

## Best Practices for Filtration of Infested Waters

### Background and Purpose

**Any water taken from an infested water of the state requires a permit from DNR.** A Water Appropriation Permit from the DNR is required for all users withdrawing more than 10,000 gallons of water per day or 1 million gallons per year. An Infested Waters Permit from the DNR is required when lower water volumes are withdrawn. [Click here](#) to learn more about water use permits. Please contact your [Invasive Species Specialist](#) for best practices in preventing the spread of aquatic invasive species or your [Area Hydrologist](#) concerning water appropriation permitting requirements.

The following is a guide for contractors and permit applicants who are required to filter aquatic invasive species during dewatering situations. Ideally permit applicants should try to find alternative water sources whenever possible before dewatering infested waterbodies. Examples below are intended to provide ideas concerning potential filtration equipment needs. Filtration of infested water may not be required in all instances. This document should be used for guidance purposes only and is not an endorsement from the DNR.

### General Application Tips

- **Plan Ahead:** Most dewatering projects can be planned well in advance. When removing water from an infested waterbody ([listed here](#)), additional planning is needed to select the best discharge location and obtain suitable filtration equipment if required. To avoid potential spread of AIS, priority should always be given to discharging back to the same waterbody. If this is not feasible, discharging onto land may be an option. When the only practical discharge option is to an un-infested water, filtration is required. Additional filtration requirements might be added based on project type.
- **Consult DNR for Guidance:** Your DNR Area Hydrologist and DNR Aquatic Invasive Species Specialist can help identify project requirements and options.
- **Understand Equipment and Limitations:** All filtration equipment come with critical maintenance requirements that must be followed to maintain optimal performance.



**Figure 1.** (left) Eurasian watermilfoil, (right) zebra mussels- both are prohibited invasive species in the state of Minnesota. Source: MPR

## Water Filtration Requirements by Aquatic Invasive Species

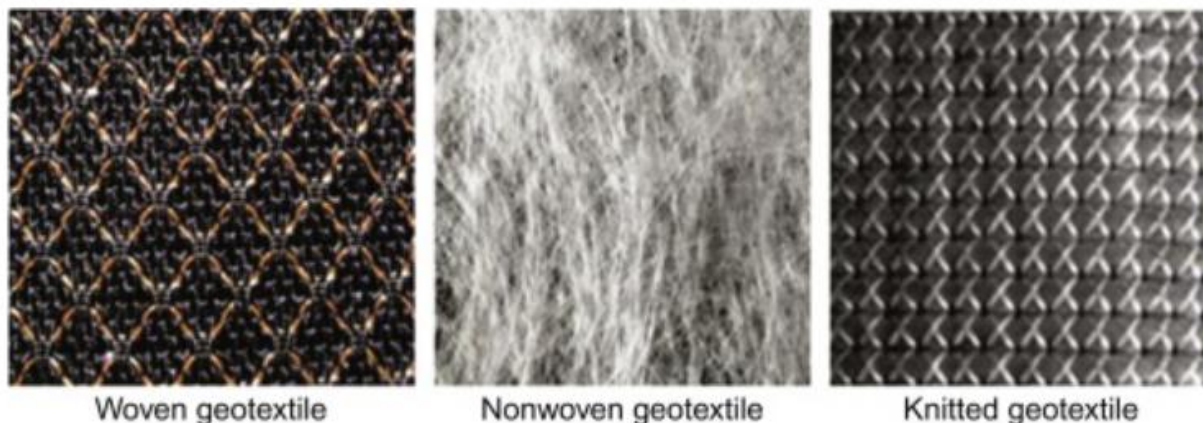
**Table 1.** AIS guidelines of filtration sizes to prevent spread during infested water appropriation activities. Table includes life stages of AIS species and filtration size requirements in order to reduce the likelihood of spread during dewatering activities. Filtration size is in microns ( $\mu\text{m}$ )

Source Water Infested with	Life Stage	Minimal Filter Size
Eurasian watermilfoil	plant fragments	$\leq 1 \text{ mm}$ (1000 $\mu\text{m}$ )
Faucet snails	juveniles	$\leq 0.4 \text{ mm}$ (400 $\mu\text{m}$ )
Flowering rush	seed	$\leq 1 \text{ mm}$ (1000 $\mu\text{m}$ )
New Zealand mud snail	adult	$\leq 0.4 \text{ mm}$ (400 $\mu\text{m}$ )
Spiny water flea	resting eggs (ephippia)	$\leq 0.25 \text{ mm}$ (250 $\mu\text{m}$ )
Starry stonewort	bulbils	$\leq 1 \text{ mm}$ (1000 $\mu\text{m}$ )
Zebra & quagga mussels	veliger (larvae) – early stage	$\leq 0.035 \text{ mm}$ (35 $\mu\text{m}$ )

## Water Filtration Equipment Considerations for Pumping Infested Water

Temporary and/or permanent filtration systems are available and choosing the optimum one is based on specific project and permitting requirements. There are many options for filtration, therefore this is not an exhaustive list. Applicants should research options based on individual project requirements and filtrations needs.

### Examples of Mesh Filtration Types



**Figure 2.** Example of mesh filter types using geotextile fabrics (Anjan 2019). Some permanent filtration systems use other filtration materials such as woven or rigid stainless steel.

*Examples of Filtration Equipment (Temporary or Permanent Solutions)*

**Table 2.** Products that could be potentially used for a dewatering projects with AIS. Recommended usage, manufacture and product examples are included. This is not an exhaustive list nor should it be taken as an endorsement from the DNR.

Products	Recommended Use	Manufacturer(s)	Example Product
<b>Filter Bags</b>	Lower flow rate or shorter duration	Rain for Rent	100 gpm to 4,000 gpm units
<b>Filtration Units</b>	Higher flow rate or longer duration	PRM Filtrations	Single and double multi-bag housing skid
		Filtra Systems	Six, eight or twelve bag housing units
<b>Self-Cleaning Filtration Units</b>	Higher flow rate, longer duration or minimal maintenance	Amaid Inc.	20-40 micron units
		Orval Filters	OR or ORS Series
<b>Custom Application (Mesh Filters)</b>	Needed for unique circumstances	Propex Operating Company, LLC	GEOTEX 1001 (0.15mm)

## Case Studies

### McMahon Lake, Scott County (AIS CONCERN: EURASIAN WATERMILFOIL)

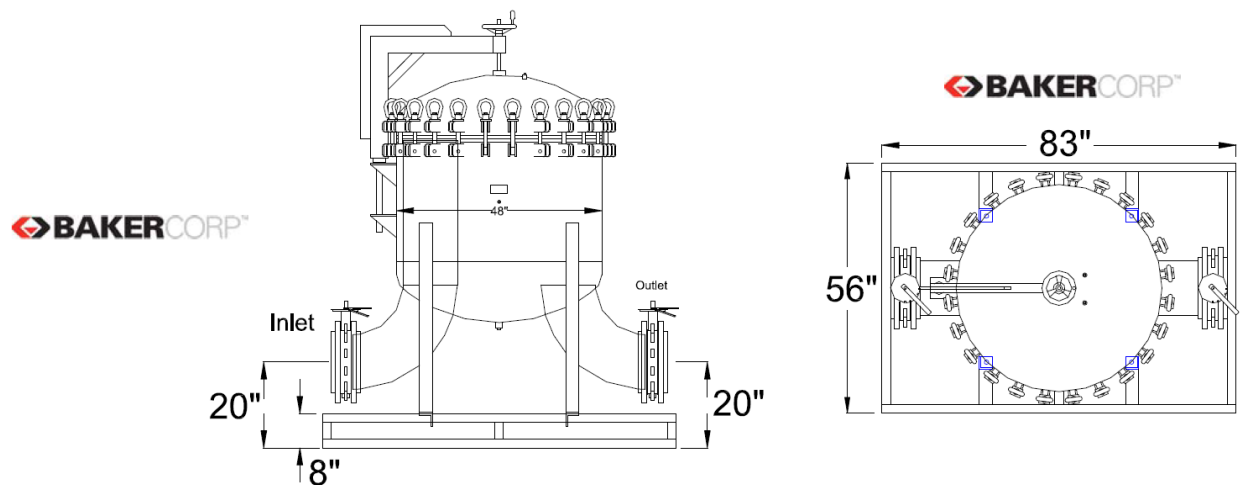
*Problem:* McMahon Lake does not have a natural outlet. High water was causing shoreline erosion. Scott County requested a temporary drawdown of the lake by pumping into a nearby roadside ditch that leads to St. Catherine Lake (not infested).

*Gallons:* 65 MGY

*Rate:* 1,347 GPM

*Resulting Actions:* 500 micron filtration prior to discharge and permit included a condition requiring the pump intake be placed as deep as practicable in the lake to reduce screen fouling and reduce uptake of aquatic plant fragments. Equipment entering and exiting the water body needs to be inspected for aquatic hitchhikers.

*Product Used:* 12 Inch Carbon Steel, 23-Bag Filter System by BakerCorp



### Saint Paul Regional Water Services (SPRWS), Ramsey County (AIS CONCERN: ZEBRA MUSSELS)

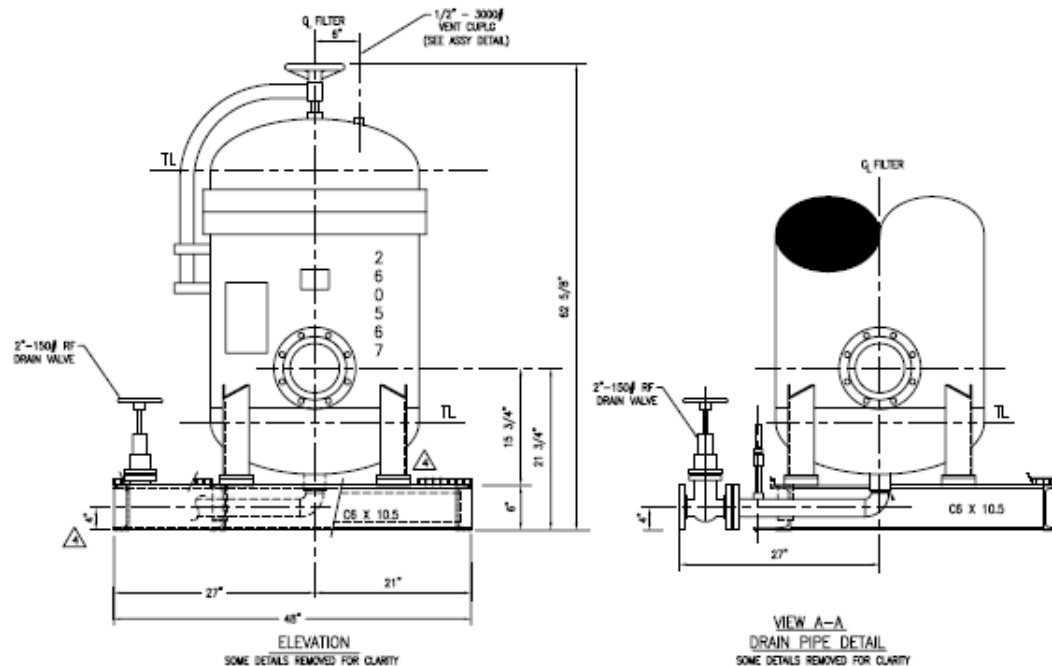
*Problem:* Staff identified a need to repair a conduit that carries raw water between the Mississippi River (infested with zebra mussels) and the SPRWS' lake system. Temporary dewatering was needed to allow for inspection and repair. Discharge was on site near Rice Creek (not infested) and was directed to turf areas/ditches along the roadways, storm sewer catch basins, or lowland/wetland areas that will not adversely impact adjacent properties.

*Gallons:* 0.3MGY

*Rate:* 1,700 GPM

*Resulting Actions:* Filter infested water (<35 µm) from conduits before discharging

*Product Used:* Trailer mounted BF1000 Bag filter with 1 micron filter by *Liquid ingenuity (Rain for Rent)*



#### Quarry Lake, Scott County (AIS CONCERN: EURASIAN WATERMILFOIL)

Problem: Need to dewater Quarry Lake (infested with Eurasian watermilfoil) due to flooding concerns from high water levels resulting in erosion and infrastructure impacts. The water was discharged through a constructed storm water pond to the Prior Lake Outlet Channel which leads to Blue Lake (not infested) and the Minnesota River.

Gallons: 100 MGY

Rate: 3,000 GPM

Resulting Actions: 500 micron filtration prior to discharge and permit included a condition requiring the pump intake be placed as deep as practicable in the lake to reduce screen fouling and reduce uptake of aquatic plant fragments. Equipment entering and exiting water body needs to be inspected for aquatic hitchhikers.

*Product Used:* Dewatering Bags, 250 micron Screen Mesh on intake pipe by *EnviroZone (Rain to Rent)*