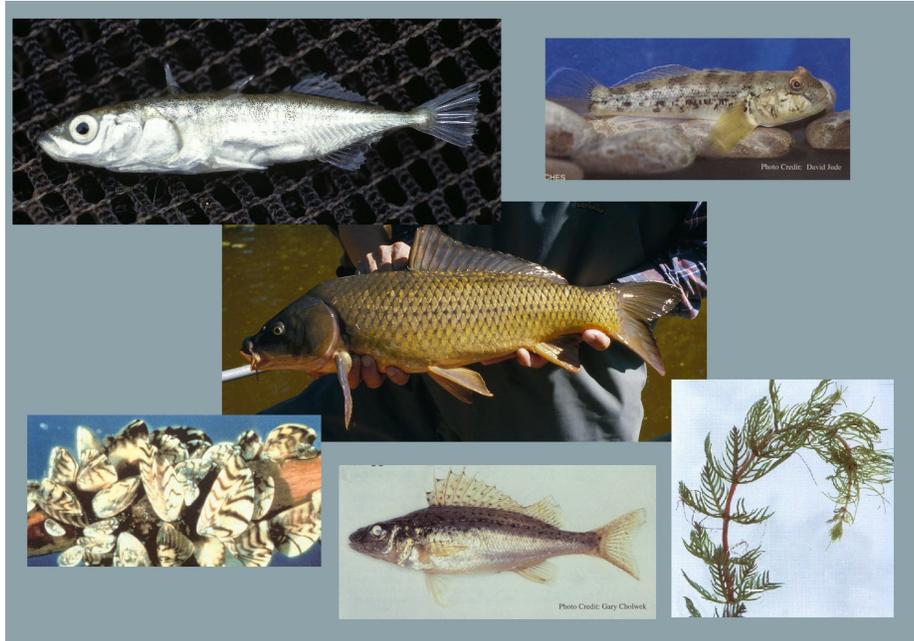


Dane County Aquatic Invasive Species Prevention and Control Plan



Prepared by:

Dane County Office of Lakes and Watersheds
In Cooperation with Major Dane County Stakeholder Groups

June 2009

DANE COUNTY AQUATIC INVASIVE SPECIES PREVENTION AND CONTROL PLAN

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INTRODUCTION

The Dane County Office of Lakes and Watersheds prepared the Aquatic Invasive Species Prevention and Control Plan with input from major stakeholder groups. See Appendix A for a listing of the stakeholders who reviewed the plan.

Early in the process in September 2008, Dane County stakeholder groups were invited to participate directly in the development of the plan by submitting comments and suggestions to the Office of Lakes and Watersheds. Upon completion of the draft plan in March 2009, stakeholder groups were invited to review the plan. The Office of Lakes and Watersheds also held public meetings in April 2009 to gather input. Revisions were then made to the plan based on comments received from the public and stakeholder groups. A final copy of the plan was submitted to the Dane County Lakes and Watershed Commission and the Wisconsin Department of Natural Resources for their approval in June 2009.

This plan addresses prevention and control strategies for aquatic invasive species considered to be truly aquatic that are transported via aquatic pathways. Wetland species, such as Japanese knotweed, Japanese hops, Phragmites and reed canary grass are also included in this plan. But they need to be addressed in a terrestrial plan as well because these wetland species are transported via both terrestrial and aquatic pathways.

EXECUTIVE SUMMARY

Aquatic invasive species (AIS) have long been recognized as a serious problem in Wisconsin and Dane County. This plan is intended to serve as a guide for the county in developing a proactive response to problems associated with aquatic invasive species. Plan implementation will involve the county working together with stakeholder groups, surrounding counties, and the state to prevent the introduction and transport of aquatic invasive species into Dane County waters. This approach will help provide regional consistency in controlling and managing AIS.

The focus of the plan is to limit the impacts of AIS by controlling their initial introduction and subsequent transfer from one water body to another. The prevention strategies contained in the plan rely heavily on information, education and outreach efforts, and also a full range of other strategies and components needed to implement an effective prevention program. The other components of the plan include monitoring, early detection and rapid response strategies, watercraft inspection efforts, biological controls, and policy/legislative initiatives.

This plan contains three major goals to prevent, control, and abate AIS:

- 1) Prevent new introductions or dispersal of aquatic invasive species into Dane County waters.
- 2) Develop management strategies to limit the spread of existing AIS in Dane County waters and other counties.
- 3) Abate, or where possible, eliminate the impacts caused by established AIS in Dane County waters.

Three summary tables include specific tasks and actions that will be undertaken to achieve each of the goals. Also included in the tables under each action are the lead entity(ies) for implementation (usually the county) and the cooperating partner organizations, and the status for each initiative. The summary table serves as a work plan for implementing specific actions aimed at preventing new introductions and managing and controlling AIS in Dane County waters.

The actions detailed in the work plan identify specific tasks required to effectively address the AIS problems facing the county. The AIS plan, if approved by DNR, would qualify the county for state grant funds to help implement the plan. In addition, the AIS plan will assist in developing funding recommendations for the 2010 and subsequent county budgets.

Annually, the county will examine and monitor the progress in meeting the goals detailed in the plan and will make refinements to the management actions as needed.

BACKGROUND ON DANE COUNTY'S WATER RESOURCES

Dane County contains part or all of 20 different watersheds that comprise a portion of four different basins including the Lower Wisconsin River Basin, the Grant-Platte-Sugar-Pecatonica River Basin, the Upper Rock River Basin, and the Lower Rock River Basin. The county contains 68 named lakes and ponds covering 33 square miles and 52 named streams and rivers extending 421 miles plus 14 miles of the Wisconsin River. The total surface water acreage in Dane County is 26,748 acres or 36 square miles. Dane County also contains 52,000 acres of wetlands (Dane County Land & Water Resources Department, 2008).

In the Rock River Basins, deep glacial deposits dammed up large valleys to form the Yahara Chain of lakes and wetlands, all of which are connected by the Yahara River. Lakes Mendota, Monona, Waubesa, Kegonsa and Wingra, that flows into Lake Monona, are all drainage lakes and comprise the Yahara chain of lakes. In the western portion of the county the land is not glaciated, and as a result the area generally lacks natural lakes. The exception is in the northwestern part of the county where Crystal, Mud and Fish Lakes are located. All three of these are classified as seepage lakes.

Many streams in the western, non-glaciated, part of the county have gravel rubble bottom with steeper topography compared to streams located in the eastern portion of the county. More details on the water resources of Dane County are contained in the Dane County Land and Water Resources Management Plan published in 2008 and the State of the Waters report (found at www.danewaters.com).

BACKGROUND ON AIS IN DANE COUNTY

This section provides a summary of the problems, concerns and threats posed by aquatic invasive species to Dane County waters. Several aquatic invasive species, such as Eurasian water-milfoil, curly-leaf pondweed, purple loosestrife, rusty crayfish, zebra mussels, *Cylindrospermopsis*, and common carp are already present in the waters of Dane County and some of them are causing major problems. Table 1 list all the named lakes and ponds in Dane County and which ones are reported with AIS.

Several other AIS could invade Dane County waters. Some examples of these species include silver and bighead carp (two of the four species of Asian carp), hydrilla (potentially worse than Eurasian water-milfoil), spiny and fish hook water fleas (zooplankton species) and Quagga mussels (a cousin of the zebra mussel). Hydrilla is currently not found in Wisconsin waters, but the spiny and fish hook water fleas and Quagga mussels are found in lakes Michigan and Superior and the bighead and silver carp have been reported in the Mississippi River near LaCrosse. Controlling the spread of these and other species will be a major challenge to the resource managers of Dane County.

A number of AIS, initially introduced into the Great Lakes, were subsequently transported to inland Wisconsin waters by boats or via other pathways. The environmental and socioeconomic costs resulting from AIS infestations will continue to rise with new introductions. Although an awareness of the problems caused by AIS is emerging in Wisconsin and Dane County, the solutions to these problems are not always readily apparent.

The introduction of AIS via the discharge of ballast water to the Great Lakes has been well documented, but other vectors of transport have not been as well studied. Almost any transfer of aquatic life can become a carrier, and therefore a source of introduction of AIS. As a result, aquaculture operations, the sale and distribution of fishing bait, the pet trade, and individual boaters and anglers can unintentionally transfer aquatic invasive species.

Natural vectors can also cause the spread of invasive species, e.g. aquatic birds, windblown seed dispersal, or river corridors. Collectively, these societal and natural sources of dispersal may be as significant to the transfer of AIS as ballast discharge is for new introductions.

Since 1810, 180 species of fish, plants, invertebrates, algae, and pathogens have been introduced into the Great Lakes (Hall et al, 2000, Ricciardi, 2001, Mills et al. 1993). Only about ten percent of these introductions have caused significant harm. Some of these species, like the zebra mussel, have been transported to inland Wisconsin waters. Dane County waters are at risk of AIS invasions because of boat traffic patterns. For example, Lake Ripley and Rock Lake in Jefferson County and Lake Wisconsin in Sauk County have zebra mussels present and are a source for transport to Dane County waters. Also the proximity to Lake Michigan and the Mississippi River poses a significant risk to Dane County lakes and streams. Invertebrate species, such as quagga mussels, spiny and fish hook water fleas, and fish species such as round gobies and ruffe that are present in Lake Michigan could be transported to Dane County waters. In addition, Viral Hemorrhagic Septicemia (VHS), an infectious disease of fish that was diagnosed in Lake Michigan and Lake Winnebago in 2005 could be transported to Dane County waters.

AIS ALREADY IN DANE COUNTY WATERS AND THEIR IMPACTS

This section describes those aquatic invasive species that are already present in Dane County waters and are particularly problematic. Management actions and control efforts, as described in Goal II of this plan, will be focused primarily on these species. The following species that are described in this section include, in no priority order:

- ◆ Purple loosestrife (*Lythrum salicaria*)
- ◆ Eurasian water-milfoil (*Myriophyllum spicatum*)
- ◆ Curly leaf pondweed (*Potamogeton crispus*)
- ◆ Zebra mussels (*Dreissena polymorpha*)
- ◆ Rusty crayfish (*Orconectes rusticus*)
- ◆ Cyllindro (*Cylindrospermopsis raciborskii*)
- ◆ Common carp (*Cyprinus carpio*)

In addition, a number of other species of concern to Dane County resource managers will be included as part of this plan and are described in the section on 'Other Aquatic Invasive Species of Concern'. These are species that may already be present in the Great Lakes and their tributary waters, or in neighboring states, that could invade Dane County waters. Management actions and prevention efforts, as described in Goal 1 of this plan, will be focused primarily on these species. The following species that are not yet found in Dane County waters but that could be introduced, include, in no priority order:

- ◆ Hydrilla (*Hydrilla verticillata*)
- ◆ Water hyacinth (*Eichhornia crassipes*)
- ◆ Quagga mussels (*Dreissena bugensis*)
- ◆ New Zealand mud snails (*Potamopyrgus antipodarum*)
- ◆ Spiny water fleas (*Bythotrephes cederstroemi*)
- ◆ Fishhook water fleas (*Cercopagis pengoi*)
- ◆ Water flea (*Daphnia lumholtzi*)
- ◆ Bloody red shrimp (*Hemimysis anomala*)
- ◆ Chinese mystery snail (*Cipangopaludina chinensis*)
- ◆ Gizzard shad (*Dorosoma cepedianum*)
- ◆ Round gobies (*Neogobius melanostomus*)
- ◆ Ruffe (*Gymnocephalus cernuus*)
- ◆ Northern snakehead (*Channa argus*)
- ◆ Asian carp, particularly bighead (*Hypophthalmichthys nobilis*) and silver (*Hypophthalmichthys molitrix*)
- ◆ Viral Hemorrhagic Septicemia (VHS)

The above list is a reflection of what species could potentially invade Dane County waters. For example, *Daphnia lumholtzi* and gizzard shad may thrive and have major impacts on the Yahara chain of lakes, particularly if the climate warms in the future. Many of the next invaders may not even be on this list, since it is difficult to predict the identity of species that may invade a waterbody or region.

Purple Loosestrife

Purple loosestrife (PL) is currently present in low densities in many wetland areas in Dane County (Figure 1). In some wetlands it has been established longer and is present in much higher densities.

In county wetlands where purple loosestrife is present, cause for concern is significant.

Because it can aggressively invade new habitat, purple loosestrife can become the dominant species, thereby endangering the diversity of the wetland vegetation and threatening continued survival of rare and endangered plants. Wildlife species that depend on native vegetation for food and shelter, such as muskrat and waterfowl, can decline in numbers significantly while other species, such as marsh wrens and least bitterns, are frequently displaced.

Brock Woods, who coordinates the state's Purple Loosestrife Biocontrol Program, encourages property owners and resource managers to use a variety of digging, cutting, and approved herbicides to reduce this plant and keep it from spreading through sites where populations are still small. The most viable long-term control strategy, especially for large infestations, is the release of *Galerucella* beetles that feed primarily on shoots and leaves.

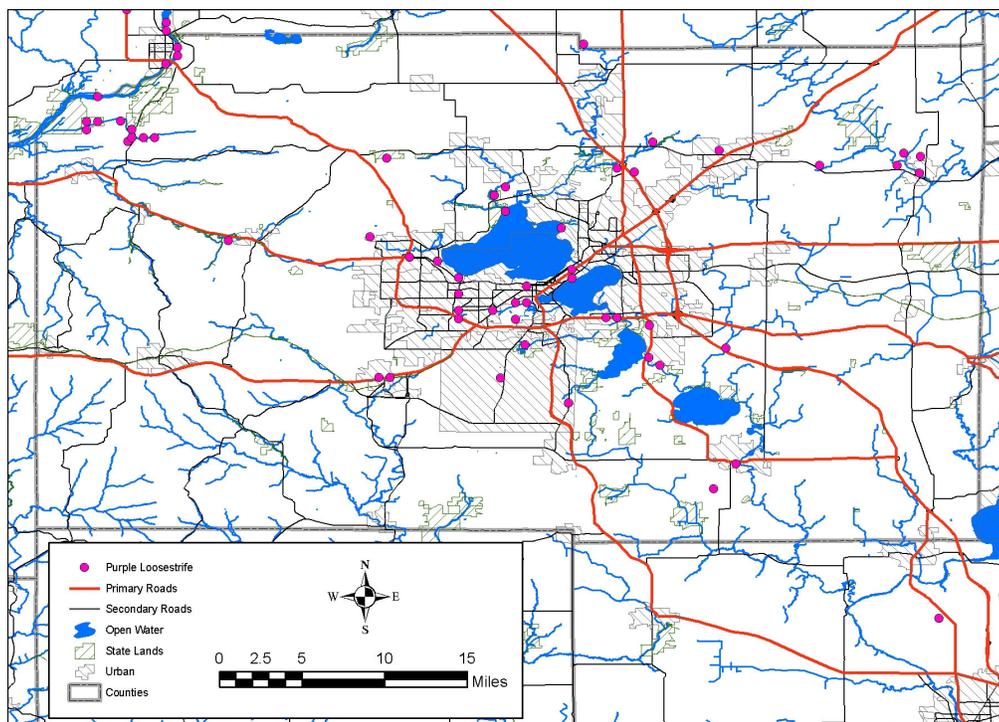


Figure 1. Distribution of purple loosestrife in Dane County (data from the Great Lakes Indian Fish & Wildlife Commission).

Galerucella beetles are a non-native insect species imported from Europe to feed exclusively on purple loosestrife. They were tested extensively and imported because North American insects cannot control purple loosestrife.

In 2008, at least 335,000 Galerucella beetles were raised and released by volunteers in Dane County. This represents a steady increase from previous years. In 2006 and 2007 for example volunteers in Dane County respectively released 240,000 and 265,000 Galerucella beetles. Despite these efforts, best estimates indicate that only about half of the dozen purple loosestrife sites in Dane County with active PL populations have had beetles released on them (Brock Woods, UW-Extension purple loosestrife coordinator, personal communication, 2008).

Of the 48 known PL sites in the county, about 12 have actively growing PL populations. The other sites presumably have PL seed banks and could again produce active populations at any time. By far the largest site is along Dunlap Hollow Creek above State Highway 78. Annually, it gets most of the released beetles in the county. The untreated sites are largely small, but hard to reach along the Yahara River and other streams. Many more small sites in such places are still unknown.

The biocontrol efforts on PL in Dane County have met with mixed success. At Dunlap Hollow Creek, the beetles have not had enough time to successfully control PL. The size of the infestation at this site is part of the challenge in trying to control this invader. The long-term goal is to have the beetles control the PL at Dunlap Hollow Creek without active intervention. Some of the smaller PL sites in Dane County have met with more success. The beetles have reduced the flowering at many of these sites, which allows other native plants to replace PL. It is not likely that the beetles will ever be able to completely eliminate PL over the long-term, but rather will reduce the population densities so they are no longer problematic (Brock Woods, UW-Extension purple loosestrife coordinator, personal communication, 2008).

Eurasian water-milfoil



Eurasian water-milfoil (EWM) first appeared in Dane County waters in the 1960's. Lake Mendota was the first lake to become infested in 1962 followed by Fish Lake in 1967. Since then, its range has expanded to include 12 of the 68 named lakes and ponds in Dane County, based on data compiled through 2008 (Figure 2).

Because of its potential for rapid growth, dispersal, and its incredible ability to regenerate, EWM can successfully out-compete most native aquatic plants, especially in disturbed areas. EWM can reproduce vegetatively by fragmentation, which allows it to be dispersed over longer distances than if it relied on seeds for natural dispersal. These fragments can be transported by currents or by humans via boats, trailers and boating equipment. EWM is also an opportunistic species, becoming rapidly established early in the spring and spreading quickly by fragmentation. Native aquatic plants are crowded out and monotypic stands of EWM can occur, causing problems to the aquatic ecosystem and for recreational water users.

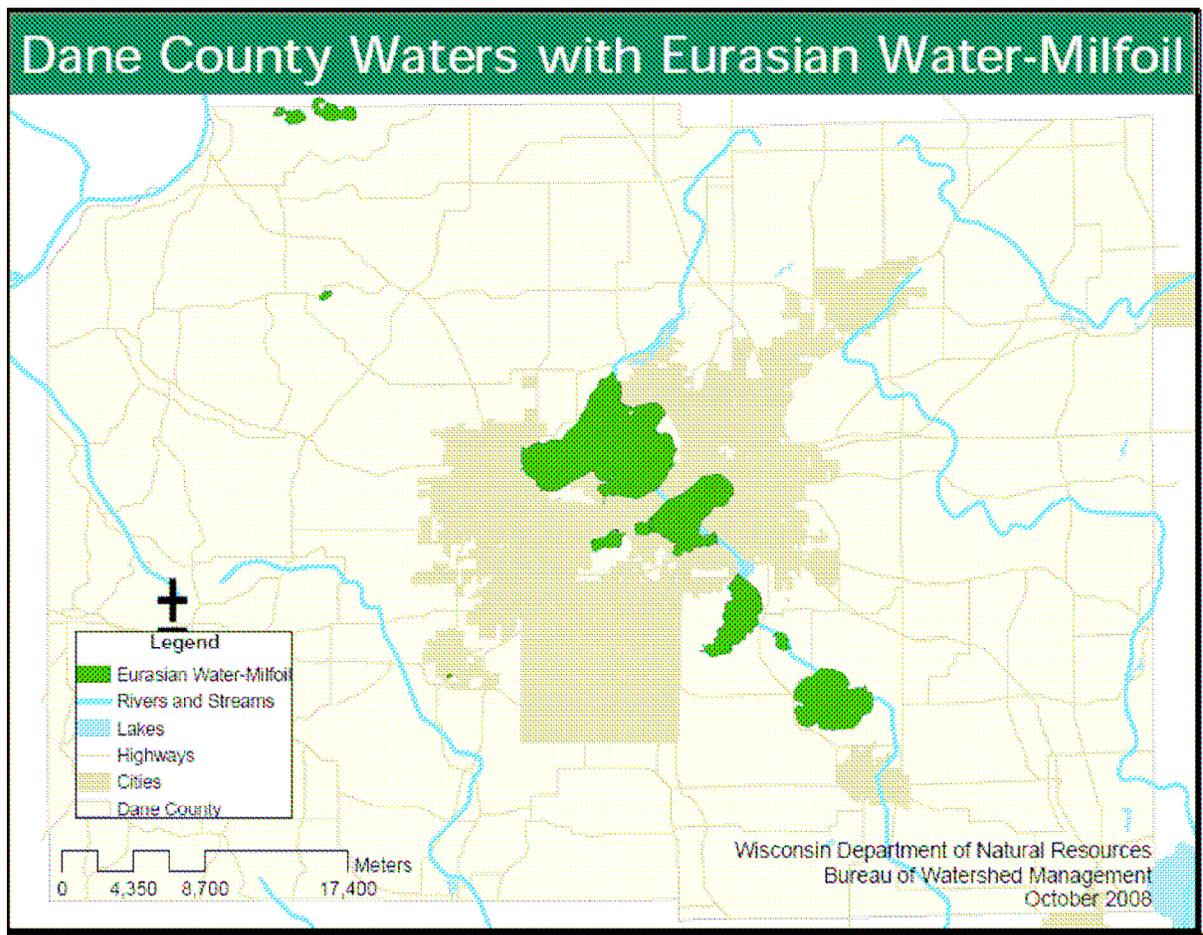


Figure 2. Distribution of Eurasian water-milfoil in Dane County lakes. Refer to Table 1 for a listing of Dane County waters infested with EWM.

In Fish and Indian lakes, EWM has formed huge monoculture stands. The mats of surface foliage over a large surface area require management (Underwater Habitat Investigations, LLC and Dane County Land & Water Resources, 2007). In other Dane County lakes such as the Yahara chain of lakes, EWM has become the dominant macrophyte species in the nearshore areas. Such stands of EWM shade out native aquatic plants resulting in ecological changes, loss of recreational opportunities and diminished aesthetic values.

Because recreational activities like swimming and boating have been limited severely by EWM on some waters, Dane County resource managers have made many attempts at control. The variety of techniques used for controlling EWM populations on Dane County lakes include mechanical cutting and harvesting in open areas, limited use of herbicide treatments, and biological control agents such as weevils. The Aquatic Plant Management Plans, developed in 2007 and 2009 by the Dane County Land & Water Resources Department with assistance from Underwater Habitat Investigations, LLC and Agrecol, describe the management strategies for aquatic invasive plants, such as EWM and curly-leaf pondweed. Reductions in nutrient loading and eutrophication may also benefit efforts to manage EWM impacts.

Curly-leaf pondweed



Curly-leaf pondweed (CLP) was accidentally introduced into the United States along with the common carp in the late 1800s. CLP was first documented in Dane County waters in 1989 in Lake Mendota. Since then, this aquatic invader has expanded its range to include 13 of the 68 named lakes and ponds in Dane County, based on data compiled through 2008 (Figure 3).

CLP is native to northern Europe and Asia where it is well adapted to living in low temperature waters. It can grow actively under the ice when most plants are dormant, giving it a competitive advantage over native aquatic plant species. By June, CLP can form dense surface mats that interfere with aquatic recreation. By mid-summer when other aquatic plants are just reaching their peak growth for the year, it dies off. CLP provides habitat for fish and invertebrates in the winter and spring when most other plants are reduced to rhizomes and buds, but the mid-summer dieback creates a sudden loss of habitat. The die-off of CLP also releases nutrients into the water column that can trigger algal blooms and create turbid water conditions. In lakes where CLP is the dominant plant, the summer die-off can lead to habitat disturbance and degraded water quality. In other waters where there is a diversity of aquatic plants, the breakdown of curly-leaf may not cause a problem.

Although present in 13 lakes, CLP is problematic only in shallow hyper-eutrophic lakes such as Indian, Crystal and Stewart lakes (Dave Marshall, Underwater Habitat Investigations LLC, personal communications, 2009). In general, CLP doesn't create problems in deeper lakes, such as the Yahara chain of lakes, or undermine the ecological balance as much as EWM. CLP is a cold-water species and thrives in eutrophic conditions and is not as dominant as EWM in Dane County lakes (Dave Marshall, Underwater Habitat Investigations LLC, personal communications, 2009). Mechanical cutting and herbicide treatments are the primary means of control of CLP in those Dane County lakes where it is a problem (Underwater Habitat Investigations, LLC and Dane County Land & Water Resources, 2007).

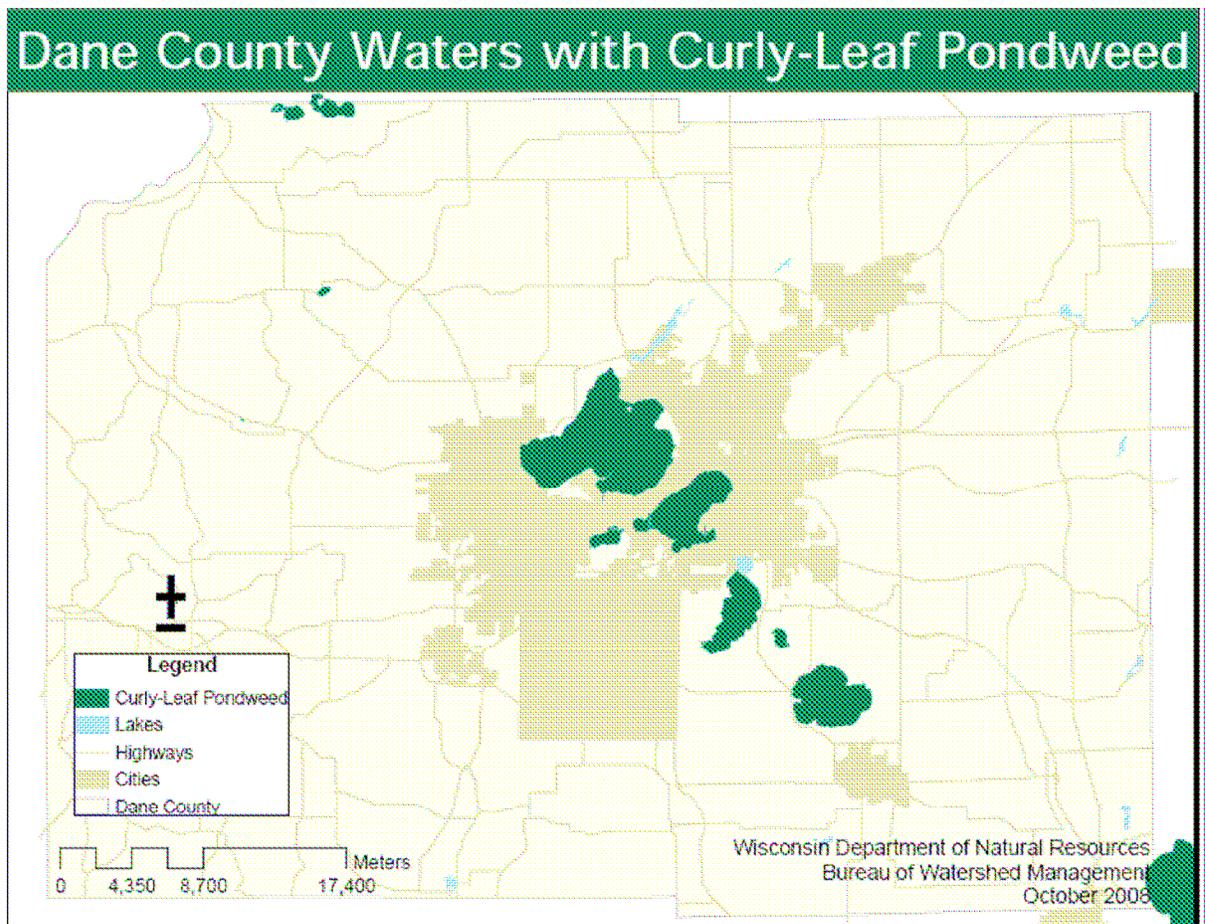


Figure 3. Distribution of curly-leaf pondweed in Dane County lakes. Refer to Table 1 for a listing of Dane County waters infested with CLP.

Zebra mussels

Zebra mussels were first documented in Wisconsin waters in Lake Michigan in 1989. Since then they have spread to over 100 lakes and streams statewide. Lake Monona is the only waterbody in Dane County where zebra mussels have been reported. After their initial discovery in Lake Monona in 2002, zebra mussels have not been observed there or in any of the other lakes in the Yahara chain. Extensive benthic sampling was conducted from 2002-07 on lakes Mendota and Monona. Three transects were taken on each lake and over 250 bottom samples were analyzed from Lake Mendota and 119 samples from Lake Monona. No zebra mussels were found in any of the samples from either lake (Karatayev & Burlakova, 2008). Monitoring protocols established by DNR need be followed to determine if Lake Monona meets the criteria for delisting.

Zebra mussels reproduce in huge numbers causing clogging of intake pipes at power plants and water utilities. They are excellent filter feeders and often make the water clearer. But the result is that the zebra mussels reduce the amount of plankton available for forage fish and that can lead to negative impacts throughout the food chain. The increase in water clarity can extend the photic zone in a lake, resulting in an increase in noxious blue-green

algae blooms, in particular attached species like *Cladophora*. Decaying *Cladophora* along the Lake Michigan shorelines in the summer have increased aesthetic and odor problems and created recreational problems on the beaches.

In addition, zebra mussels have reduced severely, and in some cases, eliminated native mussel species by colonizing on them. When the zebra mussels die and wash up on beaches, the decaying flesh creates foul odors and the shells cut the feet of swimmers.



Cluster of
Zebra Mussels

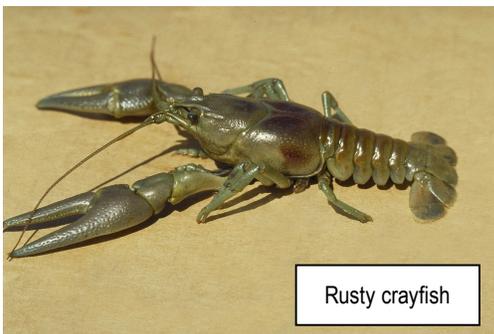
Zebra mussels create other potential concerns as well including:

- ◆ possible changes to the community structure and biodiversity of aquatic ecosystems,
- ◆ potential bioaccumulation of contaminants, and
- ◆ disposal of dead zebra mussel shells from beaches in environmentally sound and cost-effective ways.

Resource managers are particularly concerned about the potential impacts to the food chain. Studies conducted in two inland Wisconsin lakes in the 1990s (Big Elkhart Lake in Sheboygan County and Silver Lake in Kenosha County) assessed the ecological impacts that zebra mussels had on the aquatic biota (Cuhel, et al., 1999). More recent analysis of published studies has assessed the effects of zebra mussels on aquatic ecosystems. These studies indicate shifts in fish community structure favoring those species that utilize benthic resources. Overall, zebra mussels alter food webs and energy from pelagic to benthic pathways (Higgins and Vander Zanden, unpublished). Financial impacts of zebra mussels on Wisconsin residents have been significant because of maintenance costs for Wisconsin's water utilities (about \$4 million based on 1993 figures) and power plants (approximately \$1 million in 1993).

Rusty crayfish

Rusty crayfish are native to streams in Ohio, Kentucky and Tennessee. They were brought into Wisconsin for bait in the 1960s, and their populations have expanded rapidly, particularly in lakes and streams in the northern part of the state. In Dane County, rusty



Rusty crayfish

crayfish have been found in only three streams: Allen Creek, Koshkonong Creek and the Sugar River (Figure 4). No lakes in Dane County have been documented to have rusty crayfish.

Historical data collected in Wisconsin indicate that rusty crayfish are very widespread in the state. Due to the lack of a comprehensive monitoring plan, it is possible that other waters in Dane County, besides the three streams that have been

documented, are infested with rusty crayfish. Rusty crayfish could certainly inhabit the Yahara chain of lakes or other eutrophic lakes in Dane County (because they are native to the Ohio River valley where there are many eutrophic systems), but for some reason they do not. It might be because of such factors as the water chemistry, lack of habitat or presence of predators that limit their establishment. But for whatever reason, the Madison lakes appear to be relatively resistant to rusty crayfish (Jeff Maxted, Center for Limnology, UW-Madison, personal communication, 2009).

Rusty crayfish are aggressive and can out-compete and displace native crayfishes. They consume large quantities of aquatic plants, and as a result, can destroy aquatic plant beds that game fish, panfish, forage fish and aquatic invertebrates depend on for survival. In the process they upset the ecological balance and deprive native fish and other species of cover and food. Rusty crayfish also eat fish eggs, which can have an impact on fish spawning success rates.

Once established, there is no effective way of eradicating this invader. However, an eight-year study conducted on Sparkling Lake (an isolated lake in Vilas County) showed potential to control this species in the wild. Trapping of adult crayfish and restricted fishing to increase predatory fishes resulted in a decrease in the abundance of rusty crayfish (Hein, 2006). But the emphasis must continue to focus on good prevention practices to control the spread of rusty crayfish.

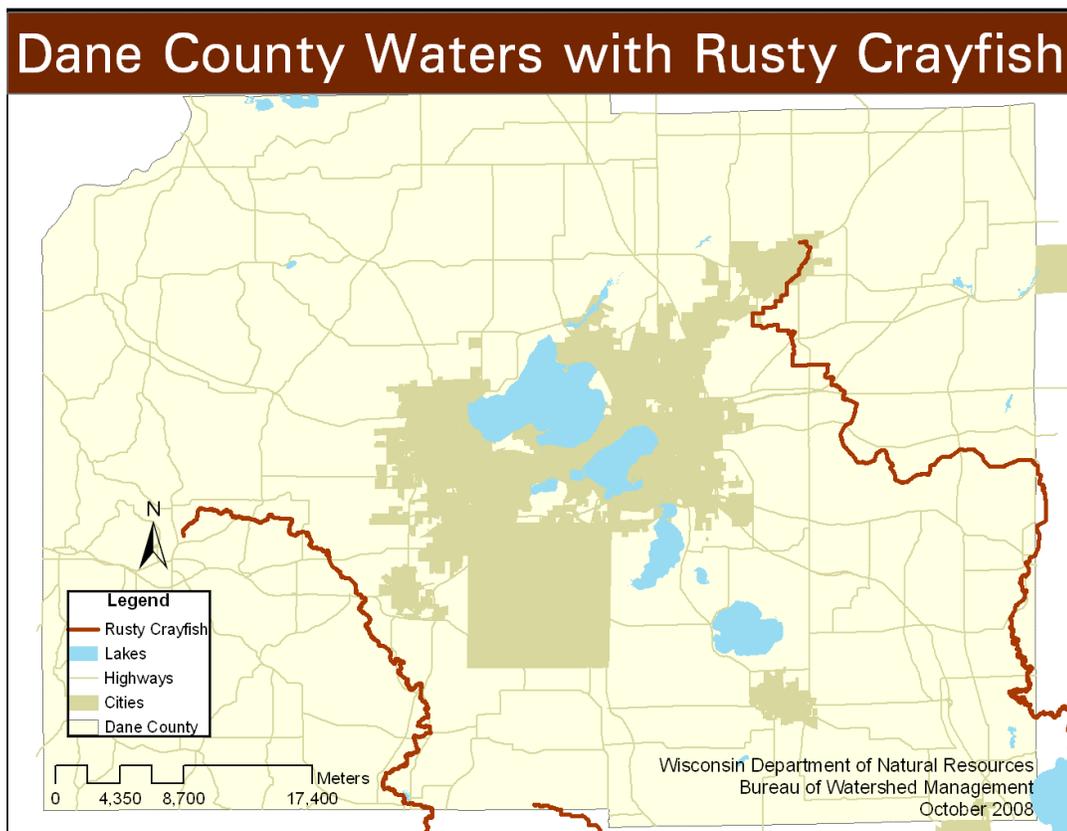


Figure 4. Distribution of rusty crayfish in Dane County waters. Refer to Table 1 for a listing of Dane County waters infested with rusty crayfish.

Cylindrospermopsis raciborski

Cylindrospermopsis raciborski (or “Cylindro” for short) is an aquatic invasive blue - green algae. It is considered a subtropical species that was originally discovered in Brazil, but has been found in recent years in the southern United States and the Midwest. Cylindro was first documented in Wisconsin waters in 2002 in Lakes Wingra, Mendota, and Monona in Dane County; since then Cylindro has been confirmed in the following Dane County lakes: Lake Kegonsa, Lake Waubesa and Lake Koshkonong (Figure 5). Cylindro has likely been present in all the Yahara Chain of lakes since the mid-1980s (Dick Lathrop, UW-Center for Limnology and DNR, Madison, personal communication, 2008).

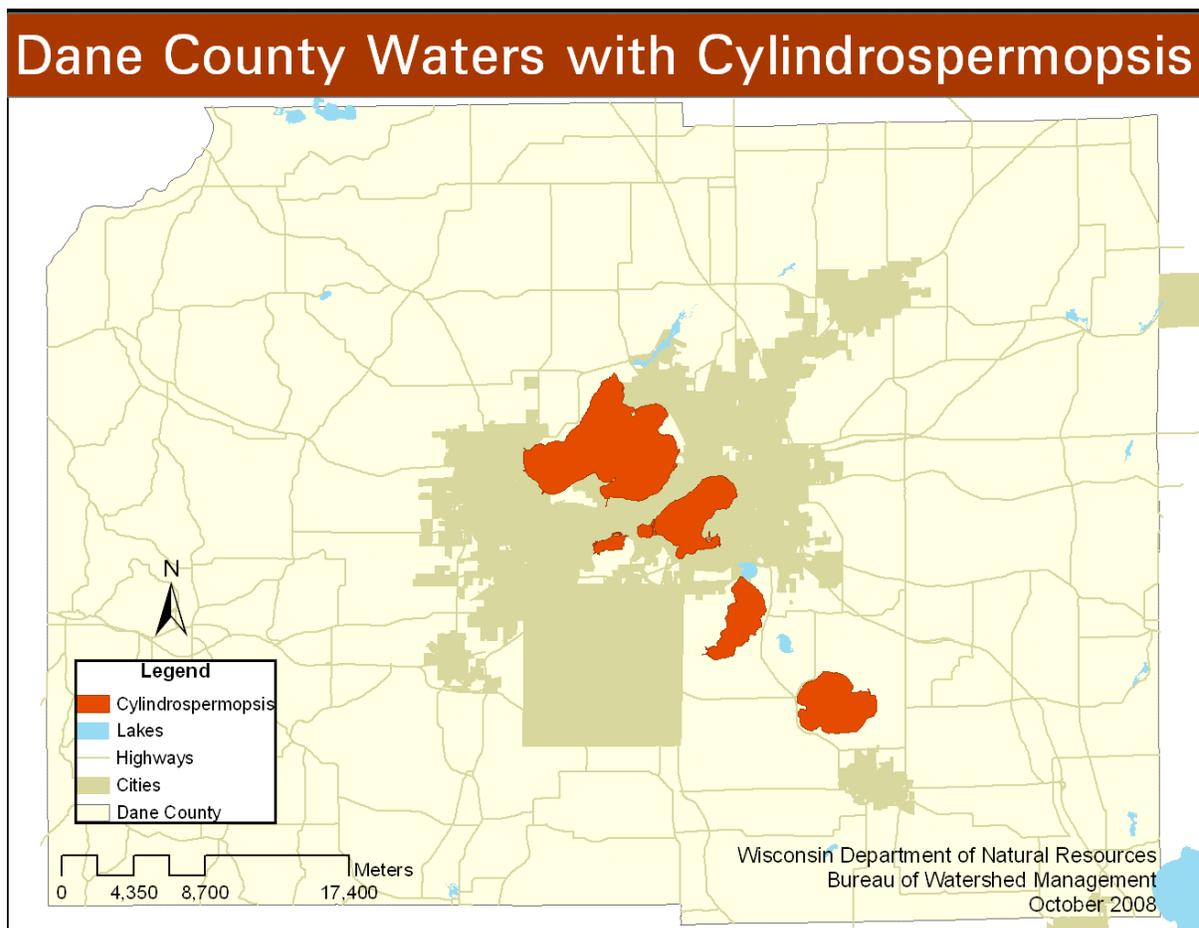


Figure 5. Distribution of *Cylindrospermopsis* in Dane County lakes. Refer to Table 1 for a listing of Dane County waters infested with Cylindro.

Cylindro typically reaches bloom densities in August and September. It differs from other blue-green algae species, native to Wisconsin lakes, because it can produce more toxins more frequently. Since Cylindro is only a problem when it blooms, decreasing a lake's productivity (nutrient concentrations) could help keep its densities low (Dick Lathrop, UW-Center for Limnology and DNR, Madison, personal communication, 2009).

When present in high concentrations, the toxins *Cylindro* produces can pose health risks to fish, pets, livestock, and even humans. Lower levels of exposure to *Cylindro* (i.e. swimming in waters with moderate blooms) can cause skin rashes and stomach problems. Long-term exposure to low levels of toxins has been linked to cancer. However, it is not clear whether Wisconsin has the strain of *Cylindro* that produces toxins similar to those found in the southern states.

Unlike other blue-green algae species found in Wisconsin waters, *Cylindro* does not always form nuisance mats of algae at the surface but rather is distributed, although not visible, throughout the water column.

Common carp

The common carp, a native of Asia, was intentionally introduced into Wisconsin waters as a food source in the 1880s. Stocking carp continued until 1895 at which time the program was discontinued. Anglers considered carp a nuisance species soon after they were introduced in the early 1900s. Excessive carp populations uproot native underwater plants, attack plant species such as cattails and re-suspend sediments and nutrients, making the water turbid. Carp survive well in the state's warm waters even those with low oxygen content or under polluted conditions. They are wide spread in Dane County waters and throughout Wisconsin except in cold water streams.

Carp compete with game fish species for food and habitat and are especially abundant in large shallow lakes and streams in the state. Historically, carp have been controlled through seining, establishment of barriers, electrical currents and chemical treatment. The fish toxicant rotenone has been used to kill carp as part of fishery habitat projects. Unfortunately, rotenone is a non-selective toxicant that kills desirable fish populations as well. The purpose of using rotenone is to keep carp populations low enough to reduce their impact.

Carp are one of the most damaging invasive aquatic species in Dane County. Management actions, such as reducing nutrient loading and eutrophication, could greatly benefit efforts to manage carp and make ecosystems less vulnerable to their invasion. A carp-free enclosure study was recently conducted on Lake Wingra to determine the impacts caused by common carp on aquatic macrophytes. Preliminary results from the carp enclosure study on Lake Wingra are very encouraging. Similar approaches could be used to help manage carp on other waterbodies in the future.

OTHER AQUATIC INVASIVE SPECIES OF CONCERN

Several other aquatic invasive species currently occur in the Great Lakes and some of its tributaries or in Wisconsin waters outside of Dane County. Species such as the spiny and fish hook water fleas, the quagga mussel, the New Zealand mud snail, the Chinese mystery snail, the round goby, ruffe and silver and bighead carp could invade Dane County waters, and may cause future control problems. Preventing their arrival is a better option than dealing with them after they arrive.

Water hyacinth and hydrilla, two aquatic invasive plants that are present in neighboring states, have been found recently in Wisconsin inland waters. Efforts to eradicate the water hyacinth from a water treatment lagoon and hydrilla from a two-acre wildlife/recreational pond (both in the northern part of the state) using chemical treatments and drawdowns appears to be successful to date. Hydrilla was brought into the state as a contaminant on native plants, which could certainly happen again in the future to Dane County waters. The transport mechanisms for these two invaders are the same as for other aquatic plants and invertebrates such as EWM, CLP or zebra mussels. Boats from infested waters in adjoining states could transport water hyacinth or hydrilla to Dane County waters.

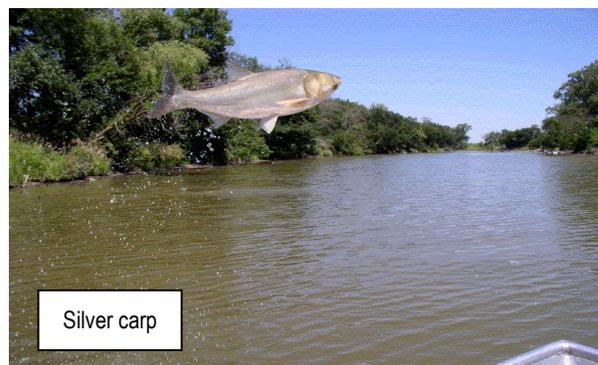
Asian carp, particularly the bighead and silver, are also a major cause for concern to Dane County water resource managers. Both these species are found in the Rock River in northern Illinois. Although the dam on the Rock River at Rockton has a fairly high head, the bighead or silver carp could move up the Rock River into Wisconsin, especially if they are moved across the dam by anglers. Even if they do get into Wisconsin waters, there are also dams on the Rock River at Beloit and Janesville that might be effective barriers in keeping these species out of the Yahara chain of lakes. During the flooding that occurred in 2008, the bighead and silver did not move upstream in the Rock River above Beloit so the dams have thus far proven to be effective barriers. There are 10 dams located on the Rock River and Yahara Rivers from Rockton, Illinois to Lake Kegonsa (Figure 6).

A bigger concern is with the bighead and silver carp moving upstream in the Sugar and Pecatonica Rivers into Dane County waters. The carp could enter the Rock River below Rockton and move past existing dams on the Sugar and Pecatonica Rivers that are less substantial barriers than on the Rock and Yahara Rivers (Don Bush, regional fishery biologist at Janesville, personal communication, 2008).

The round goby and ruffe could follow the same pathway as the bighead and silver carp upstream in the Rock, Sugar, or Pecatonica Rivers into Dane County waters.

Another potential pathway for bighead carp to get introduced into Dane County waters is via the bait industry. Distinguishing small bighead carp from golden shiners is difficult (Kolar et al, 2007). Depending on where the wild bait is harvested and how well the baitfish are sorted, bighead carp may be mixed in with the shiners.

Based on recent studies, impoundments are often more vulnerable to invasions (Johnson et al., 2008). In certain situations, dam removal could be helpful in efforts to make ecosystems more resistant to aquatic invasive species, provided the dams do not also serve the role of blocking the upstream movement of AIS.



Viral Hemorrhagic Septicemia (VHS) is a deadly and invasive fish virus threatening Wisconsin's fish. VHS was first diagnosed in 2005 and 2006 in the Great Lakes as a result of fish kills in lakes Huron, St. Clair, Erie, Ontario and the St. Lawrence River. The Department of Natural Resources has identified more than 25 fish that are at risk from VHS.

VHS is considered an invasive species, but scientists are not sure how the virus arrived in the Great Lakes. Test results from Wisconsin have detected VHS in fish from the Lake Winnebago system, Lake Michigan and Green Bay. Widespread testing of other Wisconsin waters has not shown that the virus has spread. Limited monitoring for VHS has occurred in Dane County waters. Refer to Section II D on monitoring for a listing of which waters have been sampled.

VHS suppresses the immune system, causing infected fish to become diseased. Symptoms include hemorrhaging, bulging eyes, unusual behavior, anemia, bloated abdomens and rapid onset of death. The virus can be spread in the water or by infected fish. Like other AIS, VHS can be spread by boat traffic. Boaters and anglers need to follow the same cleaning procedures for their boats, trailers and equipment to avoid spreading VHS as they would with any other AIS.

Detailed management actions listed under in Goal I of the plan will reduce the likelihood that the species mentioned above, as well as other AIS species, will be introduced into Dane County waters. This plan includes actions that should be taken to eliminate or eradicate AIS species should they be introduced into county waters.



1. Lake Kegonsa Dam
2. Stoughton Dam
3. Dunkirk Dam
4. Stebbinsville Dam - breached
5. Indianford Dam
6. Center Dam (Centerway)
7. Monterey Dam
8. Beloit (Blackhawk) Dam
9. Rockton Dam – Upper
10. Rockton Dam Power Canal

Figure 6. Dam locations on the Rock and Yahara Rivers from Rockton to Lake Kegonsa.

WETLAND SPECIES

A number of invasive wetland plants are also addressed as part of this plan including, in no priority order:

- ◆ Japanese hops (*Humulus japonicus*)
- ◆ Reed canary grass (*Phalaris arundinacea*)
- ◆ Phragmites (*Phragmites australis*)
- ◆ Japanese knotweed (*Polygonum cuspidatum*)
- ◆ Cut-leaved teasel (*Dipsacus laciniatus*)
- ◆ Glossy buckthorn (*Frangula alnus/Rhamnus frangula*)
- ◆ Narrow-leaf cattail (*Typha angustifolia*)
- ◆ Hybrid cattail (*Typha xglauca*)
- ◆ Poison hemlock (*Conium maculatum*)
- ◆ Hairy willow herb (*Epilobium hirsutum*)
- ◆ Giant hogweed (*Heracleum mantegazzianum*)
- ◆ Yellow floating heart *Nymphoides peltata*)
- ◆ Brittle naiad (*Najas minor*)
- ◆ Flowering rush *Butomus umbellatus*)
- ◆ Watercress (*Nasturtium officinale*)

The invasive wetland species listed above need to be addressed in a terrestrial plan as well because they are transported via both terrestrial and aquatic pathways. These invasive plants can grow in wetland areas; adjacent to shorelines of rivers, streams, lakes and ponds; in backwater bays; in the headwaters of streams; along roadside ditches; or in upland habitat. They are transported primarily by roadside vehicles, such as mowing or construction equipment. But they can also spread vegetatively by rhizomes, through seed dispersal, by wave action or to a lesser extent by recreational boaters and anglers. Many of these species can form dense monocultures along shores or wetlands.

For most of these species their distribution is not well documented. Reed canary grass is by far the most widespread of these wetland species in Dane County. Phragmites, Japanese knotweed, narrow-leaf cattail, and hybrid cattail are also widespread. Watercress is found in several streams and many springs in Dane County. Several other wetland invasive species are close to Dane County. Yellow floating heart has been found in two storm water ponds near Lake Delevan in Walworth County. They were probably planted intentionally a number of years ago and have established dense populations. Brittle naiad was recently found in Storrs Lake in Rock County, and it appears to have overwintered. Flowering rush has several populations recorded in Columbia and Jefferson Counties.

It is difficult to eradicate these invasive wetland species once they are established in larger infestations, so early detection and control is essential. Herbicide treatments have been effective at controlling most of them. But it requires multiple applications and effects non-target species, and they must be used very specifically for the target species and situation.

Many efforts are underway to map and control those species where early detection has occurred including populations of Japanese hops, poison hemlock, giant hogweed and cut-leaved teasel. Japanese knotweed is one species in particular that mapping and control

efforts are underway on populations along rivers and streams. In addition, the River Alliance of Wisconsin has established a citizen-based monitoring program called Riverine Early Detectors to map populations of aquatic and wetland plants and animals along river corridors. Badfish Creek is one of the pilot study sites.

GOALS OF THE DANE COUNTY AIS PLAN

The goals of the Dane County AIS plan are designed to address different stages of the AIS invasions:

- 1) the initial introductions of aquatic invasive species into Dane County waters from other watersheds or other parts of the state, continent or world;
- 2) the spread of AIS populations in Dane County to previously unaffected waters; and
- 3) the colonization of self-sustaining AIS populations within water bodies, including the harmful impacts resulting from such colonization.

The three goals of the Dane County AIS plan are as follows:

Goal I: Implement procedures and practices to prevent new introductions or dispersal of aquatic invasive species into Dane County waters.

Goal II: Develop management strategies to limit the spread of established populations of aquatic invasive species in Dane County waters and to other counties.

Goal III: Abate, and where possible, eliminate harmful ecological, economic, social and public health impacts resulting from the infestation of aquatic invasive species in Dane County waters.

The following sections describe specific actions, which the county and partner organizations will undertake to achieve the above goals. For example, Dane County will coordinate with the state and surrounding counties and local organizations to promote a sound and consistent regional approach for managing AIS.

In addition, the county will need to forge new partnerships to help achieve these goals and, in the process, leverage resources to assist in prevention, control and abatement of AIS problems.

Many of the management actions detailed in this plan are new initiatives. Implementation of these actions will require new, long-term funding from state and county sources.

MANAGEMENT ACTIONS RELATED TO GOAL I

Goal I: Implement procedures and practices to prevent new introductions or dispersal of aquatic invasive species into Dane County waters.

Some of the management actions described in this section will also apply to Goal II.

Background: The introduction of new aquatic invasive species into Dane County waters has the potential to cause serious environmental, socioeconomic and public health impacts. The long-term consequences of these impacts are largely unknown. Development of prevention programs to reduce the likelihood of introducing new AIS is a sound investment of resources because societal costs of controlling established populations of AIS, like Eurasian water-milfoil and zebra mussels, are well documented. The most likely pathway for new species introductions to Dane County waters, in particular to the Yahara chain of lakes, will come from Lake Michigan, Green Bay, Lake Winnebago and the Mississippi River, based on boat traffic patterns. Other source (infested) waters in Wisconsin and other states are also a pathway for introductions to Dane County waters. Since the early 1800s, over 180 nonindigenous aquatic species have been introduced into the Great Lakes, of which about 10% have resulted in significant environmental and/or economic harm (Hall et al, 2000, Ricciardi, 2001, Mills et al. 1993).

Without a strong new prevention program in place, Dane County can expect new AIS introductions to occur from boat traffic coming from Lake Michigan in particular, but also other source (infested) waters. Prevention actions at all levels of government are extremely important, but especially critical at the local level in order to reduce the likelihood of new introductions from boat traffic. In addition, there are other potential transport mechanisms, which could result in the releases of AIS into Dane County waters. The primary vectors of transport of AIS to Dane County waters include, but are not limited to:

- A. Recreational boaters and anglers
- B. Dispersal mechanisms through river corridors
- C. Plant nursery stocks
- D. Aquarium releases
- E. Sale and distribution of bait
- F. Accidental releases by anglers

To achieve the objectives established in Goal 1 of this plan, a strategy has been developed for each of the above pathways as well as specific management actions that will be undertaken to reduce the likelihood of new AIS introductions. Refer to Table 2 for a summary of the management actions related to Goal I.

A. Recreational boaters and anglers

The most likely way new AIS will be introduced into Dane County waters is via recreational boaters and anglers who do not properly clean their boats, trailers or boating equipment when coming from source waters. The threat is most significant to the larger lakes in the county, such as the Yahara chain, that receive boat traffic from lakes Michigan and Winnebago, Green Bay and the Mississippi River.

Tournament anglers coming from both in state and out-of-state have a higher potential to introduce AIS, particularly to the Yahara chain of lakes. In 2008, there were 18 registered tournaments with more than 40 participants per tournament. All these tournaments were run out of the Green Lantern restaurant landing on Lake Waubesa. Also regular Tuesday night tournaments were launched from various sites on the Yahara lakes including Olin Park (Lake Monona), Lake Farm Park (Lake Waubesa), Fish Camp Park (Lake Kegonsa) and Warner Park (Lake Mendota) (Scott Harpold, fisheries management technician from Fitchburg, personal communication, 2008).

Strategy IA: Increase the presence of watercraft inspectors at Dane County boat launch sites to step up inspection efforts at the landings and to ensure compliance with state launching regulations. Enhance education and outreach efforts to boaters and anglers to increase their awareness of the proper cleaning procedures for their boats and equipment.



Stop aquatic hitchhikers!
Clean all recreational equipment

Action IA1: The Dane County Office of Lakes and Watershed (OLW) should identify those landing sites that receive the highest boat traffic in the county so a proportionately higher number of watercraft inspectors can be stationed at those sites.

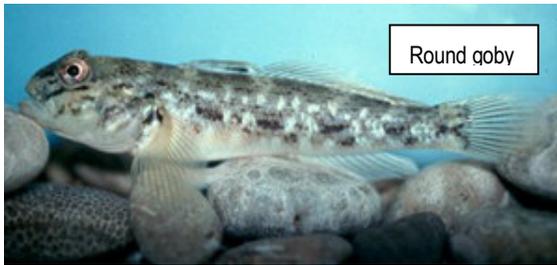
Action IA2: The Yahara Lakes Association (YLA) should participate in a Clean Boats Clean Waters workshop training session offered by the University of Wisconsin-Extension. The YLA and the Madison Fishing Expo would be responsible for establishing a schedule and staffing watercraft inspectors at boat landings on the Yahara chain of lakes, based on the priorities developed in IA1. The YLA should coordinate the scheduling of watercraft inspectors with the DNR so there is no duplication of effort between the local and state inspection efforts. Other lake groups in Dane County (i.e., the Crystal, Fish & Mud Lake District) should also consider attending a Clean Boats Clean Waters workshop.

Action IA3: The YLA and the OLW, in consultation with surrounding municipalities, should investigate the use of a portable and/or permanent boat wash facility that could be utilized for cleaning boats and equipments at all fishing tournaments held on the Yahara chain of lakes. All tournament anglers should be required to wash their boats prior to launching in particular if the OLW determines their boats were previously on contaminated waters.

B. Dispersal mechanisms through river corridors

Another primary pathway for AIS, particularly fish species, is dispersal through connected waters, especially through river systems. Of particular concern is two species of Asian carp (the silver and bighead). Both species are present in the Rock River in northern Illinois. Although several dams on the Rock River (at Rockton, Beloit, and Janesville) might prove to be an effective barrier, it is possible that these two species of Asian carp could move around these dams during floods or by anglers who catch them below the dam and release them above the dam. Another concern is that the silver or bighead carp could travel up the Rock River into the Sugar and Pecatonica Rivers. In addition, both the silver and bighead carp have been documented in the Wisconsin waters of the Mississippi River near La Crosse and could quite easily move up the Wisconsin River to Dane County waters.

Strategy IB: Determine the potential risk of the silver and bighead carp to travel past existing dams on the Rock River and become established in the Yahara chain of lakes and whether some structure modification of the existing dams would prevent the upstream movement of these species. Evaluate what the potential impact these species could have on native fish species. Assess the feasibility of eradicating either of these carp species should they become established in Dane County waters.



Action IB1: The OLW, the Dane County Public Works, and other county staff, in cooperation with adjoining counties, the DNR and Illinois staff should establish a work group that would evaluate the effectiveness of existing dam structures in preventing the upstream movement of Asian carp or other invasive fish species like the goby and ruffe.

In addition, the work group should examine the feasibility of: 1) modifying existing structures (i.e., screening devices such as rods and fencing), 2) establishing other physical barriers (i.e., electric or acoustic barriers) and 3) removal of carp populations where they are concentrated (i.e., below dams). In addition, the work group should examine other feasible options to keep these carp and other invasive fish species out of Dane County waters.

Action 1B2: The OLW should work with the DNR to adopt an early detection and rapid response strategy to eradicate the silver and bighead carp should they move upstream into Dane County waters (see Section III B on 'Early detection and rapid response').

C. Plant nursery stocks



Plant nursery stocks can sometimes have aquatic invasive plants mixed in with native species. Although this is not a major pathway of entry for AIS, it still needs to be addressed in the plan. When water gardeners purchase directly or mail order native plant species for their water gardens, invasive species can be mixed in with the native stock and unintentionally introduced. That is very likely how hydrilla was introduced to a wildlife/recreational pond in northern Wisconsin.

Strategy IC: Minimize the likelihood of unintentional introductions via nursery stock by training staff at Dane County plant sales and distribution centers on the identification of plant species so they can maintain clean stock.

Action IC1: The OLW should review current plant handling procedures in Dane County to determine the potential risks of new plant introductions. Based on the findings, modifications on the sale and distribution of plant species may be warranted. Rinsing of nursery stock may also be necessary as part of the handling procedures to remove aquatic hitchhikers.

Action IC2: Using educational materials developed by DNR, UW-Extension and Sea Grant, the OLW should provide guidance on policy and handling procedures to industry representatives, including pond consultants, to reduce the risk of unintentional plant introductions to Dane County waters.

D. Aquarium releases

Anytime private or commercial aquariums hold exotic species in captivity, the potential exists for accidental release, either knowingly or incidentally through the rearing or culturing of native species. Even though this is not likely a significant pathway of entry, the rate of expansion of the aquarium trade and the lack of consistent guidelines and protocols for managing exotic species necessitates that aquarium releases are addressed as part of this plan. The capture of a snakehead fish by DNR fisheries staff in the Rock River several years ago was likely the result of an aquarium release.

Strategy ID: Evaluate current aquatic plant and animal handling practices to determine what protocols are needed for managing exotic species to avoid accidental releases into Dane County waters. Increase awareness of the proper procedures for disposal of unwanted aquatic pets by meeting with aquarium facilities and providing information to pet owners.

Action ID1: Through links to the DNR and UW-Extension web site, the OLW should provide guidance to aquarium fish owners and commercial aquariums on how to properly dispose of any unwanted aquatic pets.

Action ID2: Using educational materials developed by DNR, UW-Extension and Sea Grant, the OLW should provide guidance on policy and handling procedures on exotic plants and animals to the aquarium trade in Dane County to reduce the likelihood of accidental releases.

E. Sale and distribution of bait

The capture, sale and transport of bait represent a significant potential for unintentional transfer and introduction of AIS. In cases where bait is harvested from infested waters, the risk of spread of AIS is greatly increased. Bait suppliers and dealers, as well as bait users, may not be aware of how their activities can affect the release of AIS to Dane County waters.

Strategy IE: Evaluate whether collection and distribution of bait poses a significant risk of introduction of AIS into Dane County waters. Determine who harvests wild bait and how it gets distributed to bait shops in the county.



Action IE1: The OLW should encourage Dane County bait handlers, fish farmers and aquaculture producers to a) take the Aquatic Nuisance Species Hazard Analysis and Critical Control Point (HACCP) training offered by UW-Sea Grant and b) implement the HACCP training in their bait marketing activities to help prevent the spread of AIS in Dane County waters.

Action IE2: The OLW, in cooperation with adjacent municipalities, should check to make sure that bait posters available from DNR or UW-Extension are posted at all Dane County bait shops. The OLW should also educate bait shops on the proper protocols for screening bait for aquatic invasive species and provide them with posters of some of the more threatening AIS. The OLW should also encourage anglers to be on the lookout and report any AIS they see in their bait.

F. Accidental release by anglers

Fish and fish diseases and pathogens are the most likely AIS to be released by anglers. Anglers who harvest wild bait for personal use can inadvertently transport fish pathogens like VHS in the water or via infected fish. Although all waters that have tested positive for VHS are closed to minnow harvesting, the majority of the waters in the state have not been tested for VHS or other fish pathogens, so the possibility of transport of fish diseases by anglers is certainly a possibility.

Species like the round goby or Eurasian ruffe could be used as bait by anglers from lakes Michigan or Superior or the tributaries to the Great Lakes and then accidentally released into other inland waterbodies such as Dane County waters. Minnows harvested for commercial use that are brought in from out-of-state, could have invasive fish species, like the Asian carp, mixed in with the bait. Small bighead carp minnows are difficult to distinguish between some native minnow species like golden shiners. If anglers do not follow proper protocols for the disposal of bait as required by DNR, invasive fish species could be introduced into Dane County waters.

Of lesser concern, as far as accidental release, are invasive invertebrate species, like the New Zealand mud snail (NZMS). The NZMS has been confirmed only in Lake Superior and some of its tributary streams. It is possible for trout anglers to transport these snails to Dane County waters from mud on their boots collected from infested waters in northern Wisconsin.



Strategy IF: Educate anglers on the threat posed from invasive fish species introductions and fish diseases and pathogens as a result of accidental releases. Communicate to trout anglers, through Trout Unlimited, the threat posed by New Zealand mud snails to Dane County waters.

Action IF1: The OLW and YLA, including area angler groups, should use all available venues (expos, mailings, web, presentations) to educate anglers and recreational boaters on the proper disposal of bait fish and methods for draining all water from boats, containers and boating equipment in order to minimize the spread of invasive fish species and fish diseases and pathogens.

Action IF2: The OLW and Trout Unlimited (TU) should work with DNR staff to develop statewide guidance for trout anglers to follow to avoid spreading New Zealand mud snails and other AIS into Dane County waters. TU should share that guidance with its membership once it is developed.

MANAGEMENT ACTIONS RELATED TO GOAL II

Goal II: Develop management strategies to limit the spread of established populations of aquatic invasive species in Dane County waters and to other counties.

The strategy and management actions described in IA also apply to Goal II.

Background: The spread of established populations of AIS among Dane County waters is primarily caused by human activities such as transfer of boats or movement of boats between connected waters, bait handling and water transport. With these multiple pathways of introduction, it is essential to have a plan in place to more effectively manage their spread. Frequently, uninfested waters are hydrologically connected to infested waters that can become infested without human intervention, complicating the situation.

Water users groups are not all aware of which waters are infested with AIS, the problems associated with them and the precautions they should be taking to limit AIS spread. The following management efforts will be undertaken to educate these water user groups and in the process help reduce the risk of spread of AIS among Dane County waters:

- A. Watercraft inspection training
- B. Education & outreach
- C. Signage
- D. Monitoring
- E. Policy/Legislative initiatives

To achieve the objectives established in Goal II of this plan, a strategy has been developed for each of the above efforts as well as specific management actions. Refer to Table 3 for a summary of the management actions related to Goal II.

A. Watercraft inspection training



Strategy IIA: Expand existing watercraft inspection efforts on Dane County waters by involving trained volunteers in the inspection of boats, trailers and boating equipment both entering and leaving navigable waters. Educate recreational boaters and anglers on the identification of problem AIS and the threat posed by AIS as part of the watercraft inspection efforts.

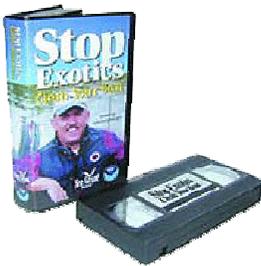
Action IIA1: The YLA should participate in the CBCW workshop training and coordinate the scheduling of watercraft inspectors on the Yahara chain of lakes with the DNR as described in Action IA2. In addition, the Crystal, Fish & Mud Lake District should participate in the CBCW training and coordinate scheduling of watercraft inspectors on their lakes with the DNR. The OLW should coordinate with the DNR on the scheduling of watercraft inspection efforts on all other Dane County waters. It is the responsibility of OLW to ensure that all high priority landings in the county have watercraft inspectors present during peak usage times (holidays and weekends) and that all watercraft inspectors in the county (except those employed by DNR) receive adequate training.

Action IIA2: The YLA; the Crystal, Fish and Mud Lake District; and the OLW should coordinate the distribution of educational and outreach materials with the DNR and UW-Extension as part of their watercraft inspection efforts at the boat landings. The educational materials to be distributed to boaters and anglers would explain how to properly clean their boats, trailers and boating equipment; help them identify invasive species found in Dane County waters; and make them more aware of the problems caused by AIS.

Action IIA3: The OLW should ensure that all the inspectors from partner groups that are conducting watercraft inspection efforts at the landings complete watercraft inspection data logs and send them into the DNR on a regular basis. The OLW should consider adding additional information not contained on the DNR logs that would be beneficial to the county in managing and controlling AIS (i.e., the name of the waterbody where boaters last launched their boats).

Action IIA4: Each trained watercraft inspector should report any violations they may observe with regard to the state's launching regulations to the Water Guard (warden) from the DNR's South Central Region.

B. Education and outreach



Strategy IIB: Target educational efforts on AIS to reach specific audiences and pathways of introduction as described in Goal I. Expand education and outreach efforts to increase public awareness of the problems and impacts of AIS and what can be done to effectively limit their spread. These I & E efforts should utilize a multi-media approach including, but not limited to: airing TV and radio public service announcements; establishing AIS educational programs for school and park curriculums; developing interpretive displays for user groups such as the Madison Fishing Expo, lake associations or environmental organizations; distribution of pamphlets, brochures, identification cards or other literature and the web.

Action IIB1: The OLW, the YLA, and other Dane County lake and river groups should distribute educational materials to recreational boaters and anglers through various means, such as kiosks at county launch sites, countywide mailings, at fishing and boating expos, and promote this through TV news stories.

Action IIB2: The OLW should provide educational materials developed by DNR and UW-Extension that are aimed at all potential pathways of introduction. These include bait dealers and harvesters, aquarium suppliers, water gardeners, pond consultants and plant nursery growers.

Action IIB3: The OLW should work with area schools to develop course work and outdoor activities aimed at hands on efforts for students to help control AIS in Dane County waters. The OLW should also coordinate with UW-Madison and Edgewood College to develop new courses on aquatic invasive species and incorporate exotics into existing aquatic studies as part of their University curriculums.

Action IIB4: The OLW, in cooperation with DNR and UW-Extension, should develop short presentations (10-15 minutes) aimed at specific targeted audiences (identified in IIB1 and IIB2 above). For example, one presentation should explain to boaters and anglers how to properly clean their boats and equipment, and a second one could describe to bait dealers how to minimize the likelihood of introduction from their activities.

Action IIB5: The OLW, in cooperation with the DNR and UW-Extension, should periodically evaluate the effectiveness of the education and outreach efforts, through surveys and other feedback techniques, and restructure the outreach program as necessary.

C. Signage

Strategy IIC: Ensure that AIS signs are posted at all boat access sites on Dane County waters to remind boaters and anglers of the procedures they should follow to maintain clean boats and clean waters.

Action IIC1: The OLW and adjacent municipalities should inventory all the landings in the county to check for adequate AIS signage and proper placement of signs based on guidance in the DNR Watercraft Inspection Handbook.

Action IIC2: Dane County watercraft inspectors should replace old signs as needed or put up new signs at landings if they are not currently posted.

Action IIC3: The OLW should provide the DNR with a listing of all public and private landing sites that are posted with each AIS sign.

D. Monitoring

Monitoring for aquatic invertebrates has been ongoing on Dane County lakes since 2004. The following lakes in Dane County have been sampled from 2004-2008 for zebra mussel veligers and spiny water fleas: Fish, Kegonsa, Monona, Mendota, Waubesa and Wingra. The UW-Center for Limnology (CFL) collected the samples and DNR conducted the analyses. All the above lakes have tested negative for both zebra mussels and spiny water fleas for each of the years sampled. In 2008, two additional Dane County lakes (Indian and Crystal) were sampled for zebra mussels and spiny water fleas. The DNR collected and analyzed the samples, which tested negative for both species.



Limited VHS monitoring has been done by DNR on Dane County waters. In 2006 Crystal Lake was sampled; in 2007 Six-mile Creek rearing pond was sampled; and in 2008, Lower Mud, Kegonsa, Monona, Koshkonong and Fish lakes were sampled. For 2009, DNR plans to sample Crystal Lake and Lake Mendota. All the samples collected so far by DNR from Dane County waters have tested negative for VHS.

Strategy IID: Assess ongoing sampling efforts for aquatic invasive species already present in Dane County waters and expand monitoring surveys if needed. Determine the level of monitoring that is appropriate for AIS that are not present but could invade Dane County waters in the future. Assess what sampling should be conducted for invasive wetland species to track their spread in Dane County.

Action IID1: The OLW, in consultation with the DNR and the CFL, should examine current sampling efforts for zebra mussels and rusty crayfish to determine if additional monitoring for these species is needed.

Action IID2: For other species of concern that could become established in Dane County waters (identified in the section on 'Other Aquatic Invasive Species of Concern'), the OLW should develop a monitoring strategy that will identify which high priority species are to be sampled and what the frequency of the monitoring should be.

Action IID3: Based on the recommendations developed by the OLW in action IID2, volunteers from different stakeholder groups should be trained to conduct AIS monitoring on Dane County waters. For example, Trout Unlimited should be responsible for monitoring of trout waters, the Upper Sugar River Watershed Association for the Sugar River and its tributaries, the friends of the Badfish Creek for the Badfish Creek and its tributaries, the YLA for the Yahara chain of lakes and the Fish, Mud and Crystal Lake District for their respective lakes. The OLW should encourage middle and high school students and university teachers and students to become trained volunteer monitors as part of an area wide environmental sciences curriculum.

Action IID4: The OLW should maintain a single database, compatible with the DNR database for invertebrates, plants and fish, on all infested waters in order to track and document the spread of AIS in Dane County waters. This information should be placed on the OLW web site and shared with the DNR and other stakeholder groups.

Action IID5: For wetland invasive species (identified in the section on 'Wetland Species'), the OLW should establish a monitoring network comprised of middle, high school, and college students; friends groups; and watershed volunteers to determine the distribution of these species in Dane County. Similar to the effort on AIS, the OLW should maintain a database to track and document the spread of invasive wetland species.

E. Policy/legislative initiatives

Strategy IIE: Review Dane County policies and local activities, such as weed harvesting, the recreational boat patrol and dry hydrants, and recommend changes if they are contributing to the spread of AIS. Check county lists of non-native plantings and recommend changes if there is cause for concern.

Action IIE1: The OLW should examine county policy with regard to the species of aquatic plants that are planted in conjunction with water management, sediment and flow through ponds. If there are risks of new AIS introductions, the OLW should adopt a specific policy to eliminate those risks.

Action IIE2: The OLW should establish an approved list of aquatic plants for Dane County restoration sites.

Action IIE3: Dane County should review its ordinances and may recommend changes to the County Board regarding AIS regulations. Dane County may also recommend changes to DNR staff on administrative codes based on the threats posed by AIS to county waters.

Action IIE4: Dane County should examine whether the management of dry hydrants (non-pressurized water supplies from a lake or stream that can be used by fire department tank trucks) and other activities carried out by local fire departments are a contributing factor in the spread of AIS. If it is determined that dry hydrants are a factor in spreading AIS, efforts should be undertaken to stop massive transfers of water among waterbodies.

MANAGEMENT ACTIONS RELATED TO GOAL III

Goal III: Abate, and where possible, eliminate harmful ecological, economic, social and public health impacts resulting from the infestation of aquatic invasive species in Dane County waters.

Background: The infestation of aquatic invasive species has caused, to varying degrees, ecological, economic, social, and public health impacts to Dane County's waters. Effective strategies to control AIS and abate their impacts are technically and environmentally difficult to implement. Control strategies must be directed at specific problem AIS in order not to cause adverse environmental impacts on non-target species. In addition, native aquatic populations that are at risk, because of direct or indirect impacts from AIS, may require protection or restoration strategies, particularly where those species are threatened or endangered. Purple loosestrife is one example of an aquatic invasive species where a successful biological control program is in place both in Dane County waters and throughout Wisconsin.

Implementing the steps in Goal I will help prevent the introduction of AIS and is the first line of defense against the establishment of new aquatic invaders. However, even the best prevention efforts are not likely to stop all AIS introductions. Implementation of an early detection and rapid response effort will increase the likelihood that aquatic invasions will be addressed successfully while populations are still localized and more likely to be contained or eradicated.

The following management efforts will be undertaken to abate and/or eliminate the harmful impact of AIS in Dane County waters:

- A. Implement physical, chemical or biological control efforts for problem AIS and
- B. Establish an early detection and rapid response program

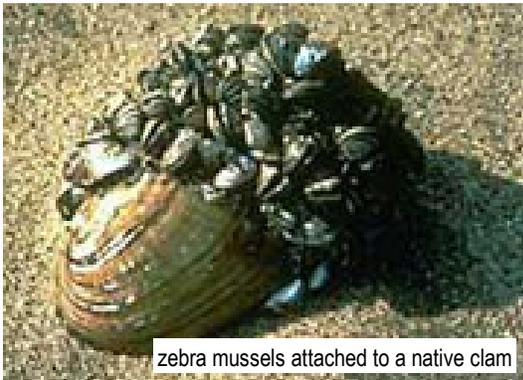
To achieve the objectives established in Goal III of this plan, a strategy has been developed for each of the above efforts as well as specific management actions. Refer to Table 4 for a summary of the management actions related to Goal III.

A. Control and abatement of AIS

Strategy IIIA: Assess the public health, social, economic and ecological impacts of AIS to Dane County waters and determine whether control actions are feasible to implement and limit those impacts.

Action IIIA1: The OLW should keep abreast of ongoing research efforts that are both cost-effective and provide long-term solutions aimed at controlling species like zebra mussels and other AIS that are problematic.

Action IIIA2: The OLW should identify which problem AIS are present in Dane County waters that should be targeted for abatement based on their impacts and the likelihood of successfully controlling or potentially eradicating their populations.



Action IIIA3: The OLW should determine which biological, physical or chemical control strategies are most cost effective and environmentally sound. In cooperation with partner organizations, the OLW should implement, if feasible, those strategies for problem AIS in Dane County waters. The OLW should also involve K-12 and university teachers and students in special projects to control and abate AIS.

Action IIIA4: The OLW should evaluate the effectiveness of control strategies that have been in place on Dane County waters (i.e., the purple loosestrife biocontrol program) and modify or discontinue implementation if it is shown to be ineffective or environmentally harmful.

Action IIIA5: The OLW, in consultation with the DNR, should assess if chemical treatment is feasible for wetland invasive species (identified in the section on 'Wetland Species') to control their population levels or eradicate them.

B. Early detection and rapid response

Strategy IIIB: Improve monitoring capabilities for Dane County waters so that new invasive species can be quickly detected. Enhance coordination efforts with state agencies, adjoining counties and local municipal officials to expedite rapid response strategies for implementation if a new species is detected.

Action IIIB1: The OLW should review rapid response contingency plans that are already developed, or in the process of being developed, to determine if they can be applied in Dane County waters. The OLW would be responsible for modifying established protocols if the existing plans didn't fit the counties needs.

Action IIIB2: The OLW should identify points of contact, including technical experts and lead agencies that could be called upon for early detection and rapid response efforts.

Action IIIB3: The OLW should develop a communications protocol for rapidly identifying invaders and formulating response efforts.

Action IIIB4: The OLW should work with the DNR to establish a rapid response team responsible for recommending to county, state, and federal agencies if rapid response protocols can or should be implemented in a specific situation.

PROGRAM IMPLEMENTATION, EVALUATION AND REPORTING

The program implementation and evaluation process for Dane County's Aquatic Invasive Species Prevention and Control Plan will enable the county to monitor progress toward prevention, control, and abatement of AIS. To provide oversight on the progress of the plan implementation and evaluation, an implementation task force, comprised of key stakeholder groups, will be formed. Groups that have been identified as participating in the plan implementation will be part of the task force as well as other interested organizations and stakeholders.

The task force will ensure that the management actions are implemented and, if needed, recommend to the county "mid-course" corrections to specific plan strategies or actions. In essence, the task force will be responsible for incorporating the best scientific and management knowledge with periodic public evaluation, and in the process, will be implementing an adaptive management program (Lee, 1993). The task force will also have a role in identifying who should be involved in implementing specific actions.

The task force's evaluation effort will be important in examining the progress in meeting the goals of the plan. But, in addition, the task force will need to examine whether funding levels are adequate to successfully address the strategies and actions identified in the plan. This evaluation process should prove useful in guiding future AIS planning efforts for Dane County. The evaluation component will also be used to incorporate information from stakeholder groups affected by, and involved in, the plan implementation. One gauge of the success of the plan will be stakeholder involvement. The county will need to get local partners involved initially in prevention, control and abatement of AIS, and then keep them involved over the long term.

Dissemination of information on the plan implementation will be accomplished through an annual report. The report will highlight the progress in meeting the management actions. It will include information on the successes in achieving the goals identified in the AIS Plan as well as providing future direction. Successes, failures, and new directions for the county plan will be evaluated and compared to other county plans and state guidelines. The report will be available on Dane County's web site, and upon request, be provided to members of the public stakeholder groups, as well as local and state officials. More frequent updates on AIS activities and opportunities for involvement will also be posted on the county web site.

DETAILED WORK PLAN

A detailed work plan summarizes the tasks that will be accomplished over the next five years as part of the Dane County Aquatic Invasive Species Prevention and Control Plan, assuming that adequate funding is provided. Each task is detailed by goal in separate tables. Table 2 lists all the actions for Goal I, Table 3, the actions for Goal II and Table 4, the actions for Goal III. Table 5 provides a summary of the lead and cooperating entities for plan implementation, evaluation and reporting. If sufficient state funds are appropriated for this five-year grant, then a full-time AIS project coordinator will be hired to implement the Dane County plan. Approximately 40% of the coordinator's time will be spent on implementing the actions in Goal I, 40% of the coordinator's time will be spent on implementing the actions in Goal II and 20% for the actions in Goal III.

State resources would provide the baseline funding for the plan with potential county appropriations augmenting the state monies. In addition, local partners would, through volunteer efforts, help leverage state and county resources. More planning will also be necessary to optimally target and prioritize efforts of the program (Vander Zanden and Olden, 2008). The county will review the work plan annually and parts of it may be amended as conditions warrant it.

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Table 1. A listing of the named lakes and ponds in Dane County and where AIS have been reported.

Lake Name	Surface Acres	Eurasian Water-milfoil	Curly-leaf Pondweed	Zebra mussels	Cylindrospermopsis
Barney Lake	27				
Bass Lake	69				
Brandenburg Lake (Katrine)	38				
Cherokee Lake	57				
Cherokee Marsh	335				
Crystal Lake*	500	X	X		
Fish Lake	216	X	X		
Fishers Lake	5.2				
Goose Lake	32				
Goose Pond	11				
Grass Lake (Town of Dunkirk)	10				
Grass Lake (Town of Dunn)	48				
Harriett Lake	32				
Hook Lake	9				
Island Lake	10				
Indian Lake	66	X	X		
Kegonsa Lake	3,209	X	X		X
Koshkonong Lake*	10,460		X		
Lake Belle View	100				
Lake Marion	17				
Marshall Millpond	185				
Mendota Lake	9,842	X	X		X
Monona Lake	3,274	X	X	X	X
Morse Pond	12				
Mud Lake (Marx Pond)	54		X		
Mud Lake	34	X			
Mud Lake (Lower Mud)	195	X	X		
Mud Lake (Upper Mud)	223				
Rice Lake	98				
Salmo Pond	4	X	X		
Stewart Lake	7		X		
Stoughton Millpond	82				
Sweet Lake	15				
Turtle Lake	15				
Verona Gravel Pits (Palmer's Pond)	8	X			
Waubesa Lake	2,080	X	X		X
Windsor Lake	9				
Wingra Lake	345	X	X		X

* The majority of the surface acreage of these lakes are in adjoining counties and managed by those counties but are also listed as part of Dane County waters.

NOTE: Rusty crayfish are found in 3 Dane County streams including Allen Creek, Koshkonong Creek and the Sugar River, but have not been found in any lakes.

Table 2. Summary of tasks/actions to be accomplished related to Goal I.

Tasks/Actions		Lead entity(ies) for implementation	Cooperating Organizations	Status
#	Description			
IA1	Identify landings receiving highest boat traffic in the county	OLW	YLA	NI
IA2	Participate in Clean Boats Clean Waters (CBCW) training & establish schedule for watercraft inspectors	YLA	Madison Fishing Expo, other Dane County lake groups	NI
IA3	Investigate the use of boat wash facilities on Dane County lakes	OLW, YLA	municipalities	NI
IB1	Establish a work group to examine potential for Asian carp to move upstream into Dane County waters	OLW & Dane County Public Works	County staff, adjoining counties, DNR, Illinois staff	NI
IB2	Adopt proactive response strategy if Asian carp become established in Dane County waters	OLW	DNR	NI
IC1	Review plant handling procedures to determine potential risks of introduction	OLW		NI
IC2	Develop educational materials for plant industry representatives	OLW	DNR, UW-Extension	NI
ID1	Provide guidance to aquarium owners on how to properly dispose of unwanted aquatic pets	OLW	DNR, UW-Extension	NI
ID2	Provide policy guidance to the aquarium trade in Dane County to reduce accidental releases	OLW	DNR, UW-Extension, UW-Sea Grant	NI
IE1	Encourage bait handlers, fish farmers and aquaculture producers to take the Hazard Analysis & Critical Control Point (HACCP) training	OLW	UW-Sea Grant	NI
IE2	Educate bait shops in Dane County on the proper protocols for screening bait for AIS	OLW	Dane County municipalities	NI
IF1	Utilize all venues (expos, mailings, web, presentations) to educate anglers and recreational boaters on proper cleaning procedures for their boats and equipment	OLW	YLA and area angling groups	EI
IF2	Develop guidance for trout anglers to avoid spreading New Zealand & other AIS into Dane County waters	OLW, TU	DNR	NI

OLW= Office of Lakes & Watersheds

YLA= Yahara Lakes Association

TU= Trout Unlimited

DNR= Department of Natural Resources

Status: AO=Annual Ongoing

EI = Expanded Initiative

NI = Proposed New Initiative

Table 3. Summary of tasks/actions to be accomplished related to Goal II.

Tasks/Actions		Lead entity(ies) for implementation	Cooperating Organizations	Status
#	Description			
IIA1	Participate in CBCW workshop & coordinate the scheduling of watercraft inspectors on Yahara chain of lakes	YLA	OLW, other Dane County lake organizations	NI
IIA2	Distribute I&E materials on AIS as part of watercraft inspection efforts at the boat landings	YLA & other Dane County lake groups	DNR, UW-Extension	EI
IIA3	Complete watercraft inspection data logs & send them into DNR on a regular basis	OLW, YLA	DNR	AO
IIA4	Report any violations of the state's launching regulations to the SCR's Water Guard (DNR warden)	OLW	YLA, DNR	AO
IIB1	Distribute I&E materials to boaters and anglers via kiosks, expos, & mailings	OLW	DNR, UW-Extension, YLA & other lake & river groups	NI
IIB2	Provide educational materials aimed at all pathways of introduction	OLW	YLA & other lake & river groups	NI
IIB3	Develop courses and outdoor activities for AIS	OLW	Area schools, UW & Edgewood College	NI
IIB4	Develop short AIS presentations for specific target audiences	OLW	DNR, UW-Extension	NI
IIB5	Evaluate the effectiveness of the I&E program periodically & restructure the program as necessary	OLW	DNR, UW-Extension	NI
IIC1	Inventory all boat landings to ensure that adequate AIS signage is in place	OLW	YLA, other lake & river groups & municipalities	AO
IIC2	Replace signage at the landings as needed or put up new signs if they are not currently posted.	OLW	YLA, other lake & river groups & municipalities	AO
IIC3	Provide DNR with a listing of all the landings that are posted with each AIS sign	OLW	YLA, other lake & river groups & municipalities	NI
IID1	Examine current sampling efforts for zebra mussels and rusty crayfish to determine whether additional monitoring is needed for those species	OLW	DNR & UW Center for Limnology	EI
IID2	Develop monitoring strategies for other AIS species of concern	OLW	DNR	NI

Tasks/Actions		Lead entity(ies) for implementation	Cooperating Organizations	Status
#	Description			
IID3	Train volunteers from stakeholder groups to conduct monitoring on Dane County waters	OLW	YLA, TU and friends groups, and UW-Extension	EI
IID4	Maintain a database of all infested waters to track the spread of AIS in Dane County waters	OLW	DNR	AO
IID5	Establish a monitoring network to determine the distribution of invasive wetland species in Dane County	OLW	Students, friends groups and watershed volunteers	NI
IIE1	Examine county policies to make sure that county activities are not contributing to the spread of AIS	OLW	County staff	NI
IIE2	Establish an approved list of aquatic plants for Dane County restoration sites	OLW	UW-Extension	NI
IIE3	Review county ordinances and recommend changes to AIS regulations to the Dane County Board	OLW	County staff	NI
IIE4	Review the management of dry hydrants to determine if they are spreading AIS and if it is a problem recommend stopping water transfers	OLW	County staff & local fire departments	NI

OLW= Office of Lakes & Watersheds
 YLA= Yahara Lakes Association
 TU= Trout Unlimited
 DNR= Department of Natural Resources

Status: AO=Annual Ongoing
EI = Expanded Initiative
NI = Proposed New Initiative

Table 4. Summary of tasks/actions to be accomplished related to Goal III.

Tasks/Actions		Lead entity(ies) for implementation	Cooperating Organizations	Status
#	Description			
IIIA 1	Keep abreast of cost-effective & long-term solutions for controlling problem AIS	OLW	DNR	NI
IIIA 2	Identify problem AIS that should be targeted for abatement based on their impacts	OLW	DNR	NI
IIIA 3	Determine which control strategies are most cost effective and environmentally sound	OLW & DNR	YLA & other Dane County lake and river organizations	NI
IIIA 4	Evaluate the effectiveness of control strategies that have been in place in Dane County waters	OLW	DNR & UW-Extension	EI
IIIA 5	Assess whether chemical treatment is feasible for wetland invasive species to control their population levels or eradicate them	OLW	DNR	NI
IIIB 1	Review rapid response contingency plans that are already developed to determine if they can be applied in Dane County waters	OLW	DNR	NI
IIIB 2	Identify points of contact that could assist in early detection and rapid response efforts	OLW	DNR	NI
IIIB 3	Develop a communications protocol for rapidly identifying invaders and formulating response efforts	OLW	DNR	NI
IIIB 4	Establish a rapid response team that would be responsible for recommending to the county, state & federal agencies if a rapid response effort should be implemented	OLW & County staff	DNR & FWS	NI

OLW= Office of Lakes & Watersheds
 YLA= Yahara Lakes Association
 DNR= Department of Natural Resources
 FWS= Fish & Wildlife Service

Status: AO=Annual Ongoing
EI = Expanded Initiative
NI = Proposed New Initiative

Table 5. Summary of tasks/actions for plan implementation, evaluation, and reporting.

Tasks/Actions	Lead entity(ies) for implementation	Cooperating Organizations
Monitor the progress in implementing the goals identified in the plan	OLW	Key stakeholder groups
Establish a task force to provide oversight and guidance on plan implementation	OLW	Key stakeholder groups
Evaluate the effort of lead entities and cooperating organizations in implementing the specific actions/tasks identified in the plan	Task force	OLW
Determine the funding level needed to address the strategies & actions identified in the plan & prioritize tasks if funding is inadequate	Task force	OLW
Engage local partners to assist in the plan implementation	OLW	Task force
Generate an annual report to the county board and county executive that summarizes the progress in meeting the plan's goals & objectives	OLW	Task force
Provide updates to the Dane County web site on opportunities for public involvement on AIS issues	OLW	Key stakeholder groups
Annually update the communication & implementation protocols to help formulate AIS response efforts in the county	Task Force	OLW
Periodically advise the Dane County Board & Executive, mayors and other elected officials on major policy issues regarding AIS	Lakes & Watershed Commission	OLW
Update the plan every five years to guide future AIS planning efforts for Dane County	OLW, Task force	Key stakeholder groups

Appendix A. Listing of stakeholder groups that were provided updates and copies and offered the opportunity to review the plan.

Badger Fly Fishers
Black Earth Creek Watershed Association
Camp Randall Rowing Club
Capitol Water Trails
Christy's Landing
Coast Guard Auxiliary
D & S Bait
Dane County Lakes & Watershed Commission
Fishing Tournament Organizers
Four Lakes Group Sierra Club
Friends of Cherokee Marsh & Upper Yahara Watershed
Friends of Lake Kegonsa Society
Friends of Lake Wingra
Friends of Monona Bay
Friends of Pheasant Branch

Friends of Starkweather Creek Watershed
Friends of the Lower Wisconsin Riverway
Lake Monona Sailing Club
Lake Mendota Sailing Club
Lake Waubesa Conservation Association
Madison City Paddlers
Mad City Ski Team
Madison Fishing Expo
Madison Sail & Power Squadron
Mazinet Marina
Mendota Rowing Club
Muskie, Inc.—Capital City Chapter
River Alliance of Wisconsin
Rock River Coalition
Rutabaga
Sailboat House
Skipper Bud's
Southern Wisconsin Chapter of Trout Unlimited
Upper Sugar River Watershed Association
UW Crew House
Von Rutenberg Ventures
Wingra Canoe & Sailing Center
Yahara Fishing Club
Yahara Lakes Association
Yahara Lakes Legacy Partnership