire contractor to complete chemical treatment with Procellacor at the dose on the product label.
- 6) Perform post-treatment point-intercept aquatic plant survey to evaluate treatment/removal effectiveness.
- 7) Review hydrologic connections with downstream waterbodies to determine if other waterbodies can be protected.
- 8) If post-treatment point-intercept aquatic plant survey indicates additional treatment is needed, repeat steps 2 through 6.
- 9) When EWM is no longer observed, regular SCUBA inspections will occur to search for reemerging plants. Whenever EWM is observed, repeat steps 2 through 6.

5.0 References

Larkin, Dan and Ranjan Muthukrishnan. 2017. Aquatic Plant Invasions: Ions and Drivers and Carp (Oh My). September 13, 2017 MAISRC Showcase.

https://www.maisrc.umn.edu/sites/maisrc.umn.edu/files/maisrc_showcase_talk_to_print.pdf. Retrieved December 12, 2017.

Minnesota Department of Natural Resources. 2013. Minnesota Rapid Response Plan for Aquatic Invasive Species. http://files.dnr.state.mn.us/natural_resources/invasives/rapid-response-ais.pdf. Retrieved December 11, 2017.

Minnesota Aquatic Invasive Species Research Center (MAISRC). 2017a. AIS in Minnesota. <https://www.maisrc.umn.edu/ais-mn>. Retrieved December 11, 2017.

MAISRC. 2017b. Learn the Facts About Zebra Mussels. https://www.maisrc.umn.edu/sites/maisrc.umn.edu/files/zebra_musselss_factsheet.pdf Retrieved December 8, 2017.

MAISRC. 2017c. Learn the Facts About Starry Stonewort. https://www.maisrc.umn.edu/sites/maisrc.umn.edu/files/starry_stonewort_factsheet.pdf. Retrieved December 12, 2017.

MAISRC. 2017d. Learn the Facts About Eurasian Watermilfoil. https://www.maisrc.umn.edu/sites/maisrc.umn.edu/files/ewm_factsheet.pdf. Retrieved December 12, 2017.

McCartney, Michael. 2017. Musseling Out Mussels: The Status of MAISRC Research on Zebra Mussel Prevention and Control. September 13, 2017 MAISRC Showcase. https://www.maisrc.umn.edu/sites/maisrc.umn.edu/files/mccartney_showcase_2017_09_13_final.pdf. Retrieved December 12, 2017.

Vanderploeg, Henry A., James R. Liebig, Wayne W. Carmichael, Megan A. Agy, Thomas H. Johengen, Gary L. Gahnenstiel, and Thomas F. Nalepa. 2001. Zebra Mussel (*Dreissena polymorpha*) Selective Filtration Promoted Toxic Microcystis Blooms in Saginaw Bay (Lake Huron) and Lake Erie. *Can. J. Fish. Aquat. Sci.* 58: 1208-1221.

Wisconsin Department of Natural Resources. 2012. Aquatic Plant Eurasian Watermilfoil. <http://dnr.wi.gov/topic/Invasives/documents/classification/Myriophyllum%20spicatum.pdf>. Retrieved on December 12, 2017