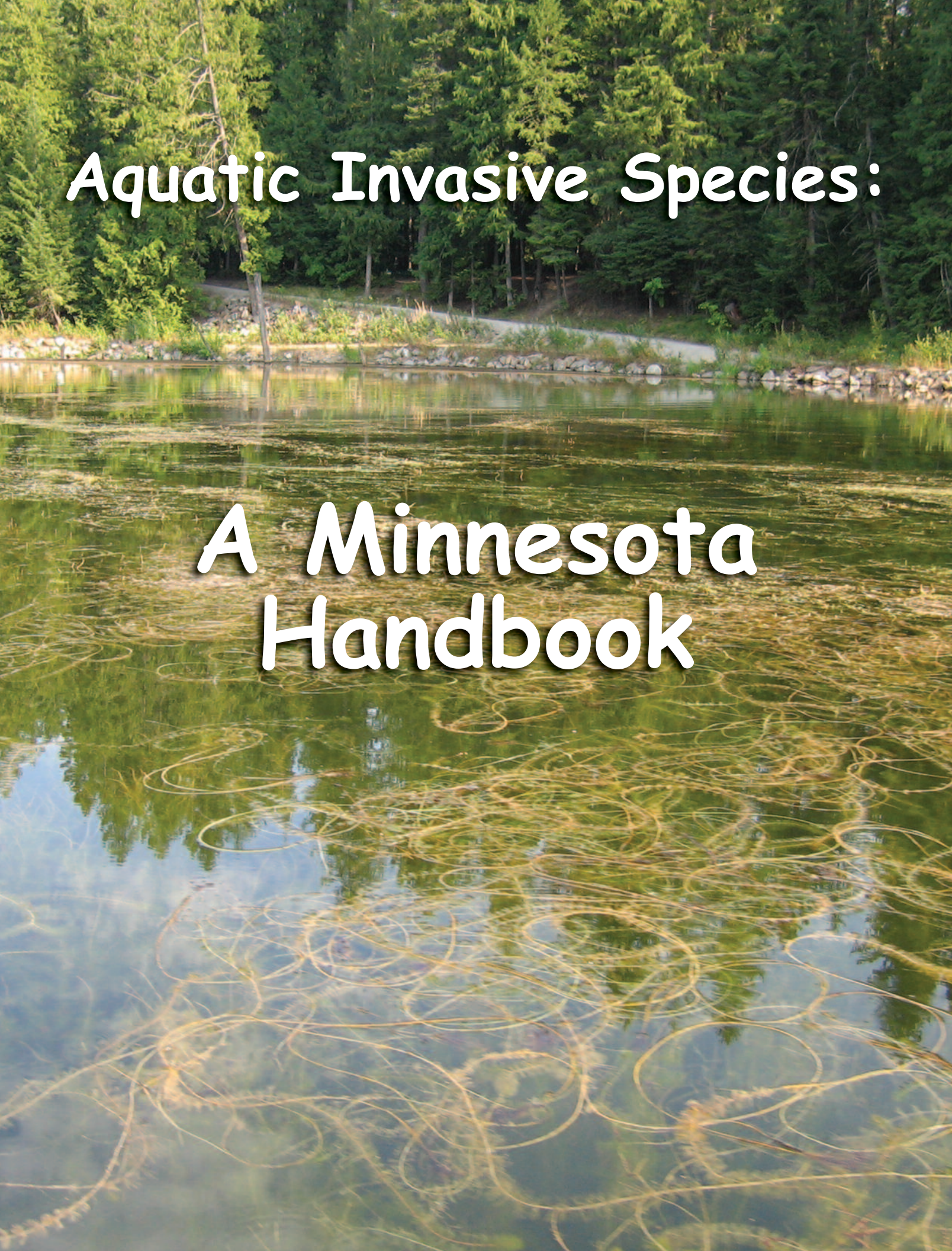




Aquatic Invasive Species:

**A Minnesota
Handbook**

When is the best time to search for these invasive species?

most visible

less visible

least visible

Common Name	Scientific Name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	
AIS INVERTEBRATES														
Zebra Mussel	<i>Dreissena polymorpha</i>	under ice; die where frozen or ice scoured				larger, prior-year(s) shells visible on hard surface			**small, current-year shells visible on hard surface**			under ice		
Quagga Mussel	<i>Dreissena rostriformis bugensis</i>	under ice; die where frozen or ice scoured				larger, prior-year(s) shells visible on hard surface			**small, current-year shells visible on hard surface**			under ice		
Faucet Snail	<i>Bithynia tentaculata</i>	under ice; die where frozen or ice scoured				snails from current and prior year(s) on lake bottom or other surface						under ice		
Spiny Waterflea	<i>Bythotrephes longimanus</i>	eggs lie dormant on lake bottom				daytime: in deep or dark water nighttime: near surface					adults die		eggs dormant	
Fishhook Waterflea	<i>Cercopagis pengoi</i>	eggs lie dormant on lake bottom				daytime: in deep or dark water nighttime: near surface					adults die		eggs dormant	
AIS PLANTS														
Eurasian Watermilfoil	<i>Myriophyllum spicatum</i>	plant under ice				plant growth	may form floating mat at surface			plants die back			small plants under ice	
Curly-leaf Pondweed	<i>Potamogeton crispus</i>	small growth of plants under ice				plant growth	may form floating mat at surface		plants die back			new plants sprout		
Hydrilla	<i>Hydrilla verticillata</i>	plant under ice				plant growth	plant forms floating mats at surface			plants die back		plant under ice		
Brazilian Waterweed	<i>Egeria densa</i>	plant under ice				plant growth	plant forms floating mats at surface			plants die back		plant under ice		
Purple Loosestrife	<i>Lythrum salicaria</i>	plant dormant				plant growth		flowering			plants die back		plant dormant	
Flowering Rush	<i>Butomus umbellatus</i>	plant dormant				plant growth		flowering		plants die back			plant dormant	

Important search times for **early detection of zebra and quagga mussels** All dates are approximate.

Table of Contents

What to look for	Invasive  Native 	Common Name	Scientific Name
Small "clams"		Quagga Mussel	<i>Dreissena rostriformis bugensis</i>
		Zebra Mussel	<i>Dreissena polymorpha</i>
		Fingernail Clams	<i>Musculium</i> spp., <i>Sphaerium</i> spp.
Tiny snails		Limpet Snails	<i>Pisidium</i> spp. <i>Ferrissia</i> spp.
		Faucet Snail	<i>Bithynia tentaculata</i>
		Fossaria Snails	<i>Lymnaea</i> spp. and <i>Fossaria</i> spp.
Gelatinous mass on fishing line		Spiny Waterflea	<i>Bythotrephes longimanus</i>
		Fishhook Waterflea	<i>Cercopagis pengoi</i>
		Native Waterflea	<i>Leptodora kindtii</i>
Underwater plants with delicate, feathery leaves		Eurasian Watermilfoil	<i>Myriophyllum spicatum</i>
		Northern Watermilfoil	<i>Myriophyllum sibiricum</i>
		Coontail	<i>Ceratophyllum demersum</i>
		White Water Crowfoot	<i>Ranunculus aquatilis</i>
		Water-Marigold	<i>Bidens (Megalodonta) beckii</i>
		Common Bladderwort	<i>Utricularia vulgaris</i>
Underwater plants with "lasagna" leaves		Curly-leaf Pondweed	<i>Potamogeton crispus</i>
		Robbins' Pondweed	<i>Potamogeton robbinsii</i>
		Other Native Pondweeds	<i>Potamogeton</i> spp.
		Water-celery (Eelgrass)	<i>Vallisneria americana</i>
Underwater plants with small whorled leaves		Hydrilla	<i>Hydrilla Verticillata</i>
		Brazilian Waterweed	<i>Egeria densa</i>
		Common Waterweed (Elodea)	<i>Elodea canadensis</i>
		Slender Waterweed	<i>Elodea nuttallii</i>
Magenta flower spike atop a 3-9 foot wetland plant		Purple Loosestrife	<i>Lythrum salicaria</i>
		Fireweed	<i>Epilobium angustifolium</i>
		Blazing Stars	<i>Liatris</i> spp.
		Hedgenettles (Woundworts)	<i>Stachys</i> spp.
Large, pink flower cluster atop a 3-7 foot wetland plant		Flowering Rush	<i>Butomus umbellatus</i>
		Joe Pye Weeds	<i>Eutrochium</i> spp.
		Swamp Milkweed	<i>Asclepias incarnata</i>

Zebra Mussel
Dreissena polymorpha



Zebra mussel—actual size



Photo courtesy of USDA NRCS

Quagga Mussel
Dreissena rostriformia bugensis



Quagga mussel—actual size



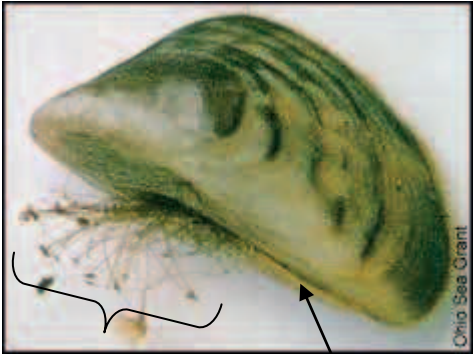
Photo courtesy of USDA NRCS

Quagga mussels (left) Zebra mussels (right)



Adapted from California Dept of Fish and Game

Attachment threads are unique to **Quagga** and **Zebra mussels** in Minnesota lakes



attachment threads
hinge area long and flat

Zebra mussels attached to a native clam



D. P. Molloy

Fingernail Clams

Musculium spp., *Sphaerium* spp. and *Pisidium* spp.



Lake fingernail clam
Musculium lacustre
and dime, actual size.



Striated fingernail clam
Sphaerium striatinum
and dime, actual size.



Andrew Hicks et al.



x 5

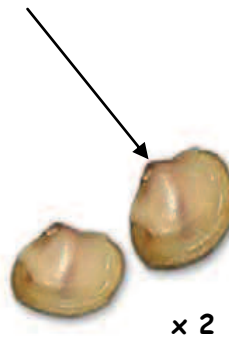
hinge area short and rounded
with **no** attachment threads



x 2

Andrew Hicks et al.

Pea clam
Pisidium sp.
and dime, actual size.



x 2

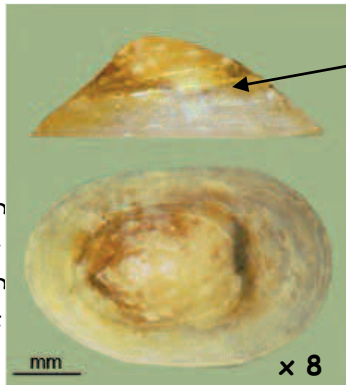
Peter Walker

Limpet Snails

Ferrissia spp.



Ferrissia rivularis



www.fwgna.org

mm

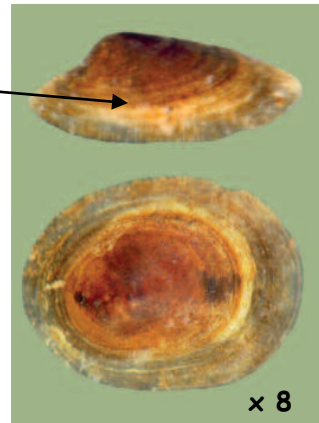
x 8

single shell
with no hinge



Limpets on plant

Ferrissia fragilis



www.fwgna.org

x 8

Faucet Snail

Bithynai tentaculata



Roger Haro, River Studies Center, UW-La Crosse



MN DNR



Amy Benson USGS



MN Sea Grant

Since it is difficult to distinguish the native snails from the non-native, invasive Faucet snail, ***please report every occurrence of tiny snails.***

Fossaria Snails

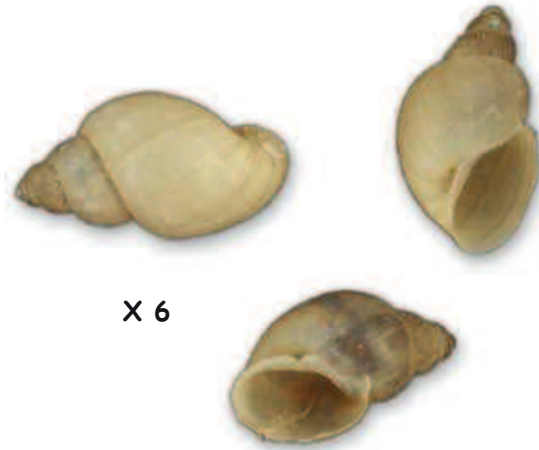
Lymnaea spp. and *Fossaria* spp.



Pygmy fossaria

Lymnaea parva

and dime, actual size.



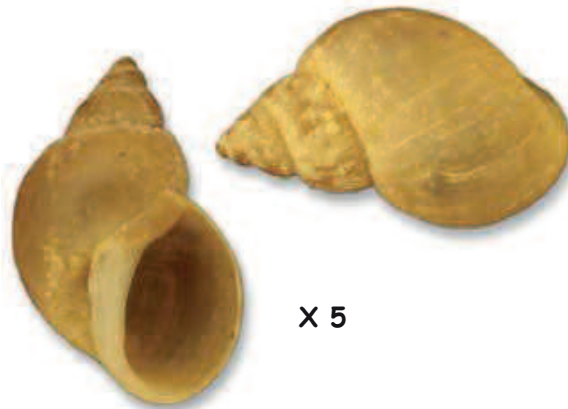
X 6

Andrew Hicks et al.

Prairie fossaria

Fossaria bulimoides

and dime, actual size.



X 5

Andrew Hicks et al.

Since it is difficult to distinguish the native snails from the non-native, invasive Faucet snail, ***please report every occurrence of tiny snails.***

Spiny Waterflea

Bythotrephes longimanus



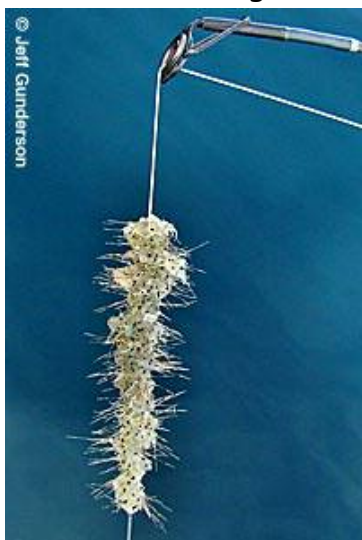
and

Fishhook Waterflea

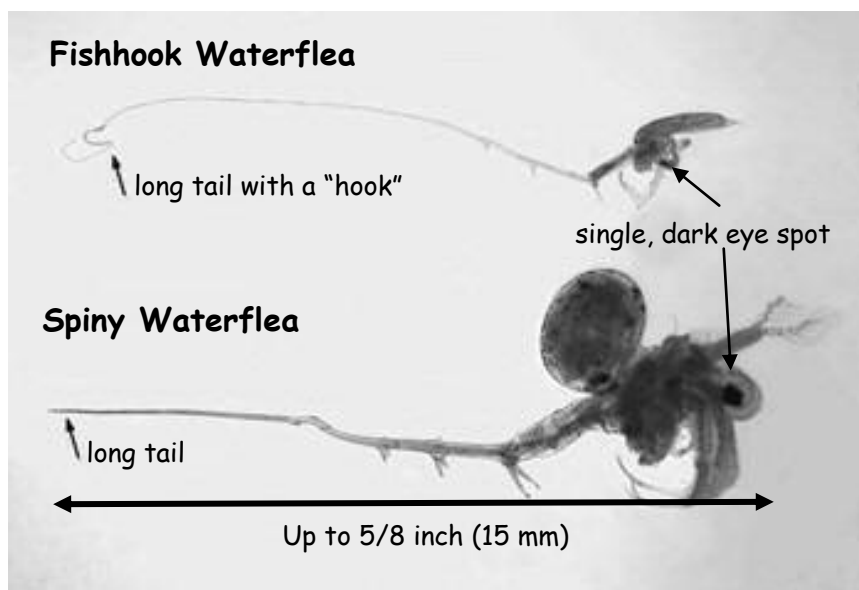
Cercopagis pengoi



Spiny Waterflea—gelatinous mass on fishing line



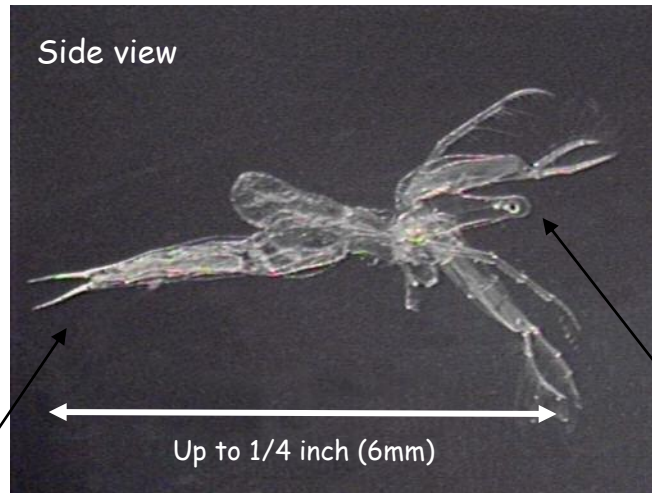
Spiny Waterflea—actual size



Since it is difficult to distinguish the native *Leptodora* from these non-native, invasive waterfleas, ***please report all occurrences of gelatinous masses found on fishing lines, anchor ropes, and/or downrigger cables.***

Native Waterflea

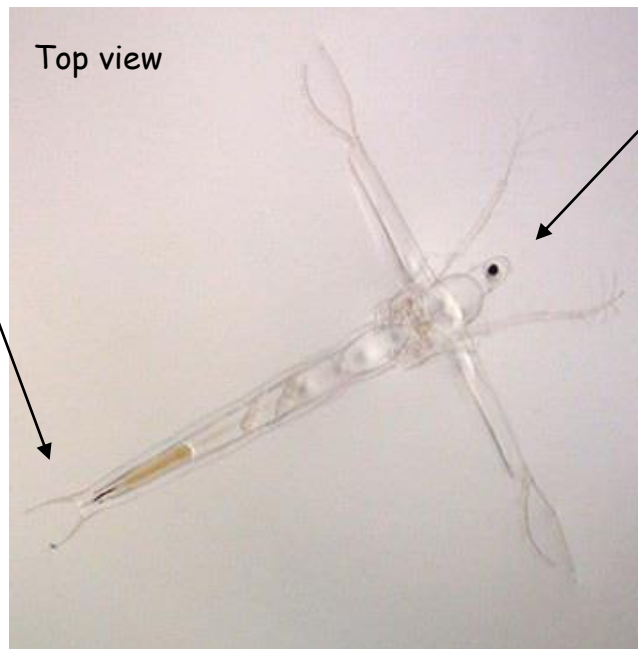
Leptodora kindtii



Adapted from: Zooplankton Project <http://www.cnas.missouristate.edu/zooplankton/default.htm>

short,
forked "tail"

single, dark
eye spot



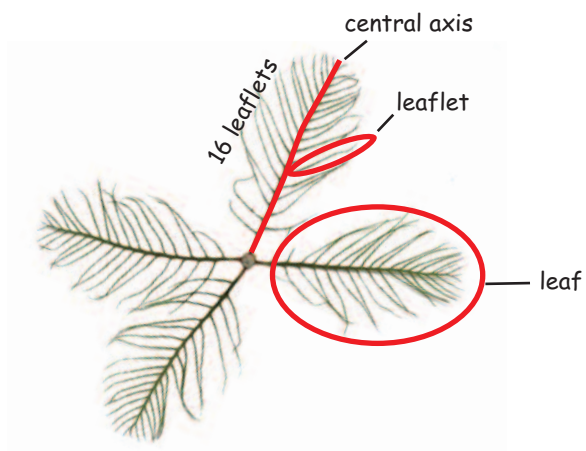
Adapted from cfb.unh.edu

Gelatinous mass on fishing line

Since it is difficult to distinguish the native *Leptodora* from the non-native, in-vasive waterfleas, ***please report all occurrences of gelatinous masses found on fishing lines, anchor ropes, and/or downrigger cables.***

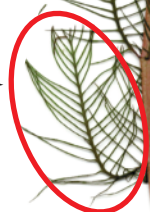
Eurasian Watermilfoil

Myriophyllum spicatum



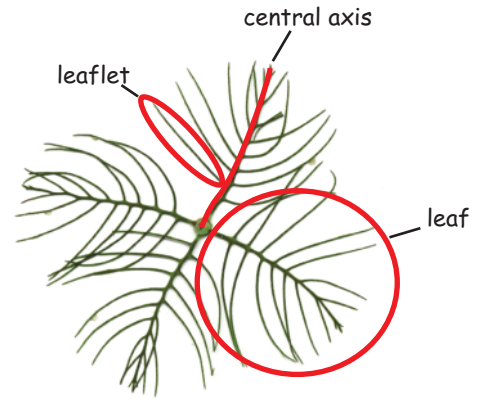
(Hint: count leaflets on one side of central axis - number of leaflets range from 12-21)

leaf →



Northern Watermilfoil

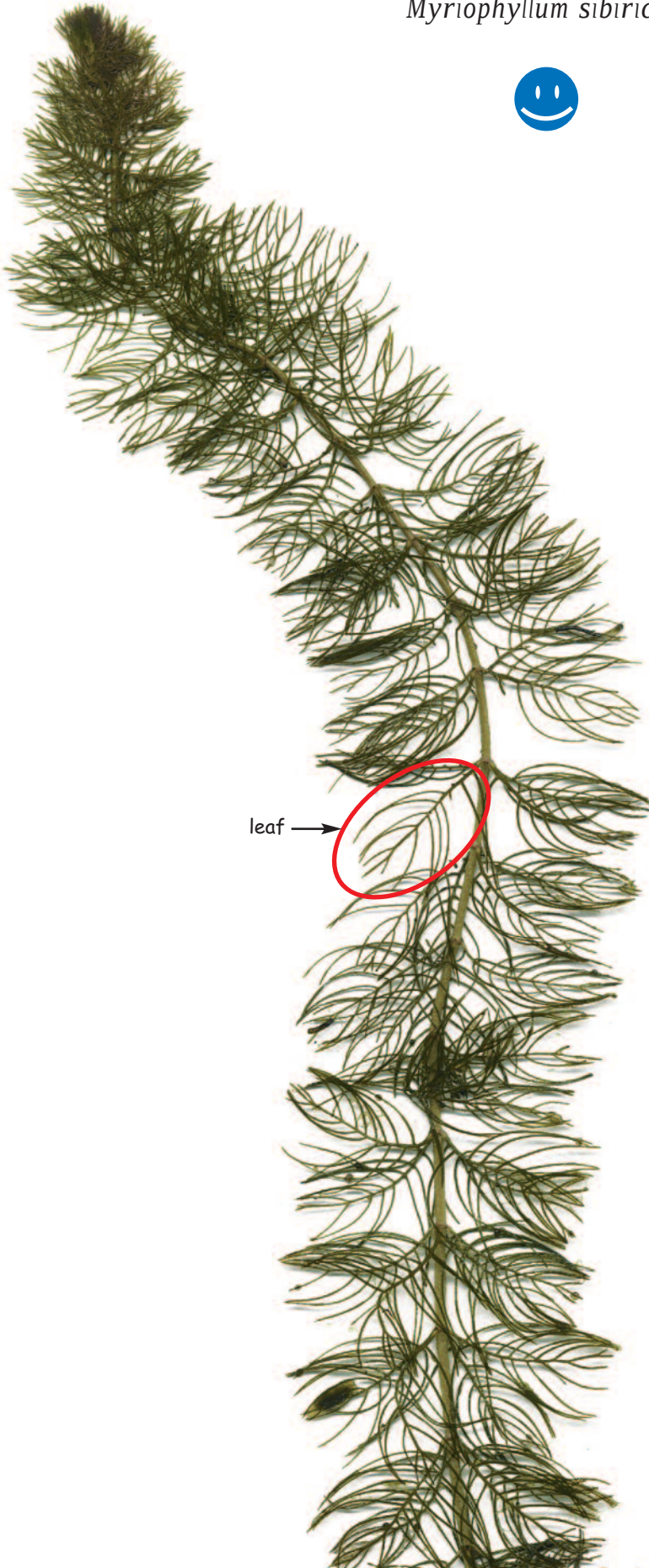
Myriophyllum sibiricum



usually 12 or fewer pairs
of leaflets

(Hint: count leaflets on one side
of central axis)

leaf →



Underwater plants with delicate, feathery leaves

Coontail

Ceratophyllum demersum



leaves forked
(no central axis)



White Water Crowfoot

Ranunculus aquatilis



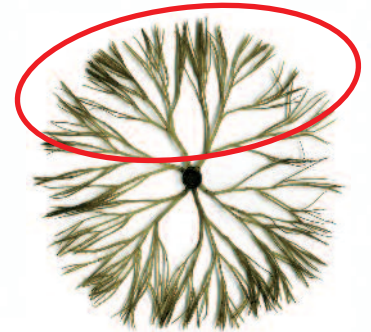
Underwater plants with delicate, feathery leaves

Water-Marigold

Bidens (Megalodonta) beckii



leaf continuously branching
(no central axis)



Common Bladderwort

Utricularia vulgaris



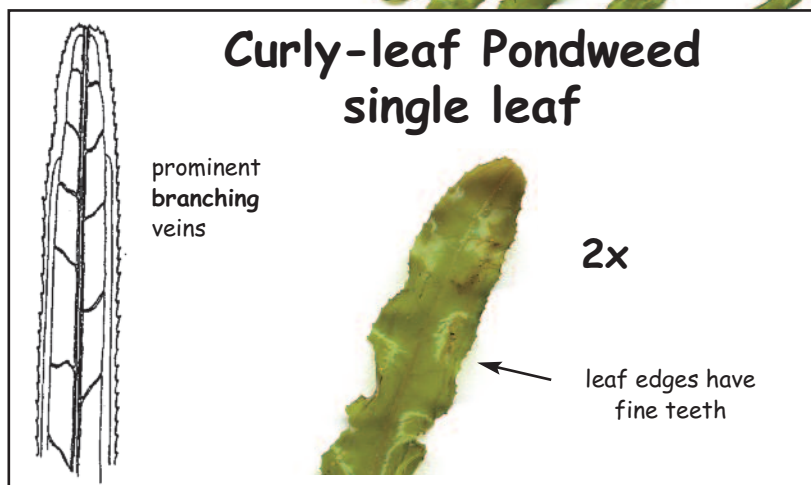
leaf
continuously
branching
(no central
axis)

small sacs or "bladders"
attached to leaves capture
tiny critters (= carnivore)

Underwater plants with delicate, feathery leaves

Curly-leaf Pondweed

Potamogeton crispus



Robbins' Pondweed

Potamogeton robbinsii



Underwater plants with "lasagna" leaves

Fern Pondweed single leaf



leaves
have
prominent
parallel veins
(hold up
to light)

leaf
edges have
fine teeth
(use
magnifying
glass)



Other Native Pondweeds

Potamogeton spp.

Clasping-leaf Pondweed
Potamogeton richardsonii



Variable-leaf Pondweed
Potamogeton gramineus



leaf edges
have no teeth

Flat-stem Pondweed
Potamogeton zosteriformis

Alpine Pondweed
Potamogeton alpinus



Plants shown in reduced size - for illustration purposes only.

Water-celery (Eelgrass)

Vallisneria americana

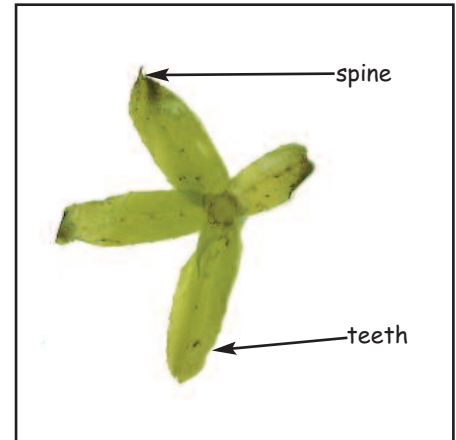


leaf edges
have no teeth

Underwater plants with "lasagna" leaves

Hydrilla

Hydrilla verticillata



- Non-native invasive plant that closely resembles Elodea.
- Bright green leaves (usually 4-5) in each whorl.
- Leaves have visible teeth and small spines on the underside.

For more information on this plant go to:
www.uwsp.edu/cnr/uwexlakes/CLMN/publications.asp

Brazilian Waterweed

Egeria densa



leaf edges have very small serrations

2x Life-size. Very leafy appearance.
Leaves in whorls of 4 to 6.

Common Waterweed (Elodea)

(*Elodea canadensis*)



Small, lance-shaped leaves attach directly to stem in whorls of 3.

Leaves crowded toward tip of stem.

Occasionally leaves will grow in whorls of 2.

No teeth or spines on leaf margins.



Slender Waterweed

Elodea nuttallii



Leaves evenly spread out
along tip of stem.

More delicate in structure with narrower
stems and finer leaves than Elodea.

Leaves pointed and arranged in
whorls of 3 or 4.

No teeth or spines on
leaf margins.

Underwater plants with small whorled leaves on long stems

Purple Loosestrife

Lythrum salicaria



leaf edges are smooth (have no teeth)

stems are angular (usually square)

Blazing Stars

Liatris spp.



round stem



Magenta flower spike atop a 3-9 foot wetland plant



Magenta flower spike atop a 3-9 foot wetland plant

Fireweed

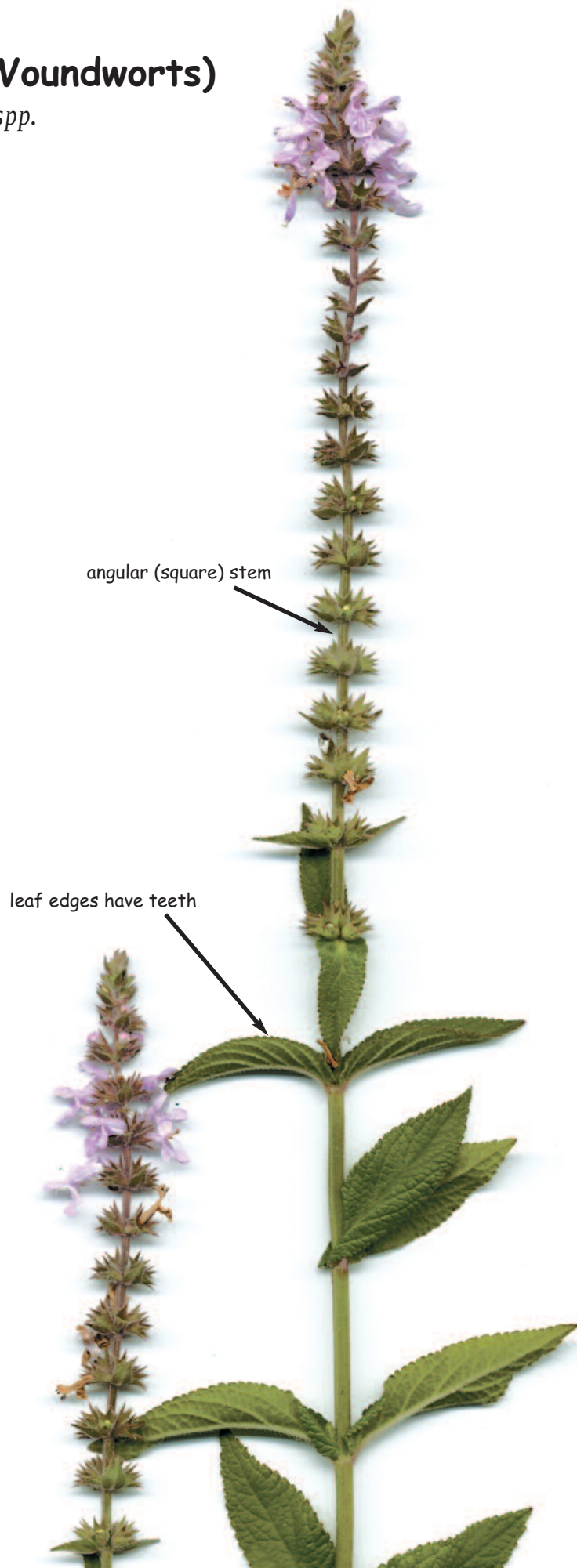
Epilobium angustifolium



round stem

Hedgenettles (Woundworts)

Stachys spp.

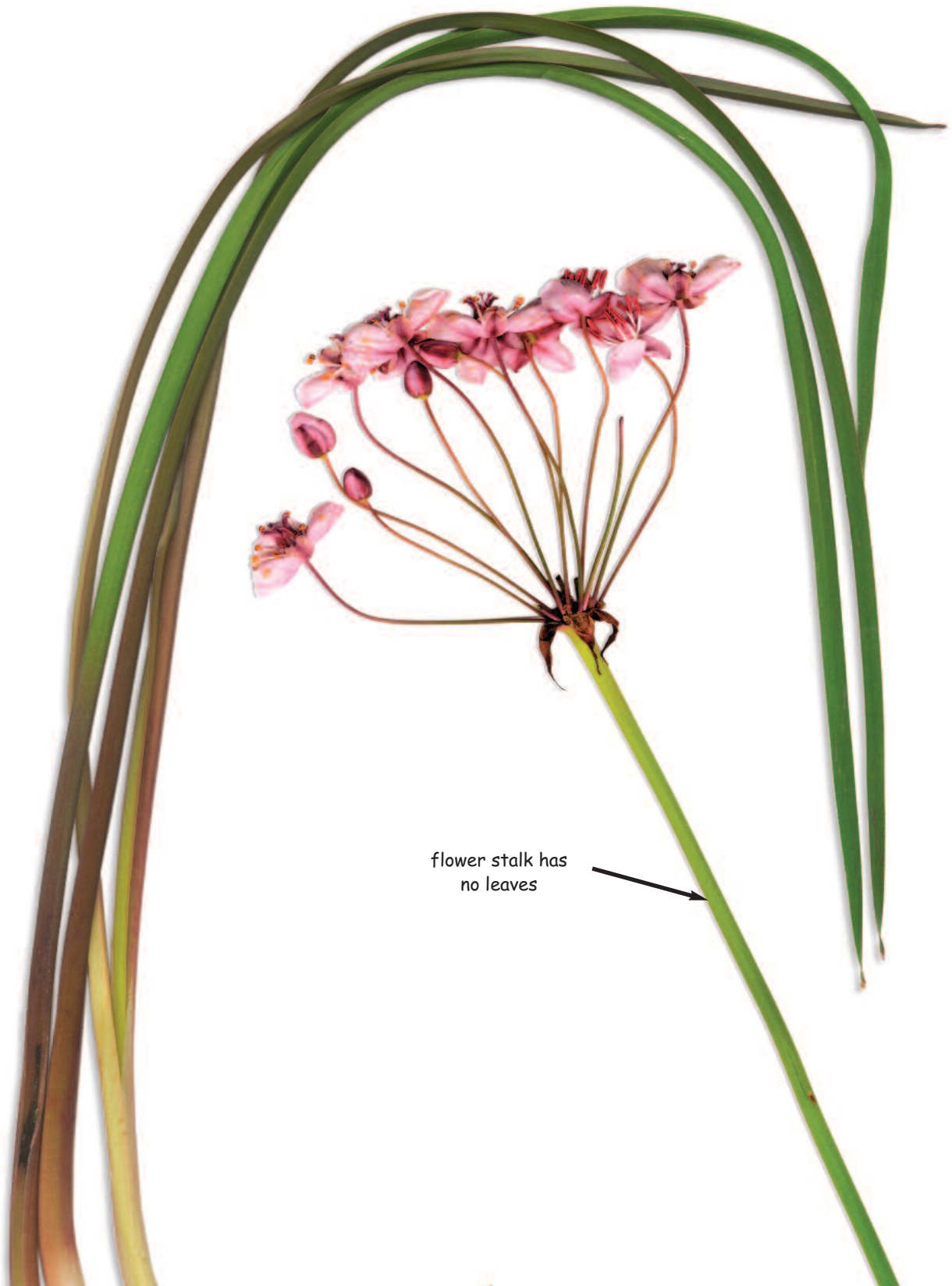


Magenta flower spike atop a 3-9 foot wetland plant

Large, pink flower cluster atop a 3-7 foot wetland plant

Flowering Rush

Butomus umbellatus



flower stalk has
no leaves



Joe Pye Weeds

Eutrochium spp.



flower stalk
has leaves



Large, pink flower cluster atop 3-7 foot wetland plant

Swamp Milkweed

Asclepias incarnata



flower stalk has leaves

For more information about Minnesota aquatic invasive species go to:

MN Department of Natural Resources -

<http://dnr.state.mn.us/nr/plants/aquatic/index.html>

MN Sea Grant - <http://www.seagrant.umn.edu/ais/index>

MN AIS Research Center - <http://www.maisrc.umn.edu/>



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**Information included from U of MN Extension,
MN DNR and MN Sea Grant resources.**

To purchase additional copies or customized booklets for your area,
contact: vjhaack@gmail.com



