

Harmful Exotic Species of Aquatic Plants and Wild Animals in Minnesota

**Annual
Report
2000**

*for the year
ended December 31*



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2000 Annual Report Highlights

Monitoring Populations of Harmful Exotic Species

- Eurasian watermilfoil was discovered in 15 additional Minnesota waters, the largest number of waters discovered with milfoil in a single year since 1989 (eight of the new infestations are connected to waters already known to be infested with milfoil). There are now 121 waters known to have Eurasian watermilfoil.
- Divers discovered numerous small zebra mussels on substrate at several locations in the St. Croix River. This discovery led to the designation of the St. Croix River downstream of river mile 25.4 (just north of Stillwater) as infested waters. Zebra mussels were reported by lake residents and confirmed by DNR to be in Lake Zumbro and the Zumbro River downstream of Lake Zumbro (north of Rochester).
- Spiny water flea populations increased in western Lake Superior causing problems for anglers.
- New exotic species were reported in the wild during 2000: water lettuce, black swan, Egyptian geese and Reeves pheasant.

Species Management

- The DNR Exotic Species and Aquatic Plant Management programs worked with cooperators to manage Eurasian watermilfoil on 33 lakes and the DNR initiated control efforts on 12 other "high-intensity management" lakes.
- Approximately 1.5 million purple loosestrife eating beetles were released at more than 250 sites. Beetles have now been released on 567 sites, one-quarter of the known purple loosestrife infestations in Minnesota. A survey of sites where biological-control beetles had previously been released found that the insects were causing significant damage to purple loosestrife on 30% (88 of 289) of the sites. There were 64 cooperators who helped rear the insects.
- The DNR Exotic Species Program staff removed flowers from flowering rush in Forest Lake, the only known population in Minnesota which produces fertile seeds.

Research and Cooperation

- Exotic Species Staff assisted the U.S. Army Corps of Engineers in studying the effectiveness of using endothall herbicide to control curly-leaf pondweed in spring when water temperatures are low.
- A cooperative study involving the DNR, Minnesota Sea Grant, and the University of Minnesota was initiated to better understand which exotic aquatic plants are being sold in the state and which plants can survive Minnesota winters.

- Over 200 lakeshore residents joined a new volunteer monitoring program this fall, checking their docks, rafts, boats, and other objects for zebra mussels. The monitoring program was sponsored by DNR and Minnesota Sea Grant.

Limiting the Spread and Preventing New Introductions

- The DNR developed and used two new television and two new radio spots to encourage boaters to clean vegetation and exotics from their boats.
- Minnesota Sea Grant lead the development of a video "Stop Exotics: Clean Your Boat" to teach boaters how to prevent the spread of species such as Eurasian watermilfoil and Zebra mussels.
- Watercraft inspectors contacted 51,508 boaters about harmful exotics species and how to clean boats and trailers. About 9% of the inspections were at uninfested waters.
- Weekend-long exotic species awareness events were conducted in the communities of Alexandria, Spicer, and Lake of the Woods.
- Four road checks were held by DNR conservation officers. Aquatic vegetation was found in, or on, an average of 17% of all watercraft/trailers inspected. Warnings and citations were issued to all violators.
- The DNR encouraged the U.S. Fish and Wildlife Service to designate black carp as an injurious wildlife species because the escape of black carp into the Mississippi River system would harm native mussel populations. The DNR also encouraged the US Army corps of engineers to construct a barrier in the Illinois waterways to prevent the spread of round goby and other species into the Mississippi River basin.

Executive Summary

This report describes the progress made during 2000 by the Exotic Species Program of the Minnesota Department of Natural Resources (DNR) and its cooperators in Minnesota. The Exotic Species Program is responsible for the monitoring and management of harmful exotic species of aquatic plants and wild animals. These are species that may harm communities of native plants and animals, limit water recreation, and increase operating costs for industry. An annual report on Program activities is required by state statute.

Funding for the Exotic Species Program is derived primarily from a \$5 surcharge on the registration of watercraft. The surcharge generates approximately \$1,200,000 annually and funds most of the activities described in this report. The program receives additional funding from a variety of other sources and those activities are also described. Activities documented in this report occurred in state fiscal years 2000 (FY00) and 2001 (FY01) which began on 1 July and ended on 30 June. A breakdown of FY00 expenditures by major category, as well as expenditures planned in FY01, is shown in Table 1.

Table 1. Water Recreation Account spending by the Exotic Species Program in fiscal years 1998-2000 and projected spending in 2001. Minnesota state government fiscal years begin on 1 July and end on 30 June.

Fiscal Year	Expenditures (\$\$\$ in thousands)						
	Administration & Overhead	General Program Activities	Public Awareness Efforts	Managing Exotic Populations	Inspections & Enforcement Efforts	Research	Total
1998	156	136	57	235	379	85	1,048
1999	135	126	114	287	358	127	1,147
2000	162	102	94	257	410	94	1,119
2001	170	105	130	280	437	111	1,233

The three primary goals of the Exotic Species Program are:

- Prevent introductions of new harmful exotic species into Minnesota;
- Prevent the spread of harmful exotic species within Minnesota; and
- Reduce the impacts caused by harmful exotic species to Minnesota's ecology, society, and economy.

To accomplish these goals the DNR and its cooperators undertake a wide variety of activities (A program summary is shown on page 5). This report details the program's progress during 2000 in meeting its goals and provides updates on management efforts for various key species, e.g. Eurasian watermilfoil, purple loosestrife, zebra mussels,

flowering rush, and curly-leaf pondweed, ruffe, and mute swan. Detailed information on emerging exotic species issues is also provided.

The Exotic Species Program's efforts in 2000 to prevent the introduction of new harmful exotic species to Minnesota were focused in three areas. Because the source of these species is outside Minnesota, program staff worked with resource agencies in neighboring states and provinces, as well as at the Federal level, to develop complementary management approaches. Management efforts should be far more efficient and cost-effective, if there are common and cooperative actions among groups of states/provinces. In a number of cases in 2000, the DNR argued that the risk associated with a particular exotic species was so significant that proposed activities should be curtailed. The second focus of 2000 prevention efforts was to identify pathways that do, or likely will, bring new harmful exotic species to Minnesota and implement steps to reduce those risks. A cooperative study by MN Sea Grant, DNR, and University of MN was initiated to identify aquatic plants that are available for sale to Minnesota residents and the vendors who supply them, and to improve methods to identify which species will be "winter-hardy". Supporting research to remove harmful exotic species from ballast water was the third focus of our 2000 efforts. This on-going research effort has had success and designs are in process for an operational scale for further testing.

Reports received by the DNR and inventory efforts conducted in 2000 documented the introduction of new harmful exotic species in Minnesota and the spread of species that are already present in the state. Exotic species staff confirmed a report that water lettuce (*Pistia stratiotes*) was growing in Lake Winona. This tropical plant has apparently been observed in the lake during several recent summers. Additional study will be required to determine if this exotic plant can survive and reproduce in Lake Winona and other Minnesota waters. Other species found in the state in 2000, or not previously mentioned in past reports, include Egyptian geese, exotic earthworms, threespine stickleback, black swan, and a Reeves pheasant. Eurasian watermilfoil was confirmed to have spread to fifteen new waters, the highest number of new infestations since 1989. This total include locations in two counties (Kandiyohi and Isanti) where the plant had not previously been identified. Nevertheless, eight of the new locations are connected to waterbodies where milfoil was already known to be present. The distribution of zebra mussels also expanded. Monitoring efforts in the St. Croix River provided clear evidence that the exotic mussel has established a reproducing population in the lower section of the river. In response, the lower 25.4 miles of the St. Croix River has been designated an "infested water." Zebra mussels were also reported for the first time in one of Minnesota's inland lakes; Lake Zumbro (north of Rochester) and the Zumbro River downstream of the lake were confirmed to be infested. A partial winter drawdown of Lake Zumbro, which is a reservoir, was done to kill zebra mussels growing in shallow-water areas of the lake.

In contrast, during 2000 no change was documented in the distribution within Minnesota of a number of other harmful exotic species. No evidence was found that flowering rush, spiny waterflea, ruffe, or round goby have expanded their range in Minnesota.

Exotic Species of Aquatic Plants and Wild Animals in Minnesota	Elements of DNR's Exotic Species Program						
	A = Public information and education B = Watercraft inspections to prevent spread C = Population surveys and monitoring D = Control to reduce nuisance E = Control to reduce populations F = Research on biology and management G = Regulations						
	A	B	C	D	E	F	G
Aquatic Plants							
Flowering rush (<i>Butomus umbellatus</i>)	✓		✓	✓		✓	✓
Purple loosestrife (<i>Lythrum salicaria</i>)	✓		✓		✓	✓	✓
Eurasian watermilfoil (<i>Myriophyllum spicatum</i>)	✓	✓	✓	✓	✓	✓	✓
Other Non-native aquatic plants	✓		✓				✓
Curly leaf pondweed (<i>Potamogeton crispus</i>)	✓	✓		APM		✓	✓
Animals							
Common carp (<i>Cyprinus carpio</i>)			F		F/W		✓
Ruffe (<i>Gymnocephalus cernuus</i>)	✓	✓	F/O		NIF	✓	✓
Round goby (<i>Neogobius melanostomus</i>)	✓	✓	F/O		NIF		✓
Spiny waterflea (<i>Bythotrephes cederstroemii</i>)	✓	✓	F				✓
Zebra mussel (<i>Dreissena polymorpha</i>)	✓	✓	✓			✓	✓
Rusty crayfish (<i>Orconetes nusticus</i>)	✓						✓
Mute swan (<i>Cygnus olor</i>)			✓				✓

- APM - Individuals or groups apply for aquatic plant management permits
 F - DNR Division of Fisheries monitors this species
 F/O - DNR Division of Fisheries and other agencies monitor this species
 F/W - DNR Division of Fisheries and/or Division of Wildlife occasionally manage this species at priority sites
 NIF - Inland waters will be addressed as outlined in a Nonindigenous Fish Plan

The Exotic Species Program continued efforts to keep Minnesotans well informed about exotic species and the problems they can cause, and to promote the adoption of "Clean Boats" behavior. A well informed public is an important strategy in DNR efforts to prevent the spread of harmful exotic species. In 2000, DNR continued to use paid TV and radio ads to reinforce the "clean boats" message and undertook a variety of cooperative efforts with the University of Minnesota Sea Grant Program. Information on harmful exotic species provided on DNR's website (dnr.state.mn.us/ecological_services/exotics/) was expanded. In addition, the program worked with local communities in Greater Minnesota to promote an exotic species prevention message. Weekend-long exotic species awareness events were conducted in Alexandria, Spicer, and Lake of the Woods during the summer of 2000. The expansion of zebra mussels into the lower St. Croix River and Lake Zumbro will require additional public awareness efforts in 2001.

The Exotic Species Program stations watercraft inspectors, who are Minnesota Conservation Corps employees, at public water access points to make the boating public aware of exotic species and provide advice on how to clean watercraft. The Minnesota Legislature mandates (M.S. 84D.02, Subd. 4) that the DNR annually accomplish 20,000 hours of water access inspection activity. The DNR's goal, based on input from constituent groups, is to focus 90% of the required access inspection effort on "infested waters". In 2000, over 22,000 hours of inspection activity was logged and over 51,000 trailered watercraft were inspected (about 91% of this activity occurred on infested waters). Special inspection efforts continued to be focused on events, e.g., fish tournaments and the waterfowl hunting season, that bring many watercraft users to infested waters. The watercraft inspectors also talk with thousands of Minnesotans during the State Fair at DNR's Exotic Species exhibit. As the number of "infested waters" in Minnesota has increased, the amount of inspection effort that can be focused in any one location has declined. The program will be exploring ways it can increase cooperation with local groups to help maintain high levels of inspection effort.

Conservation Officers play a key role in bringing harmful exotic species to the public's attention and enforcing exotic species laws. Conservation Officers use road checks of trailered boats as one tool to accomplish these goals. Road checks also can be used to evaluate the success of prevention efforts. Trailered boats represent an important vector that move exotic species between water bodies and the DNR's goal is to increase the percentage of "clean boats" on the state's roads. Conservation Officers conducted four major road checks in 2000 where over 400 boats were inspected to assess compliance with laws that prohibit the transportation of aquatic vegetation and zebra mussels on public roads. Aquatic vegetation was found in, or on, about 17% of the watercraft inspected; the lowest rate observed in the last five years. Nevertheless, results between road checks and between years are often quite variable. Watercraft inspectors also check boats entering and leaving the accesses where they are doing inspections. Their results show a different pattern; on average 24% of boats pulling out of a lake or river had vegetation attached - before cleaning - while vegetation was present on only 3 - 5% of the boats pulling into the access area. The DNR would like to

expand efforts to enforce exotic species laws and plans to seek ways to work cooperatively with other law enforcement agencies.

The Exotic Species Program attempts, alone or in cooperation with various groups, to reduce the impacts caused by harmful exotic species to Minnesota's ecology, society, and economy. A wide variety of management actions were conducted in 2000 with this goal in mind. DNR conducted or assisted with Eurasian watermilfoil control efforts on 45 lakes, purple loosestrife control efforts on over 340 sites (66 sites were sprayed with herbicide while biocontrol insects were released at more than 270 sites), and continued to coordinate flowering rush management activities on a number of lakes. Local partners are extremely important for the success of these efforts. For example, on a majority of the lakes where Eurasian watermilfoil is managed, a local partner takes the lead while the Exotic Species Program provides technical and financial assistance. Likewise, a broad group of partners assist with the rearing of the leaf-eating beetles that are being introduced to control purple loosestrife infestations. In 2000, groups cooperating with the Exotic Species Program raised and released nearly 1.5 million leaf-eating beetles. The Exotic Species Program will continue to cooperate with various groups to accomplish its public awareness, containment, management, and research goals.

Targeted research, to improve existing management approaches, can aid in reducing the impacts caused by harmful exotic species. The Exotic Species Program assisted with and/or funded a variety of research efforts during 2000 focused on improving the management of Eurasian watermilfoil, purple loosestrife, flowering rush, reed canary grass, and curly-leaf pondweed. Funding recommended by the Legislative Commission on Minnesota Resources (LCMR) and appropriated by the Legislature continued to support a large, on-going, effort to develop biological-control methods for Eurasian watermilfoil and expand biological controls for purple loosestrife. Cooperators play an important role in these research effort, including conducting basic research, helping implement field tests, and analyzing study results. During 2000, staff and in some cases students from the University of Minnesota, Cornell University (NY), the Queens University (Ontario), and the Army Corps of Engineers Aquatic Plant Research conducted research that may improve exotic species management in Minnesota.

Introduction

Administration of state exotic species control programs

The control and prevention programs for harmful exotic species in the State of Minnesota are administered by the Department of Natural Resources (DNR) and the Department of Agriculture. The DNR's Exotic Species Program within the Division of Ecological Services is responsible for programs covering exotic aquatic plant and wild animal species. DNR's Division of Forestry, working in cooperation with the Minnesota Department of Agriculture, is charged with surveying and controlling forest pests, including exotic organisms such as gypsy moth and evergreen spruce bark beetle. A separate annual report is prepared by the Forest Pest Program to report on those issues. The Minnesota Department of Agriculture is responsible for the state's noxious weed and seed laws which apply primarily to terrestrial plants that harm agricultural crops, pastures, and roadsides. Information about control, prevention, and regulatory programs for harmful terrestrial exotic plants may be obtained from the Minnesota Department of Agriculture.

Requirement to prepare annual report

Each year, by January 15, the DNR is required to prepare a report for the legislature which summarizes the status of management efforts for harmful exotic species (aquatic plants and wild animals) under its jurisdiction (see M.S. 84D.02, Subd. 3 in Appendix A). According to statute, this report must include:

- detailed information on expenditures for administration, education, management, inspections, and research;
- an analysis of the effectiveness of management activities conducted in the state, including chemical control, harvesting, educational efforts, and inspections;
- information on the participation of other state agencies, local government units, and interest groups in control efforts;
- information on management efforts in other states;
- information on the progress made in the management of each species; and
- an assessment of future management needs.

Additional sections on regulations, enforcement, emerging issues and distribution of species have been added to this report to provide a thorough account of Exotic Species Program activities. Background information on select harmful exotic species which are present in Minnesota, but are not currently actively managed are also included.

Overview of Minnesota Exotic Species Program

History of DNR's Exotic Species Program

Although harmful exotic species have been present in Minnesota for many years (e.g., common carp and sea lamprey), a specially identified program to prevent their spread and mitigate their negative impacts is relatively new to state government. In 1987, the Minnesota Department of Natural Resources (DNR) was designated the lead agency for control of purple loosestrife, an invasive plant of particular concern for the state's wetlands. In 1989, DNR was officially assigned an additional coordinating role for Eurasian watermilfoil (EWM) control (see M.S. 84D.02, Subd. 2 in Appendix A).

During its 1991 session, and in response to the "Report and Recommendations of the Interagency Exotic Species Task Force" (Minnesota Interagency Task Force 1991), the legislature called for the DNR to develop and coordinate a statewide program to prevent the spread of *ecologically harmful exotic wild animals and aquatic plants*. Many species, in addition to purple loosestrife and Eurasian watermilfoil, fall under the DNR's statewide responsibility. They include harmful exotic species that are currently found in Minnesota, such as zebra mussel and ruffe, as well as harmful species that have the potential to move into Minnesota.

Responsibilities assigned to the DNR

The purpose of the Exotic Species Program is to prevent the introduction and curb the spread of harmful exotic species. These species are aquatic plants and wild animals that can naturalize in the state and either:

- (1) displace, or otherwise threaten, native species in their natural communities; or
- (2) threaten natural resources or their use in the state.

The DNR is assigned the responsibility for preparing a long-term plan for the statewide management of harmful exotic species (see M.S. 84D.02, subd. 3 in Appendix A). Management plans for individual species are also prepared by the DNR. Preparing a statewide plan and species specific plans is beneficial for coordinating efforts within the state, and establishing priorities for prevention, management, and research activities.

The DNR is assigned responsibility for designating *infested waters* (see M.S. 84D.03 in Appendix A). Water bodies are designated *infested* if they contain certain harmful exotic species such as Eurasian watermilfoil, zebra mussels, ruffe, round goby, white perch, and spiny water flea. The current *infested waters* lists are included (Appendix B).

The DNR is also required to adopt rules (see M.S. 84D.12 in Appendix A) which place exotic species into various regulatory classifications and prescribe how exotic species permits will be issued (see M.R. 6216.0265 in Appendix B). The DNR is authorized to adopt other rules regarding harmful exotic species and infested waters.

Another important role of the program is prevention activities, such as identifying potentially harmful species in other areas of North America and the world, predicting pathways of spread, and developing and implementing solutions that reduce introduction and spread.

Program staff

Most activities of the Exotic Species Program are conducted or directed by staff from DNR's Division of Ecological Services. Those staff, their principal areas of activity, and their phone numbers, are listed below:

Exotic Species Program Coordinator	Jay Rendall	651-297-1464
Purple Loosestrife Coordinator	Luke Skinner	651-297-3763
Eurasian Watermilfoil Coordinator	Wendy Crowell (2000)	651-282-2508
	Chip Welling (2001)	651-297-8021
General Exotic Species Issues	Nicole Hansel-Welch	218-828-6132
	Nick Proulx	651-284-3589
Watercraft Inspections	Tiffanie Knapp	651-284-3586
	Heidi Wolf	651-297-4891
Zebra Mussels\Exotic Aquatic Invertebrates	Gary Montz	651-297-4888
Budget Management	Dave Wright	651-297-4886
General Information		651-296-2835

Responsibility for overall coordination of the DNR's Exotic Species Program is assigned to the Program Coordinator (Jay Rendall). Development of exotic species policy, rulemaking, legislation, participation in regional and federal entities are other key responsibilities of the Coordinator's position.

Other staff support

Staff from the Division of Fisheries, Division of Wildlife, Division of Enforcement, Trails and Waterways Unit, Bureau of Information, Education, and Licensing and Minnesota Conservation Corps also contribute significantly to the implementation and coordination of exotic species activities.

Divisions of Ecological Services, Fisheries, and Wildlife Pesticide Enforcement specialists from Ecological Services and Aquatic Plant Management specialists in the Division of Fisheries assist with the management of various exotic plants including purple loosestrife, Eurasian watermilfoil, and flowering rush. In addition to these staff, other individuals from the Divisions of Fisheries and Wildlife contribute by providing biological expertise, assisting with control efforts, conducting inventory and public awareness activities, and providing additional avenues for public input.

Division of Enforcement Conservation Officers are responsible for enforcing the state regulations regarding harmful exotic species. A regional Enforcement Supervisor (Mike Hamm 651-772-7906) now acts as exotic species enforcement coordinator within the Division of Enforcement to assist in scheduling, conducting, and reporting on

enforcement activities related to harmful exotic species. A chapter describing enforcement activities is included in this report (see Enforcement).

Minnesota Conservation Corps (MCC) In 2000, 34 corps members spent 22,033 hours inspecting boats at public water accesses on lakes and rivers in Minnesota primarily at those infested with exotic species. Corps members also assist Conservation Officers at road checks, work at the State Fair, and in a variety of education efforts. A summary of their efforts is included in this report (see Watercraft Inspections).

Bureau of Information, Education, and Licensing Staff from the Bureau of Information, Education, and Licensing provide support for the DNR's Exotic Species public awareness activities (see Education\Public Awareness).

Funding

Funding for the DNR's exotic species activities is derived primarily from a surcharge on watercraft licenses. The surcharge for a three year license period is \$5 and generates approximately \$1,200,000 annually. Additional appropriations, primarily for specific research efforts, have come from the Environment and Natural Resources Trust Fund and Minnesota Future Resources Fund (Table 2). In 2000, the program received federal funding from the U. S. Fish and Wildlife Service in the amount of \$85,000, to implement an interstate management plan that addresses prevention and management of aquatic nuisance species on the St. Croix River.

Federal and Regional Coordination

The DNR Exotic Species Program staff often participate in regional or federal activities regarding harmful exotic species. Jay Rendall, Exotic Species Program Coordinator, is the current Minnesota representative to the Great Lakes Panel on aquatic nuisance species. Participation on this regional panel, established by a federal act, helps keep Minnesota informed of regional and federal efforts regarding harmful exotic species. Participation on the Great Lakes Panel also provides a voice for Minnesota interests as regional and federal policies and priorities are developed. The Mississippi Interstate Cooperative Resources Association (MICRA) has an aquatic nuisance species committee. Jay Rendall represents the state on that committee and was the committee chairperson in 2000. The DNR Exotic Species Program Coordinator also participates on the following committees: Great Lakes Regional Ballast Technology Demonstration Project Steering Committee, Citizen Advisory Committee for the Dispersal Barrier Demonstration Project in Chicago, Recreational Activities Committee of the National Aquatic Nuisance Species Task Force, and the Policy and Regulations Work Group of the National Invasive Species Council.

Luke Skinner, Purple Loosestrife Coordinator, has been involved in regional and national efforts to use biological agents to manage purple loosestrife. He is a member of the National Biological Control Planning Committee established to develop national guidelines for implementation of biological controls for purple loosestrife. Through their efforts in 1999, \$300,000 was provided from the USFWS to raise and distribute biological control insects nationwide.

Jack Wingate, Fisheries Research Manager, is a member of the federal Ruffe Control Committee, established by the federal Aquatic Nuisance Species Task Force.

Gary Montz, Research Scientist, chaired the multi-agency St. Croix River Zebra Mussel Task Force during 1996, 1997, and 1998. Gary and Jay Rendall have participated in the development and implementation of the St. Croix River Zebra Mussel Response Plan and the drafting of an interstate management plan for the prevention and control of nonindigenous aquatic nuisance species in the St. Croix River.

References Cited

Minnesota Interagency Task Force 1991. Report and recommendations of the Minnesota Interagency Exotic Species Task Force. Final edit. Submitted to the Natural Resources Committees of the Minnesota House and Senate by the Minnesota Department of Natural Resources, Division of Fish and Wildlife, 500 Lafayette Road, St. Paul, MN 55155.

Emerging Issues

Introduction

In 2000, additional exotic species were discovered in the state including three new exotic bird species confirmed in the wild and a new exotic aquatic plant species. New exotic species expand threats to Minnesota's natural resources and require adjustment of the State's management and prevention efforts.

Other species that are likely to invade Minnesota in the future. While it is impossible to predict with certainty when, where, or how new introductions will occur, they could represent a significant threat to the state's ecosystems and related recreation and commerce activities. This chapter highlights a number of these threats, the response by Minnesota and others, and future work that needs to be done.

Emerging Issues - 2000

- A black swan, a pair of Egyptian geese, and a Reeves pheasant were observed in the wild.
- Water lettuce (*Pistia stratiotes*) a tropical floating aquatic plant that can form dense floating mats and displace native plants, was discovered in Lake Winona.
- Threespine stickleback (*Gasterosteus aculeatus*) have been found at many locations in Minnesota waters of Lake Superior.
- Exotic species of earthworms are present in many locations in Minnesota. Where a European species of earthworm (*Lumbricidae*) has invaded, it appears that the abundance and diversity of native plant species and tree seedlings decline dramatically.
- Black carp (*Mylopharyngodon piceus*) are already present in, or are proposed for use in, aquaculture ponds in at least three southern states. Their escape would pose a significant risk to the mollusk and fisheries resources throughout the Mississippi River and its tributaries.
- Bighead carp (*Hypophthalmichthys nobilis*) are in the Mississippi River Basin downstream from Minnesota and are likely to move upstream and threaten fisheries in the Minnesota.
- Eurasian collared-doves (*Streptopelia decaocto*) were documented in several additional southern counties of Minnesota and are likely to continue spreading across the state.

Mississippi River basin

Water lettuce

During the fall of 2000, a water lettuce (*Pistia stratiotes*) infestation was reported in Lake Winona by a local biology professor from St. Mary's University. The Exotic Species Program staff verified the population, collected all visible individuals (~275) and destroyed them. Subsequently, a biology professor from Winona State University also reported observing water lettuce in Lake Winona during the previous three years.

Water lettuce is a tropical floating aquatic plant found throughout the sub-tropical and tropical regions of the world. There still remains debate as to the origin of this species, but given its wide distribution and fossil records, the general consensus is of ancient descent (Buzgo 2000). Given water lettuce's cosmopolitan status, it has become an accessible and prolific water gardening plant. Water lettuce is identified by its thick, hairy, greenish-blue leaves that form a rosette. It produces new plants vegetatively from stolon's, but since it is an annual, it relies on seed production for its subsequent generations.

Water lettuce can form dense floating mats that can displace native plants. It could also reduce the dissolved oxygen within a waterbody by decreasing the atmospheric oxygen exchange and increasing the amount of decomposing plant material. If populations of water lettuce become dense, it could cause recreational problems, an increase in mosquito habitat, and a decrease in waterfowl habitat.

After consulting with the current literature and one expert on water lettuce, it would seem that water lettuce should not be able to persist in a Minnesota climate. In particular, the growing season is too short for water lettuce to produce viable seeds. There is a possibility that water lettuce could reach maturity during the first year, if stock was received from a southern locale. The second generation then would not be able to reach sexual maturity and theoretically the wild population would be extirpated (personnel communication: M. Buzgo, University of Zurich, Oct. 2000).

In response to the discovery of this new exotic species in Minnesota waters a press release was completed by DNR, several local and state media outlets picked it up. As a result of the press release, the DNR was contacted by biologists from New York and learned that numerous water lettuce plants were discovered in a New York stream. The Exotic Species Program will follow up on these initial infestations with close monitoring of Lake Winona during the 2001 field season and actions identified in the Future Needs section.

Black Carp

Black carp (*Mylopharyngodon piceus*) do not currently occur in the Mississippi River or tributaries, but they pose a significant threat to native mollusks and other fisheries in the basin. The federal Aquatic Nuisance Species Task Force conducted a risk assessment on black carp and concluded that the risk potential of the black carp to native U.S. fish and shellfish species is HIGH. In Minnesota, it has been designated as a *prohibited*

exotic species which means that it may not be imported, transported, sold, or possessed in the state.

At least three states currently have black carp, or have approved the importation of black carp, for use in aquaculture ponds. The State of Mississippi Department of Agriculture and Commerce recently approved the importation of black carp for snail control in catfish ponds. In Arkansas, diploid (fertile) black carp exist in captivity for the purpose of breeding triploid (sterile) black carp. Black carp were present in captivity in Missouri, in aquaculture ponds. Missouri state officials were successful eliminating black carp from one large aquaculture operation. Black carp are also reported to be in ponds in Louisiana. The potential escape of black carp from these states, into the Mississippi River basin, is a concern to Minnesota and basin-wide. The Mississippi Interstate Cooperative Resources Association (MICRA), with members in 28 states, wrote the governors of Mississippi and Arkansas to request their help eliminating black carp from their states. Other entities in the Mississippi basin have written or are preparing to send letters to Mississippi and Arkansas with similar messages.

The US Fish and Wildlife Service is considering listing black carp as an injurious wildlife species. Minnesota DNR supported black carp designation as an injurious wildlife species by submitting a letter to the USFWS in response to a notice in the *Federal Register*.

Bighead carp

The bighead carp (*Hypophthalmichthys nobilis*) was initially introduced into several southern Mississippi River basin states in the 1960's. Its distribution in the basin has expanded and, in recent years, populations of this fish in states such as Indiana, Iowa, and Missouri have dramatically increased. For example, near Cape Girardeau, Missouri three length groups are apparent: young of the year; hundreds of 15- to 20-inch bighead; and increasing numbers of 20- to 30-inch fish (UMRCC 1999). There are even reports of large bighead carp jumping into boats as they idle along in the river. Iowa DNR reports that bighead carp are found in large numbers in the Mississippi River below Lock and Dam 19. They are less common in Mississippi River Pools 17 and 18 (the southernmost Mississippi River pool in Minnesota is Pool 9).

Based on reports of increasing populations of bighead carp in the Mississippi River in Missouri, Iowa, and other states of the upper Mississippi basin, it is likely that this exotic will soon invade the Mississippi River and its tributaries in southern Minnesota. It is not clear how this introduction will affect native fish, such as paddlefish and bigmouth buffalo, or the basin's zooplankton and phytoplankton populations. It could mean significant changes to those parts of the river's ecosystem.

Silver carp

The silver carp (*Hypophthalmichthys molitrix*) is present in large numbers in the Mississippi River and is likely to move into Minnesota waters of the Mississippi River soon. According to Nico (2000), silver carp were first brought into the United States in 1973 for a private fish farm in Arkansas. The fish was imported and used for

phytoplankton control in eutrophic waters. The fish was found in open waters about 1980, likely the result of escapes from fish hatcheries and other aquaculture facilities. In large numbers the fish has potential to cause considerable damage to native species because it feeds on plankton required by larval fish and native mussels.

Illinois waterways

The Illinois waterways in the Chicago area are an unrestricted pathway through which harmful exotic species can move from Lake Michigan into the Mississippi River basin, and therefore into the St. Croix River, the Minnesota River, and its other tributaries in this state. This artificial connection between the Great Lakes watershed and Mississippi River watershed was the route that allowed zebra mussels to enter the Mississippi River. It now appears to be the pathway that will introduce round gobies into the Mississippi River basin and in the future could be the pathway for ruffe, a water flea (*Cercopagis*), and other exotic species to enter the Mississippi basin from Lake Michigan.

The National Invasive Species Act of 1996 called for the U.S. Army Corps of Engineers (USACE) to install a demonstration dispersal barrier to prevent the spread of aquatic nuisance species through the Chicago Sanitary and Ship Canal portion of the Illinois waterways. While this barrier was not solely intended to halt the downstream spread of round gobies, the DNR and Mississippi River basin states advocated that the barrier should be installed before round gobies spread through the Illinois waterways. Unfortunately, despite continued efforts in 2000 to make the project a priority with the Corps, the barrier still hasn't yet been built (as planned by Spring of 2000) and round gobies are now confirmed to be past the proposed barrier site and have been documented just upstream of the Des Plaines River, a tributary that leads to the Mississippi River (see Round Goby).

At a meeting in December of 2000, the Corps reported that they have approved a redesign of the project, are about to issue the contract for construction, and the project is scheduled for completion in February or March of 2001. As of January 15, 2001 no construction contract had been issued.

Exotic earthworms

Exotic species of earthworms are present in many location in Minnesota. Over the past several years concern about these exotic earthworms has been increasing. Mortensen and Mortensen (1998) wrote about the worms in *The Minnesota Volunteer* and suggested that earthworms are rapidly altering the character of some forests. More recently, television news shows and the *Smithsonian Magazine* (Conover 2000) have begun to expose impacts of exotic earthworms that researchers in Minnesota and other states have discovered.

Past studies have shown that where exotic species of earthworms from Europe (*Lumbricidae*) have invaded, they are eliminating the duff layer in hardwood forests of Minnesota and it appears that the abundance and diversity of native plant species and tree seedlings decline dramatically within a few years of the worms presence.

Earthworm invasions may pose a significant threat to many forest understory plant species including rare and endangered species and spring ephemerals.

As with other harmful exotic species, there are many human related pathways of introduction. European earthworms came to North America in soil of potted plants, in soil used for ship's ballast, and have been imported for angling bait. Worm experts have suggested that wild populations of exotic earthworms can get started from unused worms released on land by anglers and there is a good correlation of infested areas with places where people fish.

During 2000, the Minnesota Department of Agriculture (MDA) was contacted and subsequently contacted the DNR about a request to import European earthworms (*Eisenia veneta rosa*) into Minnesota for angling bait. The DNR advised MDA, who advised the US Department of Agriculture, that these worms could threaten native plants in the state and the importation permit was not issued.

Research about exotic earthworm distribution and impacts in the state is ongoing. At the University of Minnesota, Cindy Hale and Dr. Lee Frelich are undertaking "A survey of earthworms and native plant communities in hardwood forests in Minnesota." Their research is funded by the Minnesota Nongame Wildlife Small Grants Program. It is hoped that this survey will provide baseline information to aid potential policy, management, and restorations plans. Additionally, Hale and Frelich have secured funding from the National Science Foundation for 4 years of (\$318,000) to continue their detailed field study at four leading edges of earthworm invasion and to conduct field based and greenhouse experiments to investigate the mechanisms by which earthworms may be impacting understory plant populations.

The scientists from the University of Minnesota, and regulatory program staff from DNR and the MDA need to discuss this issue in 2001 and determine how to best regulate future introductions of exotic earthworms, inform the public about concerns and precautions to avoid introducing exotic earthworms, and what if any control or management options are available to limit the distribution and impacts of exotic earthworms.

Eurasian collared-dove

The Eurasian collared-dove (*Streptopelia decaocto*) was described as a new exotic bird species present in the state in the 1999 annual report. They were seen in Brown, Carver, Dakota, Freeborn, Martin, and Pipestone counties in 1999 and were observed in the following additional counties in 2000: Big Stone, Lyon, Kandiyohi, and Yellow Medicine. They are likely to be in others Minnesota counties.

Despite their history of spread in Europe and their reproductive potential, surprisingly little is known about the effect of these exotics in North America. The DNR is trying to learn more about the potential harm to agriculture, hunting, native birds, and ecosystems, and currently has no plans to limit the spread of Eurasian collared-doves. DNR biologists don't believe it would be possible to prevent their continued expansion

from adjoining states, in part because there are no regional or national control efforts planned or in place.

Note: See the 1999 annual report and references in this chapter for additional information.

Spiny water fleas

Charter boat operators and DNR watercraft inspectors in the Duluth area reported an increase in spiny water flea (*Bythotrephes cederstroemi*) populations in western Lake Superior during 2000 (personal communication: Lindi Carlson, MCC watercraft inspector supervisor, Minnesota DNR; Doug Jensen Minnesota Sea Grant, Duluth). In past years, watercraft inspectors have seen them primarily on the downrigger cables. In 2000, spiny water fleas were commonly caught on lines and in the first eyelet of fishing rods, reportedly fouling the equipment and making it difficult to land fish while angling in the vicinity of the north shore of Lake Superior. Also in 2000, the water fleas were more difficult to clean off of angling equipment, perhaps because another unidentified fibrous material in the lake aided the attachment to the lines. The increase in spiny water fleas attached to equipment, and water fleas inside boats as a result of cleaning angling equipment, may increase the potential for this species to be spread from Lake Superior to other waters.

Threespine and Fourspine Sticklebacks

One of the newer exotic fish species to be found in Minnesota is the threespine stickleback (*Gasterosteus aculeatus*). This species was first documented in Lake Superior in 1987, likely from a ballast water discharge near Thunder Bay, Ontario (Stephenson and Momot 2000). Since its first appearance in the Thunder Bay harbor, the threespine has spread to many other areas of Lake Superior including four locations in Minnesota. During 1994 they were found at Taconite Harbor (Minnesota Sea Grant 1994) and the Duluth-Superior harbor (D. Pratt, Wisconsin Dept. of Nat. Res., Superior, WI; pers. comm.). The threespine now appears to be well established in the Duluth-Superior harbor (D. Jensen, Minnesota Sea Grant, Duluth, MN; pers. comm.). They were found near Grand Marais during 1999 (Schmidt 1999). In April 2000, threespine were discovered at the mouth of the Talmadge River (D. Jensen, Minnesota Sea Grant, Duluth, MN; pers. comm.).

Stephenson and Momot (2000) suggest, based on their research in Ontario, that the threespine populations may reduce the abundance of native stickleback populations and may be less subject to predation (except by bullheads) than native ninespine.

The fourspine stickleback (*Apeltes quadracus*) is currently found in Lake Superior near Thunder Bay, but is not known to have spread to other areas of the lake. Potential future spread of this species could also reduce native stickleback populations. In Ontario, the rapid increase of fourspine particularly in nearshore areas suggests it is displacing native sticklebacks, such as the brook and ninespine, at a rapid rate (Stephenson and Momot 2000).

Reed canary-grass

Reed canary-grass (*Phalaris arundinacea* L.) is capable of invading plant communities and displacing native plant species. Invasion by reed-canary grass may also reduce the value of wetlands as habitat for wildlife. The origin of the species and the reasons for its invasive nature are not well understood (Galatowitsch 1999). Reed canary-grass is thought to be native to North America. European and cultivated strains have been introduced as forage and to establish cover on streambanks and wetland projects to prevent erosion. It is possible that interbreeding between native strains of the species and European or cultivated strains may have contributed to the development of an invasive strain.

In recent years a research group at the University of Minnesota led by Dr. Susan Galatowitsch has been evaluating the effects of reed canary-grass on communities of native plants and approaches to management of the plant. In 2000, the Exotic Species

Program contributed a small amount of funding to an effort by Ms. Carrie Reinhardt and Dr. Galatowitsch (2000). The objectives of this effort are to:

1. Review techniques currently employed in North America to control reed canary grass in wetlands,
2. Evaluate the effectiveness of control in relation to timing of growth of the plant,
3. Determine the effects of different control strategies on remnant communities of native plants, and
4. Develop a prescription for management of reed canary-grass to prepare wetland sites for restoration of native plant communities.

In addition, Ms. Marcia Raley of the University of Minnesota reported on the composition of seed banks in a restored wetland under different amounts of cover of reed canary grass (Raley, 2000, Raley and Charvat 2000).

Mr. Doug Norris, Wetlands Coordinator in the Division of Ecological Services, DNR, conducted an informal survey of wetland and wildlife ecologists to determine whether there is significant concern that reed canary-grass has negative effects on use of wetlands by wildlife. Responses indicated substantial interest in further research to evaluate the relationship between abundance of reed canary grass in wetlands and use by wildlife. Future efforts may include attempts to obtain funding to support research in this area.

There also is much concern about reed canary-grass in Wisconsin (Groshek 2000), where additional research is being conducted on the ecological relationships between the invasive species and various native plants, as well as the potential of various approaches to management to limit the harm caused by reed canary-grass.

Other species reported in Minnesota

During 2000, the DNR received reports of prohibited exotic species, regulated exotic species, or unlisted exotic species of exotic wild animals or aquatic plants (see Appendix A for explanation of these classifications) that had escaped from captivity or have become established in Minnesota. These included black swan, Egyptian geese, a Reeves pheasant, and sika deer.

Egyptian geese

A pair of Egyptian geese, prohibited exotic species in Minnesota, were observed and confirmed to be in the wild in Chisago County during September 2000. The birds moved from the pond where they had been sited and the location of the birds after September was unknown.

Black swan

A mute swan and black swan were present in Hennepin County in spring of 2000. They had attempted to mate but were unsuccessful.

Reeves pheasant

A Reeves pheasant, an unlisted exotic species, was observed and taken by a hunter near Avon during November 2000. It is presumed that this was an escape from a game farm or captive pet.

Sika deer

During the fall in 2000, the DNR received two reports of Sika deer (*Cervus nippon*) in the wild. One was a fawn found in the southwest portion of the Twin Cities and the second was a mature male in the Brainerd-Crosby area.

Future Needs

- Monitor Lake Winona during the 2001 growing season for waterlettuce and other non-native species
- Take sediment samples in Lake Winona and look for waterlettuce seed.
- Distribute information on related regulations to all local nurseries.
- Perform an ecological risk assessment for waterlettuce.

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Regulations

2000 Highlights

- The DNR supported federal designation of the black carp as an injurious wildlife species, development of the National Invasive Species Management Plan, and more comprehensive federal regulations.
- The DNR adopted emergency rules and permanent rules that designated additional infested waters and made several changes to existing harmful exotic species related rules (current Minnesota Rules regarding harmful exotic species are in Appendix B).

Background

State

Most harmful exotic species were unregulated in Minnesota until the mid-1980's. In 1987, the first law prohibiting the sale of purple loosestrife was passed. As additional harmful exotic species have been introduced into Minnesota and the Great Lakes region, state statutes were modified several times to address the changing threats to the states resources and the need for technical amendments to previous laws. The current state statutes and rules are located in Appendices A and B.

Minnesota statutes which address Harmful Exotic Species (M.S. 84D) were revised in 1996. The statute includes a comprehensive system for classification of exotic species. Under this system, any exotic species is placed to one of the four classes described below:

- Prohibited exotic species are those of the highest concern because they are the most likely to naturalize and be harmful to the state's natural resources or their use. Species designated as *prohibited* species may not be possessed, imported, purchased, sold, propagated, transported, or introduced except as provided in state statutes (see Table 2).
- Species designated as *regulated* exotic species have less of a known or predicted threat to the State's resources and use and may have significant commercial value. *Regulated* exotic species may be possessed, subject to certain conditions, but may not be introduced into a free-living state except as allowed by Minnesota Rules.
- Unlisted exotic species are species that have not been evaluated or listed as one of the other categories of exotic species and are subject to review by the DNR before it may be lawfully introduced into a free-living state (M.S. 84D.04 in Appendix A).

- Exotic species listed as *unregulated* are presumed to be minimal threat to the states resources, or are so widely distributed that regulating them would be pointless. Therefore, species in that category will not be subject to regulation under the harmful exotic species statutes.

When classifying an exotic species into the above categories, state statute directs the DNR to consider: the likelihood of introduction if the species is allowed to enter or exist in the state; the likelihood that the species would naturalize in the state; the potential adverse impacts of the species on native species, outdoor recreation, and other uses of natural resources in the state; the ability to control the spread of the species once it is introduced in the state. The general criteria the DNR will use when classifying exotic species are shown in Table 2. The final classification will reflect a combination of the criteria in each category.

Many exotic species would likely be classified as "unregulated species," primarily because they would not survive if introduced into Minnesota ecosystems. For example, it is presumed that most tropical fish would be unable to survive winter in Minnesota. To date, efforts by the Exotics Species Program have focused on classifying exotics species that would be most likely to survive in Minnesota and cause problems in the state. Species such as these are subject to the maximum level of regulation in an attempt to prevent their introduction into Minnesota ecosystems. Experience in Minnesota and elsewhere has shown that prevention of introductions is usually far more effective than management of an introduced exotic that becomes established.

In 1998, the Exotic Species Program adopted amendments to Minnesota Rules 6216 that govern harmful exotic species (see Progress in Regulations in Exotic Species Program 1999). These amendments classified numerous exotic species in the classes named above. It is important to note that classifications and designations of exotic species may change as more is learned about individual species.

Several statutory changes were made during the 1999 Legislative session. These changes were proposed by DNR's Exotic Species Program and most were related to *infested waters*. The changes allowed the harvest of bait from some infested waters, eliminated the "limited infestation of Eurasian watermilfoil" classification and related requirements, modified the requirement to conduct 20,000 hours of watercraft inspections, and made some technical amendments. The "limited infestations of Eurasian watermilfoil" classification was eliminated from statutes because the regulations were difficult to enforce and have been confusing to boaters and lake residents, as well as of questionable value to prevent the spread of milfoil. Another change to statute was related to the DNR's responsibility to conduct watercraft inspections at infested waters. The watercraft inspection mandate was broadened from "infested waters" to "waters of the state," to allow the Exotic Species Program to be more proactive and inform boaters throughout the state about precautions that boaters should take to comply with laws prohibiting the transport of aquatic plants and harmful species. The priority for inspections remains with infested waters, but about 10% of the effort will be directed to noninfested waters. This change will help reduce the

increasing number of repeat inspections of the same boaters at infested waters. The time frame during which inspections could be conducted was also broadened to encompass the whole boating season.

Federal

Federal Public Law 101-646, titled the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, includes a mandate that the U.S. Coast Guard regulate ballast water discharge into the Great Lakes. Since many harmful species present in waters near Duluth are the result of ballast water discharges, this legislation was an important first step to protect Minnesota waters from future introductions of harmful species.

The National Invasive Species Act of 1996, reauthorizing Federal Public Law 101-646, was passed by the U.S. Congress and signed into law. The act is intended to enhance prevention of aquatic nuisance species introduction and spread at the national level.

On February 3, 1999 President Clinton signed an executive order that mobilizes the federal government to defend against harmful exotic species. The Departments of the Interior, Agriculture, and Commerce, will take the lead in to encourage federal agencies to work together to prevent the introduction of non-native species and control those already here. Under the executive order, a new Invasive Species Council is formed to, amongst other activities, provide national leadership regarding invasive species, and see that the Federal agency activities concerning invasive species are coordinated, complementary, cost-efficient, and effective, relying to the extent feasible and appropriate on existing organizations addressing invasive species, such as the Aquatic Nuisance Species Task Force, the Federal Interagency Committee for the Management of Noxious and Exotic Weeds, and the Committee on Environment and Natural Resources.

Table 2. Explanation of regulations and criteria associated with Minnesota's exotics species classifications.

		Criteria for Classification*					Regulations			
Regulatory Classification	Species Examples	Likelihood of Introduction	Likelihood of naturalization	Magnitude of potential adverse effects	Ability to control	Other criteria	Transportation	Importation, sale, possession, propagation	Introduction	Responses to escapes
Prohibited	Eurasian Watermilfoil	Likely	Most likely	high to medium	moderate to low		Prohibited - except for disposal as part of control activities or when transporting to DNR to report the presence of a species.	Prohibited - except under permit for disposal, control, research, or education.	Prohibited	For escaped animals, the individual must notify DNR within 48 hours and is responsible for cost of capture.
Regulated	Cabomba	Likely	Possible	medium to low	moderate to low	Commercial use	Not prohibited	Not prohibited	Prohibited - unless excepted by rule, or under DNR permit (per M.S. 84D.07).	For escaped animals, the individual must notify DNR within 48 hours and is responsible for costs of capture if permit conditions were violated.
Unlisted	Elephant	Unknown	Unknown	Unknown	Unknown	Not established	Not prohibited	Not prohibited	Prohibited - unless reviewed and permit issued (per 84D.06) or after review the DNR designates the species as unregulated.	For escaped animals, the individual must notify DNR within 48 hours.
Unregulated	A. Tropical fish B. Ring-necked pheasant C. Starling		A. Unlikely, or	B. Minimal, or	C. Too wide-spread to manage		Not prohibited - (These species are not subject to regulation under Minn. Stat. 84D. Although may be regulated through other laws.)	Allowed		No requirements.
Species not subject to harmful exotic species regulations	A. Red deer, llamas, ostrich. B. Cattle, cats					A. Species exempt by statute: birds or mammals defined as livestock B. Domestic animals.	Not prohibited	Not prohibited	Not prohibited	No requirements.

* Combinations of all criteria will be used to classify each species

Progress in Regulations - 2000

During 2000, progress was made in the following areas that were identified as future needs in the 1999 report.

- DNR supported efforts to integrate and improve the comprehensiveness, enforceability, and responsiveness of federal laws regarding noxious weeds, injurious wildlife, and other designations related to harmful exotic species.
- DNR adopted rules, under the authority in Minnesota Statutes 84D.12, that designate additional infested waters.
- DNR sought to obtain information to improve our ability to evaluate the likelihood of introduction, the likelihood of naturalization, and the magnitude of potential adverse impacts needed to regulate pathways and classify species.

Improve federal laws

The DNR provided comments on several federal regulatory issues, regional policy positions, and participated on national work groups related to federal policies and regulations. The DNR sent a letter to the US Fish and Wildlife Service encouraging them to designate the black carp as an injurious wildlife species because of its potential to harm native mussel populations in the nations waters. The DNR sent a letter of support for, and providing comments on, a draft National Invasive Species Management Plan prepared by the Invasive Species Council. The DNR Exotic Species Program Coordinator was invited to participate on the Invasive Species Council's Policy and Regulations Work Group and assisted in drafting an outline for federal policy and regulations changes. The DNR provided comments to the Great Lakes Panel on aquatic nuisance species on a draft policy paper regarding ballast water management. The policy paper includes regulatory issues that will be addressed in 2001 through the process of Congressional reauthorization of the National Invasive Species Act of 1996.

Minnesota Rules

The DNR adopted emergency rules and permanent rules that designated additional infested waters (The current rules regarding harmful exotic species, including the infested waters list, are in Appendix B).

Several other changes to the permanent rules related to harmful exotic species were adopted by the DNR. Public notice that permanent rule changes were adopted was published in the State Register on June 19, 2000 and the rules became effective on June 26, 2000.

The amendments to existing rules covered a variety of areas pertaining to harmful exotic species and did the following:

- Eliminated portions of the rules related to designations of limited infestations of Eurasian water milfoil, and conditions and procedures for marking and use of water bodies with limited infestations of Eurasian water milfoil to reflect statutory changes

made in 1999 (see Minn. Rule 6216.0300 DESIGNATION, NOTICE, AND MARKING OF INFESTED WATERS);

- Designated infested waters that have been identified since the previous designations in permanent rules (see Minn. Rule 6216.0350 DESIGNATED INFESTED WATERS.);
- Specified issues related to harvest of wild animals from infested waters for bait, aquatic farm, and non-commercial purposes (see Minn. Rule 6216.0400 RESTRICTED ACTIVITIES ON INFESTED WATERS; PERMITS, Subpart 1. Taking bait from infested waters.);
- Prescribed a permit application process for harvesting wild animals from infested waters (see Minn. Rule 6216.0400 RESTRICTED ACTIVITIES ON INFESTED WATERS; PERMITS, Subpart 1a. Permit application.);
- Allowed the non-commercial harvest of bait from Eurasian water milfoil infested waters without a permit (see Minn. Rule 6216.0400 RESTRICTED ACTIVITIES ON INFESTED WATERS; PERMITS);
- Added a regulatory option of requiring whitefish and cisco netters to freeze or dry nets used in infested waters before use in other waters (see Minn. Rule 6216.0400 RESTRICTED ACTIVITIES ON INFESTED WATERS; PERMITS);
- Expanded the list of commercial fishing activities that have restrictions on taking in infested waters to include turtle, crayfish, and frog harvest (see Minn. Rule 6216.0400 RESTRICTED ACTIVITIES ON INFESTED WATERS; PERMITS, Subpart 3. Commercial fishing restrictions in infested waters.);
- Eliminated the language prohibiting entry into limited infestations of Eurasian water milfoil to reflect statutory changes made in 1999 (see Minn. Rule 6216.0400 RESTRICTED ACTIVITIES ON INFESTED WATERS; PERMITS, Subpart 4. Prohibition on entry into areas marked for limited infestation of Eurasian water milfoil.);
- Changed conditions and procedures for the transportation, use, and appropriation of water from infested waters. The changes to these subparts expanded previous language from restricting the transport of fish from infested waters to restricting the transport of all wild animals from infested waters. It was necessary to expand the application of this provision from just fish to all wild animals because several species of wild animals, other than fish, such as crayfish, turtles, and frogs are likely to be transported for commercial and sport purposes from infested waters. (See Minn. Rule 6216.0500 TRANSPORTATION AND APPROPRIATION OF WATER FROM INFESTED WATERS, Subpart 1. Transporting water and wild animals from infested waters, and Subpart 2. Disposition of water used to transport wild animals from infested waters.)

- Added a provision to allow by permit the stocking or transport of fish by facilities utilizing infested waters to waters containing the same prohibited or regulated exotic species or to water bodies that do not contain prohibited or regulated exotic species if the facility adequately treats its infested waters to remove any exotic species (See Minn. Rule 6216.0500 TRANSPORTATION AND APPROPRIATION OF WATER FROM INFESTED WATERS, Subpart 5. Fish hatchery or aquatic farm operations in infested waters.); and
- Clarified the relationship of rules related to waters open to taking minnows and laws restricting the harvest of bait from infested waters. The changes to this part were necessary to link Minn. Stat., secs. 84D.03, subd. 3, 84D.11, subd. 2A, and Minn. Rule 6254.0200. These regulations were all developed independently, but are related in various ways. (See Minn. Rule 6254.0200 WATERS OPEN TO TAKING MINNOWS; PERMITS.)

Obtain Information regarding introduction, naturalization, and adverse impacts

Two new projects were initiated in 2000 to help assess the potential for harmful exotic aquatic plant species to be shipped to Minnesota and whether they may survive and cause adverse impacts. One project is funded by Sea Grant and will evaluate vendors who ship aquatic plants to Minnesota to determine if they purposely or accidentally are shipping "prohibited species." A second related project, to be funded by the DNR Exotic Species Program, will look at the cold tolerance for exotic aquatic plants and develop techniques to study effects of temperature on over winter survival. This will help to determine the potential for species to naturalize in the state and to be invasive. Both projects will be conducted under the direction of Professor Sue Galatowitch at the University of Minnesota.

Effectiveness of Regulations

The DNR believes that regulations are an important component of an effective strategy to help prevent the spread of harmful exotic species. Three surveys of boaters, including a 1998 survey from the Brainerd area (MDNR 1999), indicate that boaters support this view.

Future Needs for Regulations

Federal

- Continue to support efforts to integrate and improve the comprehensiveness, enforceability, and responsiveness of federal laws regarding noxious weeds, injurious wildlife, and other designations related to harmful exotic species. Specifically, seek a more comprehensive federal law prohibiting transport and possession of invasive wildlife such as black carp, goby, and ruffe.

State

- Continue to adopt rules, under the authority in Minnesota Statutes 84D.12, that designate additional prohibited, regulated, and unregulated exotic species; and designate infested waters as they are identified.
- Continue to obtain information to improve our ability to evaluate the likelihood of introduction, the likelihood of naturalization, the magnitude of potential adverse impacts, and the ability to eradicate or control various exotics species.

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Expenditures

Appropriations and activities

Base funding for the Exotic Species Program is derived from a \$5 surcharge on the registration of watercraft. Surcharge receipts are deposited in the Water Recreation Account and appropriated by the Legislature. The surcharge generates approximately \$1,200,000 annually and additional program funding comes from other state and federal sources. Significant support for exotic species research efforts has been appropriated from the Environment and Natural Resources Trust Fund and the Minnesota Resources Fund (as recommended by the Legislative Commission on Minnesota Resources). Federal funds support implementation of the St. Croix Interstate Management Plan for ANS including public awareness efforts and monitoring activities. State funding for Department of Natural Resources' efforts to control exotic species was first appropriated in 1988 and has gradually increased. A summary of appropriations to the program for fiscal years 1991 through 2001 (FY91 - FY01) is provided in Table 3 along with projections for FY02. This report covers activities in calendar year 2000, which includes half of two state fiscal years, (FY00 and FY01) that begin on July 1 and end on June 30. To provide a comprehensive review of expenditures that occurred during 2000, we report both expenditures that were incurred in FY00 and those planned in FY01 (Table 4). The following assumptions and definitions were used to report on expenditures.

Administration

Administration expenditures include the administrative charges assessed by the Division and the Department as well as day-to-day office expenses: clerical staff time, telephones, postage, office rent, etc. Staff time spent on administrative activities (training or professional development activities, assistance with other division or department projects, and personal leave including holiday, sick, and vacation time) is also included under administrative expenses.

Program planning/direction

Program planning/direction includes expenditures and activities which primarily benefit the entire Exotic Species Program, not one of the particular program components listed below. They include:

State program coordination: preparation of state plans and reports, hearings, strategic planning efforts, as well as the general oversight and planning of program activities. Expenditures primarily represent staff time spent on these activities.

Coordination with regional and federal activities: staff time and out-of-state travel to represent the state at meetings of the Great Lakes Panel on Aquatic Nuisance Species, provide relevant testimony for federal legislative development, and participate in regional meetings on harmful exotic species issues.

Equipment and Services: purchases and repair of boats, trailers, computers, and similar items, computer support services, and analytical chemistry services purchased from the Minnesota Department of Agriculture.

Public awareness

Expenditures in this category include staff time, in-state travel expenses, fleet charges, mailings, supplies, printing and advertising costs, and billboard rental to increase public awareness of exotic species. The cost of developing and producing pamphlets, public service announcements, videos, and similar material is included, as is the cost of developing and maintaining exotic species information on the DNR's website.

Control, Management, and Inventory

Expenditures in this category include staff time, in-state travel expenses, fleet charges, commercial applicator contracts, and supplies to survey the distribution of exotic species in Minnesota and to prepare for, conduct, supervise, and evaluate control activities. Funds provided to local units of government and organizations to offset the cost of Eurasian watermilfoil management efforts are also included.

Inspections/Containment

Expenditures in this category include the costs that Conservation Officers incur enforcing exotic species rules and laws, the costs of implementing watercraft inspections at public water accesses, and staff time and expenses associated with promulgation of rules, development of legislation, and other efforts to prevent the introduction of additional exotic species into Minnesota.

Research

Expenditures in this category include staff time, in-state travel expenses, fleet charges, supplies, and contracts with the University of Minnesota and other research organizations that were established to develop new or improve existing control methods.

Not Spent

Funds in this category were not spent during FY00 and are available to be spent during the following year (FY01).

Fiscal Year 2000 (FY00)

Expenditures on exotic species activities during FY00 (July 1, 1999 - June 30, 2000) totaled \$1,295,000 and are shown in Table 4. Expenditures from the Water Recreation Account, the primary source of funding, are listed along with spending from other accounts. The Exotics Species Program has related accounts that also provide funds to support program activities. For example, revenues from the sale of public awareness material are deposited in a Publications Account and can be used to fund future public awareness efforts. Likewise, reimbursement received from local groups for DNR-funded control efforts are deposited in a Coop Account and used to fund similar control programs. Expenditures from other Department accounts, (e.g., the Game and Fish Account and the General Fund) reflect staff in the Division of Ecological Services who are not hired as exotic species specialists, but who occasionally work on exotic species

issues as part of their department positions. This summary does not reflect the contribution of all DNR staff who provide assistance to the Exotic Species Program. Exotic species research projects funded by the legislature, as recommended by the Legislative Commission on Minnesota Resources, are also shown.

The \$1,091,000 of Water Recreation Account expenditures by the Exotic Species Program during FY00 were less than the \$1,132,000 appropriated (Table 3). Water Recreation Account funds that were not spent in FY00 were added to the funding the DNR received for FY01. The DNR anticipates that all Water Recreation funding appropriated to support the Exotic Species Program during the FY00/01 biennium will be spent.

FY00 expenditures by major category differed from those reported in recent years (Table 1). Year-to-year variations in expenditures are expected and reflect changes in program needs and the level of assistance provided by various partners. For example, expenditures in the program planning category were higher in FY99 because the Exotic Species Program invested a significant amount of time in FY99 meeting with constituent groups and holding public hearings to develop new rules. Administration and Inspection/Containment costs increased in FY00. The increase in Inspection/Containment spending represents both the increasing costs of hiring, training, and deploying MCC access inspectors, and the costs of increased travel. The Exotic Species Program is expanding the number of access inspections conducted in out-state areas (both on infested and non-infested waters) and this decision has increased travel costs. In addition, prevention activities that had previously been listed under Program Planning have been moved to the Inspection/Containment category. Administrative costs are also rising, primarily because staff used more leave/vacation time in FY00. The following chapters describe in detail the activities that were conducted using FY00 funds.

Fiscal Year 2001 (FY01)

Since this report was completed in the middle of FY01, planned expenditures for this year are also reported. Expenditures in most categories are expected to remain relatively constant between FY00 and FY01. The Exotic Species Program believes that the current distribution of funding among major program categories represents an appropriate allocation; significant investments are being made in each of the four primary focus areas (public awareness, control/management, inspections/containment, and targeted research to improve management and prevention) as well as to efforts to maintain a coordinated statewide and regional response to the threats posed by exotic species. These anticipated spending levels would change if a significant event (e.g. the discovery of a new harmful exotic species in Minnesota, the availability of a new management method) altered exotic species management needs and options.

The following chapters also describe in detail the activities that have been and will be conducted using FY01 funds.

Table 3. Appropriations (in thousands) for DNR Exotic Species Programs, fiscal years 1991 - 2002.

Funding Source	FY91	FY92	FY93	FY94	FY95	FY96	FY97	FY98	FY99	FY00	FY01	FY02
Water Recreation Account (WRA)	250 (\$1 watercraft surcharge)	416 (\$2 watercraft surcharge)	657 (\$3 watercraft surcharge)	1,011 (\$5 watercraft surcharge)	1,112	1,136	1,087	1,092	1,106	1,132	1,181	1,172
Legislative Commission on Minnesota Resources recommendations:												
1) Purple Loosestrife	100 ¹			75 ²	75 ²	75 ²	75 ²	37.5 ² (\$37,500 match from WRA funds)	37.5 ² (\$37,500 match from WRA funds)	37.5 ² (\$37,500 match from WRA funds)	37.5 ² (\$37,500 match from WRA funds)	25 (\$25,000 match from WRA funds)
2) Eurasian watermilfoil			160 ¹	125 ² (requires \$100,000 non-state match)	125 ²	75 ²	75 ²	37.5 ² (\$37,500 match from WRA funds)	37.5 ² (\$37,500 match from WRA funds)	37.5 ² (\$37,500 match from WRA funds)	37.5 ² (\$37,500 match from WRA funds)	25 (\$25,000 match from WRA funds)
3) Ballast Water Control								125 ¹	125 ¹			
Total	350	416	817	1,211	1,312	1,286	1,237	1,292	1,306	1,207	1,256	1,196

¹ From the Minnesota Future Resources Fund² From the Minnesota Environment and Natural Resources Trust Fund

Table 4. Exotic species related expenditures in fiscal year 2000 (FY00) and projected expenditures in FY01 (in thousands of dollars).

	Water Recreation Account		Other Exotic Accounts		Other Dept. Accounts		Totals	
	FY00	FY01	FY00	FY01	FY00	FY01	FY00	FY01
Administrative/Operations								
Rent, Phones, Postage, Misc.	31	32						
Staff Time	35	35						
Staff Personal leave (Vacation, Holiday, Sick)	49	50						
Clerical	10	10						
Div/Dept Administrative Support	37	43					162	170
Program Planning/Direction								
State program coordination	56	58			13	12		
Support regional / federal activities	20	25			<1			
Equipment and services	8	10			4		102	105
Public Awareness								
Communications plan, workshops, presentations, radio spots, billboards, TV, website development	94	100		30			94	130
Control, Management, and Inventory								
General	11	10						
Eurasian watermilfoil	123	135		10	<1			
Purple loosestrife	106	110			1			
Zebra mussel	2	5	5					
Curly-leaf pondweed	4	5						
Flowering Rush	2	3						
Nongame Fish	1	1						
Invertebrates	<1	1					257	280
Inspections/Enforcement								
MCC - access inspections	351	365						
Enforcement - road and access checks	54	57						
Development rules/laws/other prevention efforts	5	15					410	437
Research						20		
General	2	10						
Eurasian watermilfoil	48	53						
Purple loosestrife	40	45						
Zebra mussel								
Curly-leaf pondweed	1	1						
Flowering Rush	2	2						
Nongame Fish	<1						273	161
Not Spent	40						40	
Total	1,132	1,181	5	40	19	32	1,338	1,273

* and Minnesota Future Resources Fund

Education / Public Awareness Activities

2000 Highlights

- The DNR produced and placed two new television spots, and two new radio spots encouraging boaters to help prevent the spread of exotics. These spots were based on a video produced by Minnesota Sea Grant and featured John Ratzenberger (Cliff Clavin from "Cheers"). The spots were placed as public service announcements and paid advertising during the course of the year.
- Television spots were placed on all in-state television stations as paid advertising and/or public service announcements.
- The DNR and Minnesota Sea Grant conducted cooperative educational activities to maintain high levels of public awareness about exotics and exotic issues.

Background

Since 1992, the DNR's Exotic Species Program has made substantial efforts to maintain high public awareness and understanding about harmful exotic species. Communication efforts are built around the theme of "Clean boats, Clean waters". This theme captures the desired outcome (clean waters) and the proposed strategy (clean boats) to achieve that result.

Public awareness efforts in Minnesota are designed to:

- make the public aware of the negative environmental impacts caused by some exotics;
- help the public identify specific exotic species;
- outline actions that boaters, anglers, seaplane pilots, waterfowl hunters, and others must do to reduce the spread of these exotics; and
- summarize research and control approaches.

Progress in public awareness - 2000

Key components of the Exotic Species Program's 2000 communication efforts included:

- exotic species signs at public water accesses;
- information about harmful exotic species in the fishing and boating regulations;
- radio and television advertisements during Fishing Opener, Memorial Day, Fourth of July, and Labor Day weekends;

- a series of press releases and media contacts were made throughout the year to keep current information before the public;
- staffing and displays at various sport shows and the Minnesota State Fair;
- preparing and distributing radio and television public service announcements to all Minnesota stations; and
- attending meetings of lake associations and other groups concerned about exotic species.

Television was utilized again in 2000 with paid placement supplementing the use of public service time from nearly all state stations.

Radio was used in 2000 to reach boaters and anglers in several ways. Paid advertising was used on larger Twin Cities stations including WCCO-AM, KQRS-FM, KFAN-AM, WKLX-FM, KSTP, and KTCZ-FM. These stations were selected for their listener profile which matched the desired demographics of boat owners. Radio ads were run during high activity weekends including the fishing opener, Memorial Day, and Fourth of July. A special effort was made in the Duluth market, using both radio and television, as well as southeastern Minnesota where the presence and threat of zebra mussels continues to grow.

In addition, public service announcements were produced and distributed to all Minnesota radio stations (a total of 165). A cover memo and related materials, which encouraged station program managers to play these announcements as often as possible, were distributed with the tapes.

DNR Exotic Species Program staff participated in the Northwest Sport Show and the Minnesota State Fair to distribute literature and information. At the State Fair, a barrel encrusted with zebra mussels was exhibited and drew considerable attention. Information and exotics publications were also distributed at the Minneapolis Boat Show.

DNR Watercraft inspectors made 51,508 personal contacts with boaters launching their boats at public accesses (see Watercraft Inspections Section) providing them with information and tips on ways to reduce the spread of exotic species.

Presentations were given to a variety of audiences, including: university classes, high schools, Minnesota Turf and Grounds Foundation Conference, Midwest Aquatic Plant Management Society (Chicago), annual meetings and training of the Minnesota Agricultural Inspectors, Gardening Club of America, The Exchange Club of Minneapolis, regional MnDOT meetings, 10th International Zebra Mussel and Aquatic Nuisance Species Conference (Toronto), Midwest Fish and Wildlife Conference (Minneapolis), and several lake associations.

Effectiveness of public awareness efforts

The DNR and Minnesota Sea Grant have conducted surveys to help assess the effectiveness of public awareness efforts conducted in Minnesota. In 1994, Minnesota Sea Grant conducted a survey of boaters in Minnesota, Wisconsin, and Ohio to evaluate and compare regional differences in educational and awareness programs.

A report (Minnesota Sea Grant 1994) summarizing the survey results said,

"More effort has been expended and a greater variety of techniques have been used in getting the exotic species message out in Minnesota than in the other two states surveyed. Survey results indicate Minnesota boaters are more knowledgeable about exotic species issues and have already changed their behavior to a greater extent (to prevent the spread of exotics) than boaters in the other two states. This suggests that educational programs are effective."

In 1996, the DNR funded a follow-up survey of boaters in the Minneapolis/St. Paul metro area (MDNR 1996). Also in 1998, a survey of boaters in the Brainerd area was conducted (MDNR 1999). Both these surveys indicate that awareness about exotics has continued to increase. Watercraft inspectors (see Watercraft Inspections) also continue to find high levels of public awareness of exotics throughout Minnesota. Information from past surveys and a new multi-state Sea Grant funded survey mailed out in fall of 2000 will continue to be used to guide development of annual public awareness efforts and maximize their effectiveness.

Participation of others in public awareness activities

Other agencies have been cooperatively involved with public awareness activities in the state for several years. Our most widely used public awareness pamphlet, *A Field Guide to Aquatic Exotic Plants and Animals* continues to be distributed by the National Park Service, MN Sea Grant, the U.S. Fish and Wildlife Service, and the U.S. Army Corps of Engineers, as well as numerous Midwestern states and Provinces.

The Lake Minnetonka Conservation District (LMCD) initiated public awareness efforts to help keep zebra mussels from being introduced to Lake Minnetonka. In 2000, they funded the posting of signs at accesses and six billboards in the vicinity of Lake Minnetonka for four week periods during May and June.

"Aquatic Exotics" educational traveling trunks designed for hands on learning about harmful exotic species are used by and available from several organizations in the state in addition to DNR: University of Minnesota Sea Grant and the Bell Museum of Natural History, the National Park Service, and teachers (for additional information see www.seagrants.umn.edu/education/ttea.html).

The Exotic Species Information Center at the University of Minnesota Sea Grant Program provides research, outreach, and education in collaboration with the DNR's Exotic Species Program. The Center has served as an important resource on aquatic

nuisance species (ANS) and provides information to the public to prevent and slow their spread. Since 1998, Center staff regularly attend DNR Exotic Species Program meetings to help identify program priorities and unmet needs, coordinate activities, leverage funds and resources, and share information and publications.

2000 Highlights of Minnesota Sea Grant's Education Activities in Minnesota:

- Sea Grant lead the production of an award-winning videotape, *Stop Exotics, Clean Your Boat*, that educates boaters and anglers about how to prevent the spread of aquatic nuisance species. Sponsored in part by the DNR, U.S. Coast Guard, U.S. Fish and Wildlife Service and others, the video features John Ratzenberger (a.k.a. Cliff Clavin from the TV show *Cheers*). This 11-minute humorous video is designed for use at visitor and learning centers, retail outlets, and boater workshops in Minnesota and nationwide. Video content is based on voluntary prevention guidelines approved by the U.S. Coast Guard. In 2000, the video was shown by Sea Grant at 10 education workshops across the state. Several PBS and public access cable television stations across the nation have broadcast it as an education program.
- Sea Grant also led a national effort to evaluate the effectiveness of public awareness efforts pertaining to aquatic nuisance species in five marine and freshwater states. Developed collaboratively with the Minnesota DNR, U.S. Fish and Wildlife Service, California and Ohio Sea Grant, and Vermont Department of Environmental Conservation, a mail survey was sent to 4,000 boaters in Minnesota, Ohio, Kansas, California, and Vermont in fall 2000 to evaluate and compare regional differences in boater awareness and behavior. Results of the survey will evaluate what educational programs work, assess boaters' risk for spreading aquatic nuisance species, and will guide future public awareness efforts.
- Sea Grant and DNR staff co-hosted an *Infested Waters Training Workshop* for wild bait fish harvesters and DNR conservation officers in March. Sea Grant staff provided an overview of the draft *ANS-HACCP: Aquatic Nuisance Species and Critical Control Point Training Curriculum*, which is intended for use by the industry and public agencies to help ensure that facilities and products are free of aquatic nuisance species. In addition, a presentation of the draft curriculum was given at a special aquaculture symposium at the 62nd Midwest Fish and Wildlife Conference in Minneapolis. DNR intends to pilot test the ANS-HACCP approach in some of its hatcheries in 2001. Outreach posters and bait bucket stickers are under development for distribution at retail bait shops to educate anglers.
- Sea Grant continues to extend outreach to prevent and mitigate impacts of aquatic nuisance species on other water-related industries. Center staff gave a primer on zebra mussel impacts and control at the American Water Works Association's Northeast Water Operator's School last spring. Center staff also hosted a downlink site in Duluth for a ballast water teleconference broadcast from Canberra, Australia.

- DNR and University of Minnesota Extension Service staff teamed with Center staff for a new initiative to pilot test a *Purple Loosestrife Biocontrol 4-H Project*. Efforts resulted in releases of biocontrol beetles (*Galerucella*) in infested wetlands by five Duluth area 4-H clubs (with five more expected in 2001). Based on this experience, a 4-Her won a grand champion for her poster at the Lake County Fair and subsequently won 1st place at the 2000 Minnesota State Fair. The purple loosestrife biocontrol project is expected to be offered as an official project in 2001.
- Center staff collaborated with DNR to produce a new *Purple Loosestrife WATCH* ID card led by Michigan Sea Grant designed to raise awareness, provide identification features, help control the spread, and encourage public reports of new infestations.
- Sea Grant co-sponsored the 10th *International Aquatic Nuisance Species and Zebra Mussel Conference* (the most comprehensive forum on ANS attended by over 380 participants in 11 countries) in February in Toronto, Ontario. Sea Grant staff debuted the *Stop Exotics, Clean Your Boat* video there and at another workshop held in conjunction with the conference for lake and recreational boating associations. DNR and Sea Grant staff also gave several presentations.
- A proceedings based on the 9th International Conference, hosted by Minnesota Sea Grant and co-sponsored by DNR in Duluth in 1999 was published.
- Center staff provided presentations about harmful aquatic exotic species at 20 conferences, workshops, meetings, and festivals to Minnesotans, including one of the DNR's training meetings for MCC watercraft inspectors in July, the Great Lakes Aquarium volunteer staff training in August, and co-moderated a special symposium, *Aquatic Exotics in the Mississippi River Basin*, at the 62nd Midwest Fish and Wildlife Conference, Minneapolis, in December.
- Center staff participate on several regional and national entities including the St. Croix Zebra Mussel Task Force, Great Lakes Panel on ANS (chair), Great Lakes Sea Grant Network Nonindigenous Species Outreach Committee (chair), the Recreational Activities Committee of the ANS Task Force (National Sea Grant representative), and the ANS Task Force Community, Education and Outreach Committee. Center and DNR staff also gave presentations before the Washington State ANS Task Force and spoke at a hearing of the Senate Natural Resources Committee in September.

Future Needs for public awareness in Minnesota

- Continue existing public awareness efforts at comparable levels to maintain high awareness of exotic species by watercraft users.
- Continue to make public awareness of zebra mussels in southeast Minnesota near the Mississippi and St. Croix rivers a priority.
- Develop public awareness efforts cooperatively with specific groups that have not received significant attention in previous years, such as the aquaculture industry, live bait dealers, water garden and horticulture industry, and aquarium trade.
- Enhance interagency communication on the status and progress of exotic species management efforts for resource professionals.
- Increase public awareness efforts with lake communities outside the Metro Area.
- Increase the information about harmful exotic species available through the DNR web site.
- Sea Grant staff will continue to work on collaborative projects with the DNR and pursue research and outreach funding through National Sea Grant competitions and other external sources.

References Cited

- Minnesota Sea Grant. 1994. Exotic Species and Freshwater Boating Survey. University of Minnesota, Duluth, Minnesota.
- MDNR (Minnesota Department of Natural Resources). December 1996. 1996 Metro Boating Survey. An unpublished survey and report prepared for Minnesota Department of Natural Resources by Thom Tech Design Company.
- MDNR (Minnesota Department of Natural Resources). September 1999. Boating in North Central Minnesota: Status in 1998 and Trends Since 1985. (Unpublished report available at the DNR's web site: www.dnr.state.mn.us).

MCC Watercraft Inspections

2000 Highlights

- During the 2000 boating season, 51,508 boater contacts were made by watercraft inspectors to educate the public about harmful aquatic exotic species.
- Inspections at uninfested waterbodies made up 8.9% of the program's overall inspection effort. These hours occurred on accesses where we had little activity in years prior to 1999 when inspectors were present only at infested waters.
- Three weekend-long awareness events were conducted in greater Minnesota. Each event focused publicity and awareness on aquatic exotic species in order to maximize the attention and interest of the local citizens near Alexandria, Spicer and Lake of the Woods.

Background

The potential for boaters to accidentally move aquatic exotic species from one lake to another is a clear threat to Minnesota's aquatic ecosystems. For this reason, the 1991 Minnesota Legislature mandated that DNR conservation officers conduct inspections of trailered boats on Minnesota highways. The purpose of these inspections was to look for Eurasian watermilfoil, issue citations to violators, and to inform the public about the potential spread of harmful aquatic exotic species.

In 1992, the DNR, the Minnesota Lakes Association and angling groups proposed and supported legislation (adopted as M.S. 18.317, Subd. 3a, and recodified as 84D.02 subd. 4, see Appendix A) requiring 10,000 hours of inspections of watercraft leaving "infested" water bodies containing harmful aquatic exotic species such as Eurasian watermilfoil, spiny water flea, and zebra mussels. Subsequently, a watercraft inspection program was established by the DNR in 1992 to accomplish this mandate. In 1993, legislation was passed increasing the number of inspection hours to 20,000 starting with the 1994 boating season. In 1999 this statute was amended to allow inspections on both infested and uninfested waterbodies to fulfill the 20,000 hour requirement.

Watercraft Inspectors, employed through the DNR's Minnesota Conservation Corps, conduct inspections at public water access sites. The goal of their effort is to promote actions by boaters that will reduce the risk of transporting harmful aquatic exotic species throughout the state. Their objectives are to increase public awareness of the threats posed by exotic species, inform boaters of the laws regarding exotic species transportation, and to show individuals how to inspect and remove exotics and aquatic vegetation from their boating equipment before leaving an access. Inspection activities are targeted at high use accesses and during high use periods.

Progress in watercraft inspections - 2000

In 2000, inspections began in May and continued through the end of October. Within this 26 week period, 22,002 inspection hours were logged and 51,508 watercraft/trailer units were inspected (Fig. 2).

In 2000 the accomplishments and responsibilities of MCC Watercraft Inspectors included the following:

- Assisted the Division of Enforcement with four road checks;
- Answered questions at the Exotic Species display during each day of the 2000 Minnesota State Fair;
- Conducted inspections at 36 different fishing tournaments throughout the state;
- Conducted inspections for waterfowl hunters during the "opener" and throughout the month of October;
- Distributed Exotic Alert Tags on 6,029 vehicles with trailers at access points on infested waters;
- Cleared aquatic plant fragments from public water accesses as encouraged in M.S. 84D.02, subd. 3, (8) (Appendix A). Removing vegetation fragments from the access sites helps to reduce the amount of Eurasian watermilfoil and other aquatic plants adhering to watercraft and trailer units exiting infested waters;
- Answered questions at an informational booth for Cannon Valley Trails Day; and
- Conducted 3 awareness events (in the Alexandria, Spicer and Lake of the Woods areas).

A total of 34 inspectors worked through the summer of 2000 providing information to the public on watercraft inspections and exotic species. Inspection efforts were distributed across the state in rough proportion to the number of public water accesses (PWA) on infested water bodies, with some inclusion of high use accesses on uninfested waterbodies. The actual distribution of time reflects both the number of PWAs and the level of public use at those accesses. This year the program was broadened to include many uninfested waterbodies in an effort to reach more boaters in non-metro locations.

Overall the number of inspections conducted in 2000 increased by about 10,064 from 1999, hours worked increased by 1,660 (Table 5). This is a change in number of inspections per hour from 2.00 in 1999 to 2.34 in 2000. 1997 was the previous highest ratio of inspections to hours at 2.11. This increase may suggest that the program did a better job of spending time at busier accesses during busier hours - or it may be that boating traffic was heavier this year. This is difficult to determine because the number of inspections conducted per day varies due to weather conditions and boater activity.

Figure 2. 2000 MCC Watercraft Inspections at public water accesses.

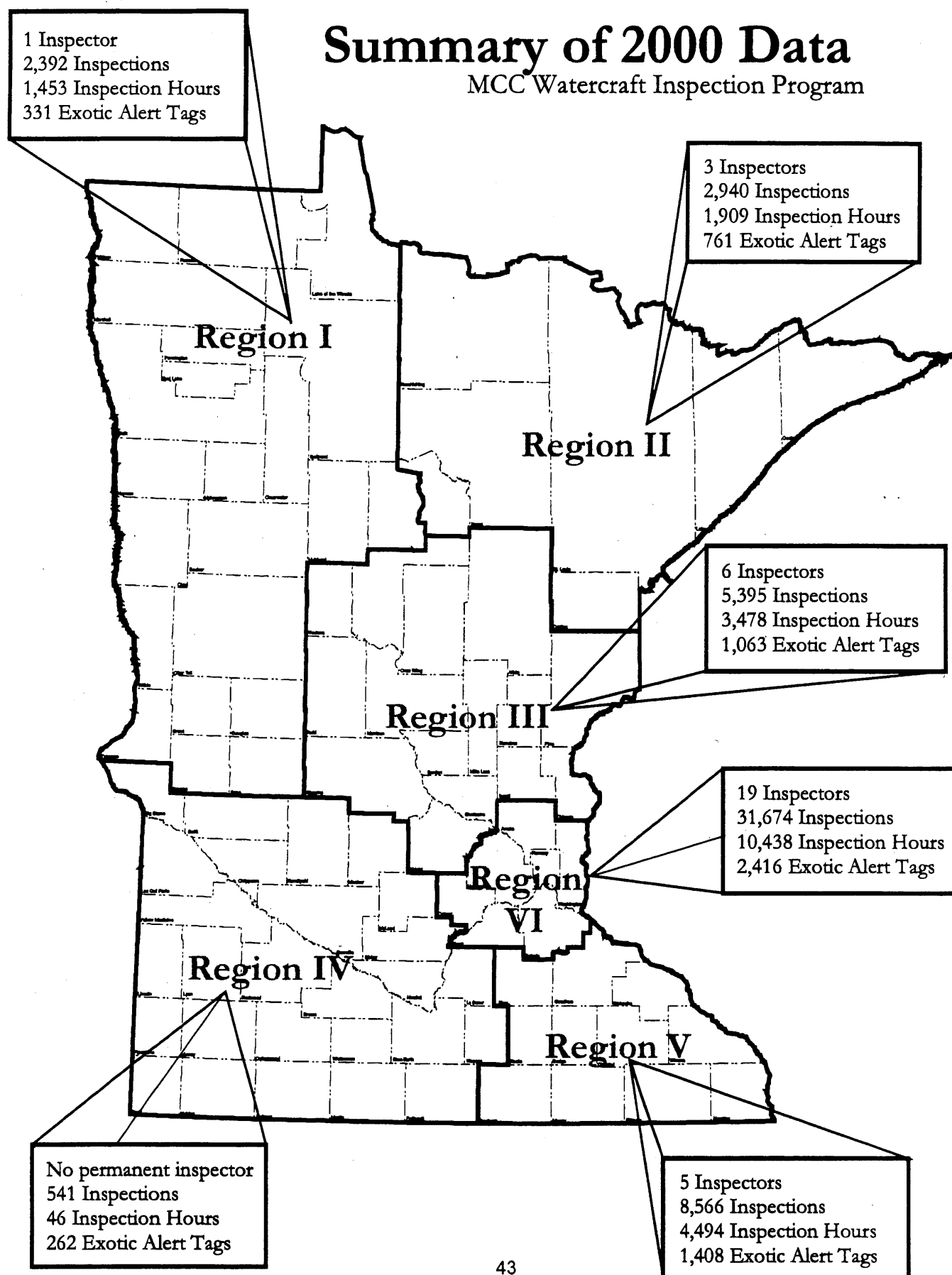


Table 5. Number of watercraft inspections conducted by MCC Watercraft Inspectors in 1998, 1999, and 2000.

Area	Number of Watercraft Inspected		
	1998	1999	2000
Region I - Northwest	201	1,584	2,392
Region II - Duluth/Superior	1,332	1,729	2,940
Region III - Central	4,476	7,360	5,395
Region IV - Southwest	0	138	541
Region V - Mississippi River	3,953	5,748	8,566
Region VI - Metro	28,457	24,885	31,674
State-wide Total	38,419	41,444	51,508

In addition it is important to note that the percent of time the program is spending in each region has shifted considerably from 1998 to 2000 (Fig. 3). A higher percentage of time in 2000 was spent in regions I, II, IV and V, reducing the percentage in regions III and VI. Region III decreased primarily due to a shortage of staff in the Brainerd area. An increase in infestations in the greater MN area in the past years, coupled with a consistent level of inspection effort necessitated a decrease in hours spent in Region VI to shift efforts to other regions. The necessity of having inspectors on infested waterbodies in greater Minnesota has enabled the program to spend time on surrounding uninfested waterbodies as well.

Inspections at Uninfested Waters

The watercraft inspection program has primarily focused on water bodies with infestations of harmful exotic species. The purpose of spending time on infested water bodies is to reduce the transportation of exotics out of those lakes or rivers. While it is important to contact boaters leaving water bodies infested with harmful exotic species, we feel that it is also important to inform boaters on other popular recreation lakes in Minnesota. To allow more flexibility in the program, the statute was amended to include watercraft inspections on uninfested waterbodies in the Department's 20,000 hour mandate (M.S. 84D.02, Subd. 4). During 2000, inspections on uninfested waters represented about 5.6% of the total inspections (2859 inspections) and 8.9% of the inspection hours (1957 hours).

To determine which noninfested waters to visit we used three criteria; 1) lakes or areas with a high level of boater activity, 2) lakes identified on program surveys as frequent destinations for boaters leaving infested water bodies, and 3) lakes with lake associations who desired to hold "Exotic Awareness Events".

Figure 3. Percent of the state's total MCC watercraft inspection hours spent in each region in 1998, 1999, and 2000.

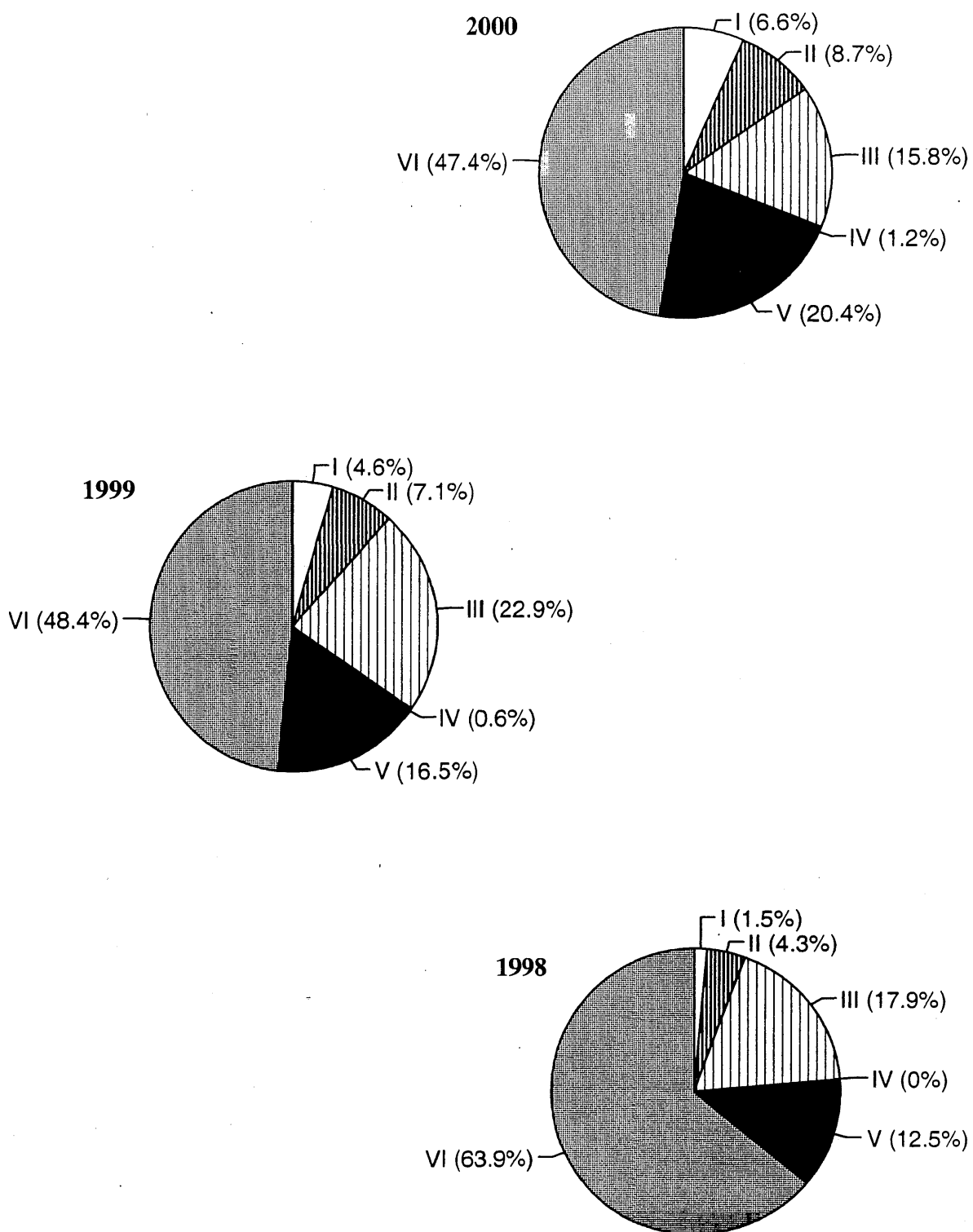
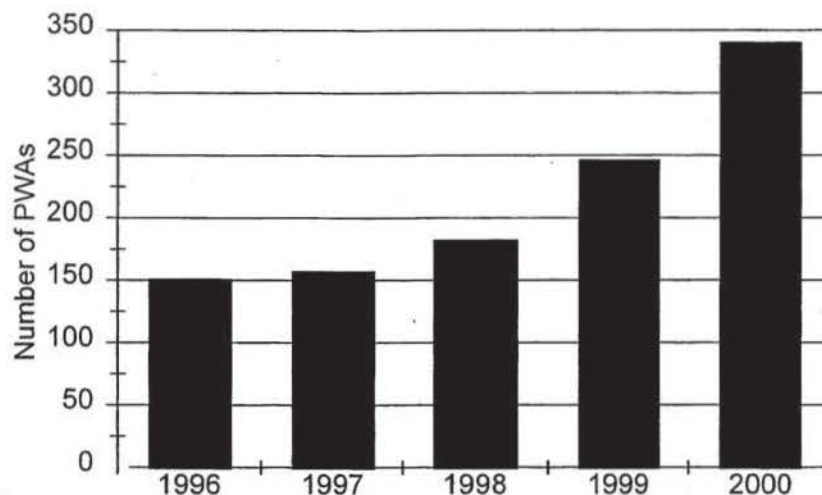


Figure 4. Total number of public water accesses with MCC watercraft inspections, 1996 through 2000.



The number of accesses where inspections are conducted has increased as new infested waters are identified (Fig. 4). In 1999, which was the first year we moved to uninfested waterbodies, the number increased significantly. In 2000 the program visited 94 more accesses than in 1999. Many of these new accesses were on waterbodies with curly leaf pondweed, a harmful exotic species that is widespread in the state. Others were on uninfested waterbodies, as we strove to increase the percent of time spent on uninfested accesses to our stakeholders recommended 10%.

Table 6. Number of public water accesses on infested and uninfested waterbodies in each Region at which MCC inspectors spent time in 2000.

Area	Public Water Accessed	
	Infested	Uninfested
Region I - Northwest	8	61
Region II - Duluth/Superior	24	49
Region III - Central	36	31
Region IV - Southwest	6	8
Region V - Mississippi River	41	0
Region VI - Metro	73	3
State-wide Total	188	152

Effectiveness

The goal of the watercraft inspection program is to promote actions by boaters that will reduce the risk of transporting harmful aquatic exotic species. The objectives are to increase awareness of aquatic exotic species issues and laws, and to reduce the number of boats and trailers leaving an access with vegetation or harmful exotic species on their watercraft.

Surveys conducted by watercraft inspectors provide important information on the public's awareness of exotic species laws and help identify high risk areas, i.e. accesses where many watercraft pick up plant fragments. According to survey information collected by watercraft inspectors, awareness of exotic species laws remains very high among Minnesota boaters. The percent of watercraft users who responded "yes" when asked if they were aware of the exotic species laws for the state was 97% (Fig. 5). Boaters from other states using Minnesota waterbodies had a slightly lower response at 92.1%. The range of percentages for each Minnesota county varied from 91.1% (in Itasca) to 100% (in multiple counties). This was the first year in which hours were spent in Itasca county (two inspectors spent a Labor Day Weekend on Lake of the Woods). Of those who said they were not familiar with the laws 6.3% (63 out of 996) had vegetation on their watercraft when they entered the access. In contrast, 2.9% (672 out of 24,120) of the people who said that they were familiar with the laws entered with vegetation.

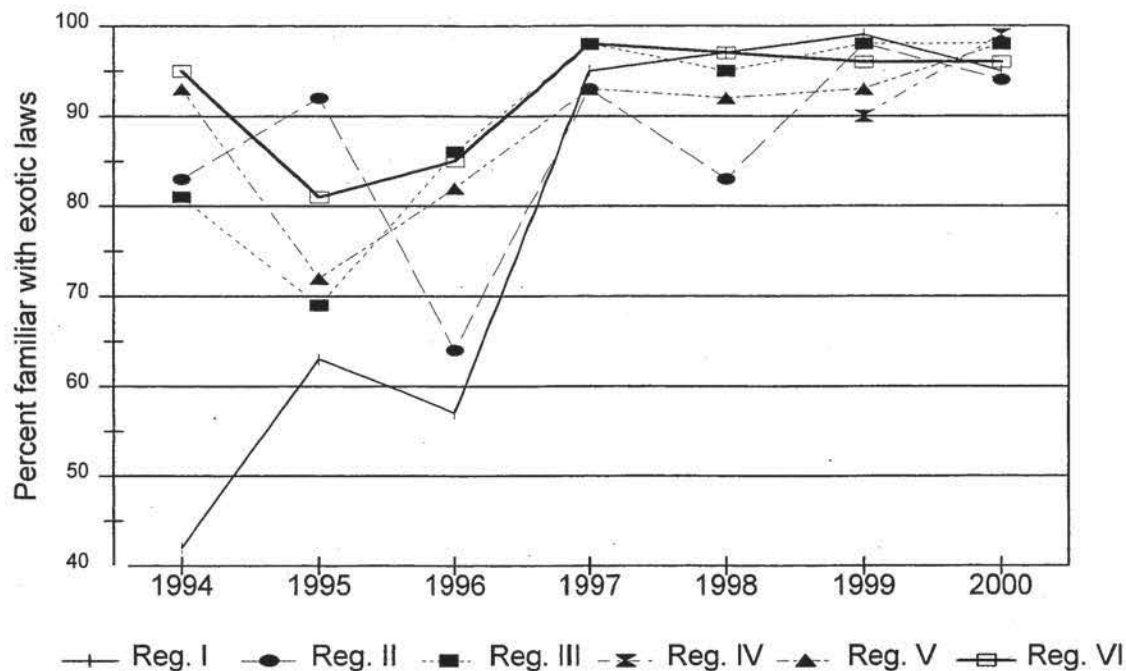
Decals are given to boaters (see *Decal Program for Trailered Watercraft* at the end of this section) which signifies that they have talked with a watercraft inspector. Of those with no decal 6.5% said they were not familiar with the exotics laws. In contrast, of those with a year 2000 decal 0.1% said they were not familiar with the laws. This suggests that the watercraft inspection program is successful at educating boaters about the exotics laws.

The Exotic Species Program continues to use a variety of media to keep exotic species awareness high (see Education/Public Awareness Activities).

Transportation of Vegetation

The percentage of boats/trailers carrying vegetation as they were trailered out of a lake or river varied widely by county. These variations may be caused by several variables including the amount and type of vegetation in the water body, its proximity to the public water access, and amount of the recreational boating traffic. An average of 24.3% of the watercraft checked by watercraft inspectors were found with vegetation (5841 watercraft) as they trailered out of the water. This rate demonstrates the clear risk that boaters will transport aquatic vegetation (and exotics) from lake to lake if boats are not properly cleaned. The percentage of boats and trailers carrying vegetation as they enter public accesses on infested waters was 2.8%. This is a good indication that the majority of boaters using infested waters are inspecting and cleaning their boats and trailers.

Figure 5. Surveyed watercraft users awareness of exotic species laws by DNR Region in Minnesota for the years 1994 through 2000.



During the DNR's exotic species road checks in 2000, the violation rate for transportation of vegetation was 17%, much higher than the percent of boats entering public waters with vegetation. This might be accounted for if the areas where the road checks were held is considered. Three of the four road checks occurred in counties (2 in Hennepin and 1 in Chisago) where the number of boats exiting with vegetation was high in comparison to other counties in the state (Fig. 6). In fact Chisago county had 23.9% of its entering boats carrying vegetation. This rate demonstrates the need for increased outreach and education in certain areas. Enforcement of exotic species laws continues in an effort to reduce the transportation of vegetation and harmful exotics (see Enforcement section).

Transportation of other Exotic Species

One boat going into the St. Louis River had zebra mussels inside the boat. Zebra mussels are being "caught" off the bottom by fishermen who often discard them in the bottom of their boats. Two boats, one entering the St. Louis River and the other entering Lake Superior, were found to have spiny water fleas. Forty-nine boats leaving these same waterbodies were cleaned of spiny water fleas.

St. Croix River

Watercraft inspectors continued to conduct inspections at several public water accesses along the St. Croix River (see: Management of Zebra Mussels). Increased public awareness and education in this area is necessary due to zebra mussels being

found in the St. Croix this season. Over 3600 watercraft were inspected and boaters were educated on specific steps to take to prevent the spread of zebra mussels.

Decal Program for trailered watercraft

During the 1994 boating season, several boaters expressed frustration over being approached by inspectors several times each week throughout the summer. To respond to boater's concerns and to reduce the duplication of education efforts, a decal was developed and distributed to boaters whose watercraft had been inspected for exotic species (see decal below). Boaters are instructed to (voluntarily) affix the decal to the winch post of their trailer. This allows inspectors to identify the boaters who inspectors have already spoken with during the summer. Boaters with a decal are given a brief reminder to drain water and remove vegetation from their boats. The decals have been used for five years now and have been well received by the public. The 30,000 decals distributed during the 2000 boating season also remind boaters to inspect their boat when inspectors are not present.

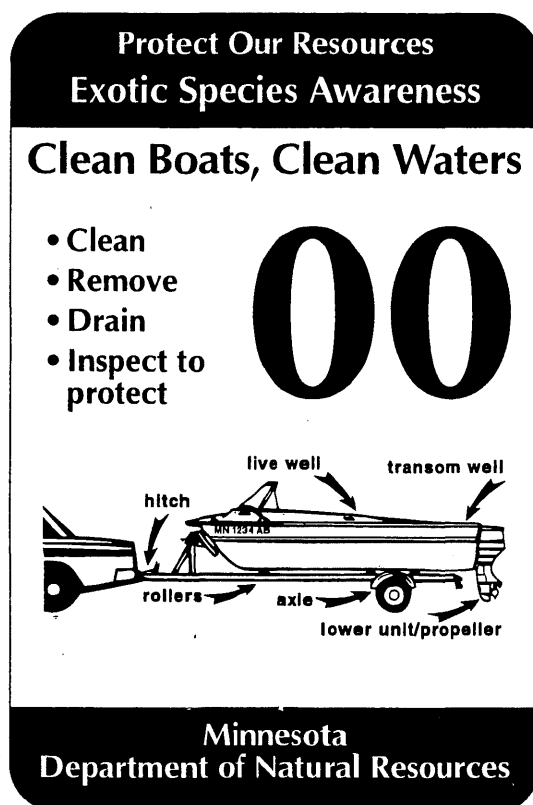
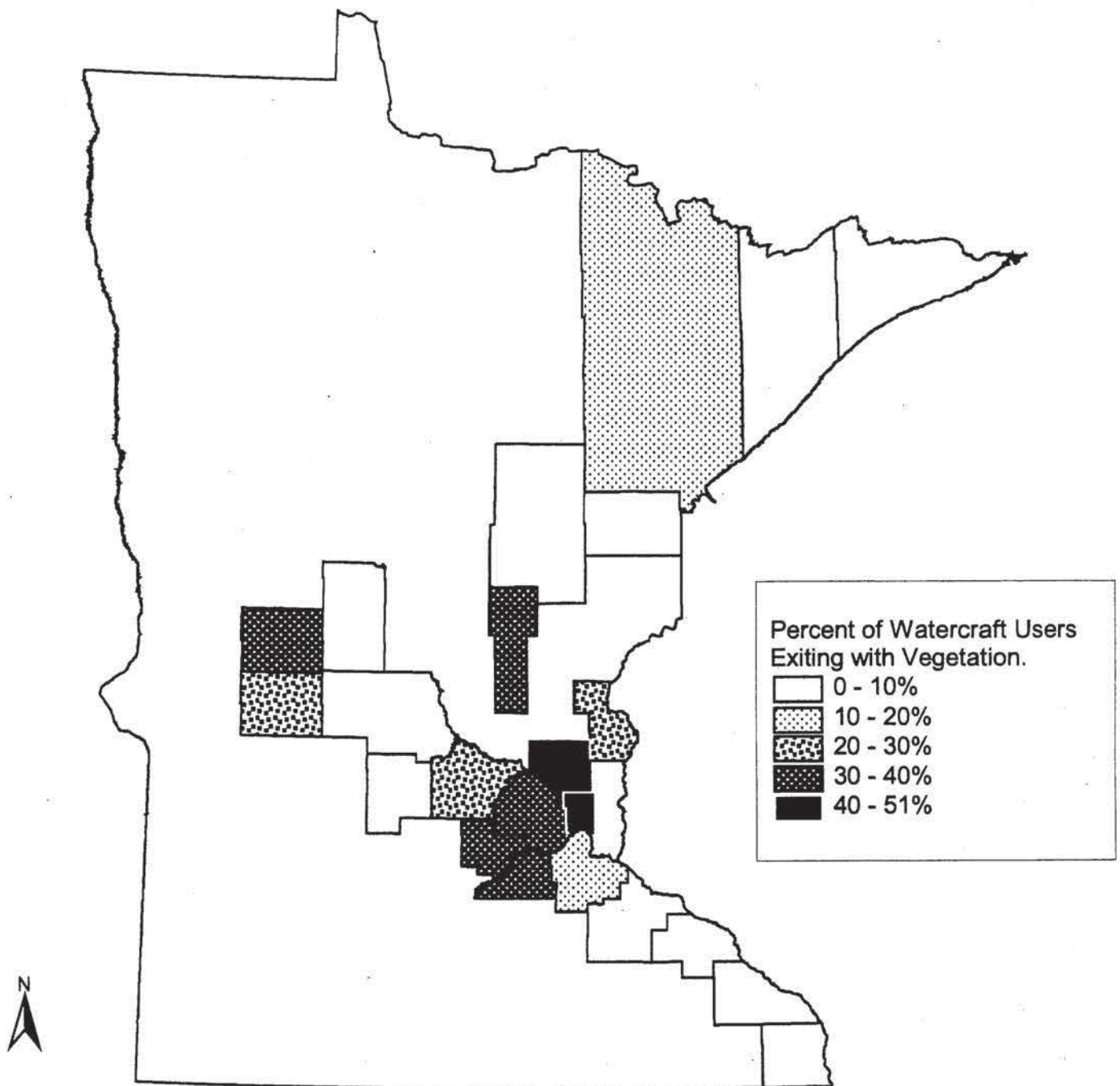


Figure 6. Percentage of exiting watercraft users inspected with attached vegetation prior to cleaning watercraft (in counties where more than 90 boats were inspected upon leaving an access).



Future Needs and Recommendations for watercraft inspections

- Conduct a minimum of 20,000 hours of inspections during the 2001 boating season.
- Continue to reduce the percentage of watercraft traveling on Minnesota roads carrying vegetation and other exotic species.
- Continue to broaden program to include additional non-metro high use lakes.
- Increase cooperation with citizen groups that would like to help increase awareness in their areas.

Enforcement

2000 Highlights

- Four road checks for trailered boats were held and aquatic vegetation was found in, or on, an average of 17% of all watercraft/trailers inspected. Along with day-to-day enforcement action, road checks and access checks continue to be used to increase public awareness of exotic species laws and to gather information on violation rates of the law prohibiting transportation of aquatic vegetation.
- Conservation Officers spent 1,500 hours enforcing the exotic species laws and rules.
- Two civil citations and 20 warnings were issued to individuals for violations.

Background

In 1991, the Minnesota Legislature directed the DNR Commissioner to establish a two year program designed to check trailered boats for the presence of Eurasian watermilfoil (milfoil). These requirements became effective August 1, 1991. Road checks were initially designed to inspect boats and trailers for the presence of milfoil fragments and to educate and inform boaters about milfoil. As additional harmful exotic species have become established in Minnesota, road checks and boat inspections were expanded to detect illegal transportation of these organisms, including zebra mussels and ruffe.

The Department of Natural Resources (DNR) supported changes in statute passed during the 1996 Legislative Session that prohibited the transport of all aquatic vegetation (rather than Eurasian watermilfoil exclusively). This change in law made enforcement simpler. Instead of having to identify Eurasian watermilfoil, which can be difficult, officers and watercraft users only had to ensure that all vegetation was removed before transporting boats and equipment. The law change also reduced the chances of zebra mussels, that can attach to aquatic plants, being inadvertently spread. Passage of the 1996 law prohibiting transport of aquatic plant has allowed an increase in exotic species-related enforcement efforts by Conservation Officers.

In 1999 the Division of Enforcement began to implement an Exotic Species Enforcement Plan to prioritize exotic species enforcement needs in each district. Under the plan, Conservation Officers' activities were expanded to include time spent at boat accesses doing more exotic species-related checks of boats, trailers, live wells, etc. Exotic species activities were included as a specific component of the 2000 Work Plan developed by the Division of Enforcement. This annual plan describes in detail each Enforcement District's responsibilities in meeting various enforcement requirements, including exotics, and insures that appropriate work activities and levels are targeted.

Progress in Enforcement - 2000

Road Checks

In 2000, four major road checks were conducted, three in the Metro area and one in greater Minnesota (Table 7). A road check was scheduled for Knife Lake in Kanabec County for June 25, 2000 but was canceled because of inclement weather. The two road checks at Orono (Hennepin Co.) on County Road 51 had the lowest percentage of watercraft carrying vegetation at 12% and 13% (Table 7). Most of the vegetation was found on trailer frames, bunks, and rollers. The Chisago County road check on Hwy 8 had the highest volume of traffic. The Hubbard County (Park Rapids) road check had the lowest volume of traffic. In total, 410 watercraft were inspected as part of the road check enforcement effort. Seventy-one watercraft (17%) were found to have vegetation in, or on, the trailer/watercraft. All 71 violations resulted in verbal or written warnings, or citations being issued.

An important component of the Department's goal to prevent the spread of exotic species in Minnesota is to lower the percentage of boats transporting vegetation in the state. Road checks of trailered boats are a method to evaluate the success of that effort. In 2000, the highest violation rates observed were in Chisago County (24%). The Department intends to continue using road checks - both for their educational value and as a tracking tool. Traffic patterns and safety issues will dictate when and where road checks are implemented.

Care needs to be taken in using road checks as a tracking tool. The amount of vegetation on/in watercraft stopped at road checks is dependent on what lakes the boats came from as well as how conscientious the owner was in removing attached vegetation. Depending on the access, a lot or a little vegetation removal may be needed. Data collected in 2000 (Figure 6) showed wide variation in the percentage of watercraft with vegetation as they were pulled up onto the access ramp.

Table 7. Results of 2000 Road Checks conducted by DNR Enforcement Officers.

Location	Number of watercraft inspected	Number of watercraft with aquatic plants	Number of verbal warnings	Number of written warnings	Number of written citations
Hennepin Co. - Orono Co. Rd. 51 - 7/15/00	117	14 (12%)	8 (7%)	6 (5%)	0
Chisago Co. Hwy. 8 - 7/29/00	158	38 (24%)	32 (20%)	4 (3%)	2 (1%)
Hubbard Co. - Park Rapids Hwy. 71 - 8/11/00	43	7 (16%)	5 (12%)	2 (5%)	0
Hennepin Co. - Orono Co. Rd. 51 - 8/12/00	92	12 (13%)	7 (8%)	5 (5%)	0
TOTALS	410	71 (17%)	52 (13%)	17 (4%)	2 (<1%)

Road checks can be a very effective method of drawing public attention to an issue. Nevertheless, based on recent court decisions, the violation rates observed at the road checks need to be high enough to justify the public inconvenience and expense of the checks. In 2000 the violation rates ranged from 12% to 24% with a mean of 17% (Table 7). In comparison, the violation rates averaged 20% and 21% in 1998 and 1999 (Table 8), respectively. This information about violation rates will be used to evaluate the appropriateness of proceeding with future road checks.

Table 8. Summary of trailered watercraft inspected by the DNR during road checks conducted between 1991 and 2000.

Year	Number of Road checks	Number of watercraft inspected	Number of watercraft with aquatic plants	Number of warnings ¹	Number of written citations
1991	8	818	na	9 (1.1%)	5 (0.6%)
1992	7	1412	na	14 (1.0%)	12 (0.8%)
1993	37	982	na	63 (6.4%)	9 (0.9%)
1994	7	775	na	35 (4.5%)	?
1995	3	202	na	9 (4.5%)	?
1996	3	595	138 (23%)	138 (23%)	0
1997	7	638	161 (25%)	152 (23.8%)	2 (0.3%)
1998	5	645	127 (20%)	117 (18.1%)	3 (0.5%)
1999	4	491	101 (21%)	95 (19.3%)	7 (1.4%)
2000	4	410	71 (17%)	69 (16.8%)	2 (0.5%)
Total	85	6968	598	570	40

¹Made assumption that between 1994 and 1996 all offenders were issued warnings

Mississippi River

Conservation Officers conducted exotics enforcement activities along the Mississippi River focusing on the transportation of zebra mussels and infested waters. Boaters using the Mississippi River south of the Twin Cities must empty bilges, live wells, and bait buckets so that they do not transport zebra mussel infested water from the Mississippi. During the summer of 2000 officers spent about 233 hours of enforcement time along the Mississippi River including accesses near Hastings, Red Wing, Lake City, Kellogg, Winona, and LaCrescent.

Waterfowl Hunting Season

Conservation Officers conducted exotics enforcement activities during the waterfowl hunting season to inform hunters about the laws prohibiting transportation of aquatic vegetation. Hunters must remove vegetation from their boats, decoys, and anchors before leaving the boat access. There is an exception for the transport of shooting blinds, and emergent vegetation cut above the water line can be transported. Conservation Officers contacted hunters during the waterfowl hunting season at the

following accesses along the Mississippi River: Verchota (Winona County), North Lake (Goodhue County), Dresbach (Houston County), Wilcox and Halfmoon (Wabasha County). Additional time was spent in Freeborn County, Otter Tail County, Beltrami County, and Mille Lacs County at several lakes frequented by waterfowl hunters.

St. Croix River

Divers continued to be employed for underwater inspection of both commercial and recreational vessels in the St. Croix River. Conservation Officers also met with the Wisconsin DNR and the National Park Service several times to ensure interagency cooperation on zebra mussels.

Effectiveness

The DNR believes that enforcement plays a critical role in reducing the spread of harmful exotic species. In order for the regulations on harmful exotic species to be effective in reducing their spread there must be: a balanced mix of public education and awareness efforts, voluntary compliance from the general public, and enforcement of the regulations. An ideal measure of the effectiveness of enforcement efforts would be a long-term decrease in the percentage of boats carrying vegetation. The number of hours of enforcement effort or its distribution across Minnesota may have to be adjusted to achieve this goal. If additional enforcement effort in specific areas of the state is necessary, the work planning process used by the Division of Enforcement will help to effectively allocate time to meet those identified needs. The DNR's ability to reduce the transportation of aquatic vegetation on public roads will be evaluated after several more seasons under the current statutes.

Future plans and needs regarding enforcement:

- Road checks will continue to be conducted next summer. Our goal is to conduct four major road checks between June and August. Annual road checks (Anoka, Hennepin, & Chisago Counties) will continue to be used to track boater compliance although the timing and locations of the road checks may be altered. A new road check will be planned on I-94 at the MnDOT truck scale site just east of the Minnesota/Wisconsin border.
- Focus enforcement activity near lakes with Eurasian watermilfoil infestations. Eurasian watermilfoil occurs in some large outstate lakes (Minnewaska and Mille Lacs) so some additional enforcement focus will be moved outstate to those areas and near three other outstate lakes where milfoil or zebra mussels were first found in 2000.
- Exotic species information will be included in "Resort Packets" that Conservation Officers deliver to Minnesota resorts.
- Continue inspection, public education, and enforcement efforts at public accesses (including fishing tournaments, sailing regattas, and other special events) throughout the summer, including cooperative assistance with MCC inspectors during access checks.

Management of Eurasian Watermilfoil

2000 Highlights

- Eurasian watermilfoil was discovered in 15 additional Minnesota waterbodies during 2000. This is the largest number of new waterbodies discovered with milfoil in a single year since 1989. There are now 121 Minnesota waterbodies known to contain Eurasian watermilfoil. Eight of the newly discovered waterbodies are connected to other waters that are known to have milfoil. This may explain part of this year's increased spread of milfoil. Unfortunately there is no way to prevent milfoil from spreading between connected waters.
- By the end of August milfoil could not be found in the two lakes in Itasca County, Lake McKinney and Ice Lake. These two lakes were treated with the herbicide Sonar® AS in 1999 with the goal of reducing the amount of milfoil to below detectable levels for 2-3 years. As expected, these treatments also had significant negative non-target impacts on native aquatic plants.
- Eurasian watermilfoil was discovered in two small areas in Green Lake, in Kandiyohi County. These areas were treated with 2,4-D herbicide in an attempt to prevent the spread of milfoil within the lake, and to other area lakes.
- Horseshoe Lake, a small lake with no water access in St. Louis County was confirmed to have Eurasian watermilfoil in December, 1999.
- The DNR Exotic Species and Aquatic Plant Management programs worked with cooperators on 33 Minnesota lakes during 2000 to manage Eurasian watermilfoil and initiated control efforts on 12 other "high-intensity management" lakes.
- The DNR Exotic Species Program continued to support and conduct research to improve management of Eurasian watermilfoil.

Background

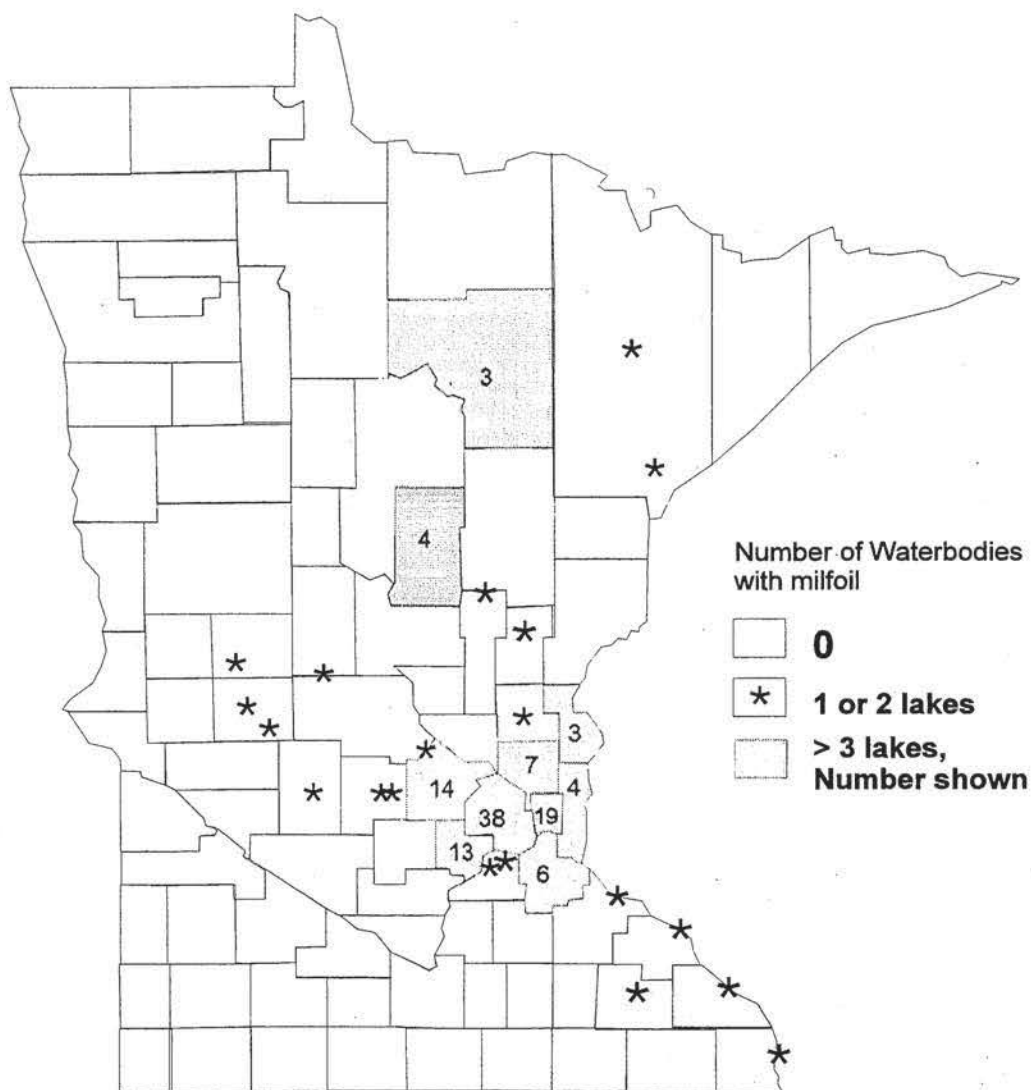
Eurasian watermilfoil (*Myriophyllum spicatum*) is an exotic plant that was inadvertently introduced to Minnesota. Milfoil was first discovered in Lake Minnetonka during the fall of 1987. The DNR's Exotic Species Program manages milfoil because it can limit recreational activities on water bodies and alter aquatic ecosystems by displacing native plants. This report describes the Exotic Species Program's efforts in 2000 to manage this exotic plant and limit its spread in Minnesota.

Progress in management of Eurasian watermilfoil

Spread of Eurasian watermilfoil in Minnesota

Eurasian watermilfoil is now known to occur in 121 bodies of water in Minnesota (Figure 7). During 2000, it was discovered in 15 new waterbodies. This is the largest

Figure 7. Distribution of waterbodies infested with Eurasian watermilfoil in Minnesota as of December 11, 2000.



number of new waterbodies discovered with milfoil in a single year since 1989 (Table 9). The high number of new lakes discovered to have milfoil this summer is due in part to the low water levels in many Minnesota lakes. In periods of low water milfoil is more visible to lake users because it tends to mat more at the water surface.

The spread of milfoil between connected waterbodies was a common cause of infestation for lakes discovered with milfoil in 2000. Eight of the newly discovered waterbodies are connected to waters already known to be infested with milfoil. Deer and Goose lakes in Wright County are connected to Buffalo Lake, which has been known to have milfoil since 1999. Kohlmans, in Ramsey County is part of the Gervais Chain of Lakes which has been known to have milfoil since 1995. Snail Lake in Ramsey County is connected to Sucker Lake, which has been known to have milfoil since 1995. Owasso, in Ramsey County is connected to Lake Wabasso which has been known to have milfoil since 1992. The Ripple River in Crow Wing County is downstream from Bay Lake, which has been known to have milfoil since 1992. Upper Prior Lake in Scott County is connected to Lower Prior Lake which has been known to have milfoil since 1991. And Peltier Lake in Anoka County is connected to Centerville Lake which has been known to have milfoil since 1999.

Eurasian watermilfoil was found in two counties in 2000 where it had not been found before, in Green Lake in Kandiyohi County, and Green Lake in Isanti County. In the Kandiyohi County lake, milfoil only occurs in two small areas and these areas were treated with 2,4-D herbicide by the DNR. In the Isanti County lake milfoil is widespread, and probably had been in the lake for several years before it was discovered in 2000. Because milfoil is already widespread in Green Lake, Isanti County, the DNR did not attempt to control the milfoil within the lake.

In December, 1999 Eurasian watermilfoil was confirmed in Horseshoe Lake in St. Louis County. Because it is not connected to any other waterbodies that have Eurasian watermilfoil, and because there are no water accesses (public or private) on the lake, it is unclear how milfoil became established in this small (40 acre) lake. It is possible that milfoil was carried into this lake by fragments transported by waterfowl. While it is believed that milfoil rarely establishes populations from seed, it appears to be possible (Aiken *et al.* 1979, Hartleb *et al.* 1993). Because there was no obvious way that milfoil could have been introduced into Horseshoe Lake by human activity milfoil from the lake was sent to California for genetic tests which confirmed its identification as Eurasian watermilfoil.

There may be additional Minnesota lakes that have milfoil that have not yet been discovered. The participation of the public in reporting new occurrences of milfoil remains critical. The Exotic Species Program continues to encourage anyone who suspects there is milfoil in a lake to call and send a sample to the Eurasian Watermilfoil Program Coordinator for identification. The program investigates likely reports as soon as possible because early detection and treatment of milfoil is a key element of our strategy to limit the spread of milfoil to other bodies of water.

Table 9. Numbers of lakes or rivers in which Eurasian watermilfoil is known to occur in Minnesota as of December 2000.

Year	Number of Lakes in which milfoil was discovered	Number of Rivers in which milfoil was discovered	Cumulative number of water bodies with milfoil
1987	1	0	1
1988	8	0	9
1989	14	1	24
1990	12	1	37
1991	14	0	51
1992	10	2	63
1993	5	0	68
1994	2	0	70
1995	7	1	78
1996	5	0	83
1997	5	0	88
1998	9	1	98
1999	8 ¹	0	106
2000	14	1	121

¹ This total includes Horseshoe Lake, which was confirmed to have Eurasian watermilfoil in December, 1999

Treatment of Eurasian watermilfoil in Itasca County lakes with Sonar® herbicide

Because McKinney and Ice lakes in Itasca County are small, 115 and 41 acres, respectively; are a source of potential spread of milfoil to the northern part of Minnesota; and are far enough away from other lakes with milfoil that the possibility of a quick reinfestation is low, they were treated with Sonar® herbicide (Welling *et al.* 1997) in the summer of 1999. The goal of the treatments was to significantly reduce the abundance of milfoil in these lakes, which in turn could reduce the potential for spread to other lakes in northern Minnesota.

The 1999 treatments successfully controlled Eurasian watermilfoil. Exotic Species Program staff surveyed the aquatic plants in both Ice and McKinney lakes in July of 2000. Milfoil was not observed in Ice Lake. In McKinney Lake only a few green milfoil plants were observed, which were showing signs of dying. Because there was still sufficient concentration of herbicide in the water from the 1999 Sonar® treatment to control these few remaining milfoil plants, no Sonar® herbicide was applied to McKinney in 2000. It is likely at some point that milfoil will reappear in these lakes. At that time, the value of a second treatment with Sonar® herbicide will be evaluated.

The 1999 Sonar® treatments also significantly reduced many native plant species in both lakes. In Ice Lake the number of native submersed aquatic plant species fell from 23 species before treatment to 10 species in 2000. In Lake McKinney the number of submersed aquatic plant species fell from 29 species before treatment to 17 species in 2000. Some native plant species may not return to pre-treatment levels of abundance or may not reappear in the lake for many years.

Effectiveness of efforts to limit the spread of Eurasian watermilfoil

The discovery of Eurasian watermilfoil in 15 additional Minnesota waterbodies during 2000 is the largest number of new lakes discovered with milfoil in a single year since 1989. This increase in the number of new lakes discovered is due in part to the spread of milfoil between connected waters. Because milfoil spreads by the movement of plant fragments, there is no feasible way of preventing the spread of milfoil between connected waterbodies. The spread of milfoil between connected waters may have accounted for up to eight of the 15 new waterbodies discovered to have milfoil in 2000. Nevertheless, public efforts to limit the spread of milfoil in Minnesota appear to be having a positive effect. If the spread of milfoil was unchecked we would expect an increasing number of new lakes to be infested each year. As the number of infested lakes increased, so would the rate of spread.

We attribute the apparent slow rate of spread by boaters to efforts to educate users of Minnesota's lakes and rivers about milfoil, along with other exotics, and actions that people take to prevent the spread of exotics (see sections on Regulations, Public Awareness, Watercraft Inspections, and Enforcement).

Management of Eurasian watermilfoil in Minnesota lakes

Classification of water-bodies for management of Eurasian watermilfoil

Management of Eurasian watermilfoil by the Exotic Species Program starts with the classification of waterbodies known to have the plant. In the spring of 2000, the Exotic Species Program classified the 106 bodies of water known to have milfoil on the basis of surveys done in 1999. Seventy-seven lakes were determined to be eligible for management with State funds (Table 10). Another 22 lakes were determined to be ineligible for management with State funds because they do not have public water accesses or are not protected waters that are regulated by the State of Minnesota (Minnesota Statutes 103G.005, Subd. 15). Lastly, seven bodies of water with milfoil are rivers or streams where management of this exotic is not usually attempted. The 15 water bodies that were discovered to have milfoil during 2000 milfoil included five lakes classified for high-intensity management and seven lakes classified for maintenance management (Table 10).

Table 10. Classification of bodies of water in Minnesota with Eurasian watermilfoil during 2000.

Classification	Spring	New in Summer	Fall
Eligible for management with State funds			
High-intensity management	13	5	18
Maintenance management	64	7	71
Ineligible for management with State funds			
Public water but no public access	18	2	20
Not public water	4	0	4
Other			
Rivers or streams	7	1	8
Total	106	15	121

High-intensity management of Eurasian watermilfoil

The goals of high-intensity management are to reduce the abundance of milfoil within a lake and slow the spread of the exotic to other lakes. Based on our past experiences attempting to eradicate Eurasian watermilfoil, the Exotic Species Program believes that eradication of the exotic from Minnesota lakes is not a realistic goal.

During 2000, the Exotic Species Program conducted high-intensity management on 18 lakes with Eurasian watermilfoil (Table 11). High-intensity management began with surveys of lakes by staff of the Exotic Species Program. Following these surveys, applications of herbicide were made to 12 of these lakes by commercial applicators under contract to the DNR. George Lake in Anoka County, Sauk Lake in Todd County, Ice Lake in Itasca County, and Minnewaska Lake in Pope County were not treated because no milfoil plants were found in those lakes. Gilchrist Lake in Pope County was not treated because the milfoil was in poor condition and it did not appear that treatment was necessary. McKinney Lake in Itasca County was not treated because there were only a few scattered dying milfoil plants, and because there was still enough herbicide in the water from the 1999 whole lake treatment of McKinney to control those plants.

The amount of state funds spent on high intensity management in 2000 was lower than the amount spent in 1999 (Table 12). This is due largely to the high cost of Sonar® treatments done on McKinney and Ice lakes in Itasca county in 1999. Those treatments, which were done to prevent the spread of milfoil to other lakes in northern Minnesota, together cost \$46,000.

Table 11. Minnesota Lakes which received high intensity management of Eurasian watermilfoil in 2000

Record Number	Lake Name	County	Year discovered
1	Eagle	Hennepin	1992
2	George *	Anoka	1998
3	Gilbert-Pit (Ore-be Gone)	St. Louis	1999
4	Gilchrist **	Pope	1996
5	Green	Kandiyohi	2000
6	Ice *	Itasca	1999
7	McCarron	Ramsey	2000
8	McKinney **	Itasca	1999
9	Mille Lacs	Mille Lacs	1998
10	Minnewaska *	Pope	1998
11	North Twin	Itasca	2000
12	Owasso	Ramsey	2000
13	Ruth	Crow Wing	1997
14	Sauk *	Todd	1994
15	Stella	Meeker	1999
16	Sugar	Wright	1990
17	Turtle	Ramsey	2000
18	Washington	Meeker	1999

* No milfoil found during 2000.

** Milfoil found, but in such a poor condition no treatment warranted in 2000.

Table 12. Number of lakes managed and amount of state funds used for management of Eurasian watermilfoil in Minnesota during 1999 and 2000.

Year	Maintenance Management		High Intensity Management		Total	
	Number of lakes	Funds from DNR	Number of lakes	Funds from DNR	Number of lakes	Funds from DNR
1999	34	\$63,500	12	\$65,000	46	\$128,500
2000	33	\$68,100 ¹	12	\$30,700	45	\$98,800

¹ This is an estimate of the amount of DNR funds that will be spent for 2000 because some of the projects eligible for reimbursement have not been completed as of December 15, 2000.

Maintenance management of Eurasian watermilfoil

The goals of maintenance management are to manage nuisances caused by milfoil, but not necessarily reduce the abundance of the plant lake-wide, and to slow the spread of the exotic to other lakes. Most management of milfoil on maintenance management lakes (Table 13) was initiated by cooperators, who were reimbursed by the DNR for the costs of the management, up to the maximum available for their lake. The amount of State funds available for eligible lakes varied according to the extent of the potential habitat for milfoil, the size of the littoral zone in each lake. The littoral zone is that portion of a lake where submersed plants can grow and is legally defined as the portion of the lake with water depths of up to 15 feet. The grant program for milfoil management on maintenance lakes is described in the Announcement of Availability of Funds (DNR 2000).

During 2000, funding and technical assistance were offered by the Exotic Species Program to 51 potential cooperators for management of Eurasian watermilfoil on 71 lakes in the maintenance management classification (Table 13). The number of lakes exceeds the number of cooperators because we seek one cooperator for connected lakes, and because some cooperators have responsibility for several lakes. This offer of assistance is described in a document that is annually mailed to potential cooperators (DNR 2000).

As of December 15, 2000, we had reimbursed 12 cooperators on 16 lakes for costs of management of milfoil. We expect to reimburse an additional 14 cooperators on 18 lakes for costs of milfoil management (Table 12). These efforts ranged from the herbicide treatment of milfoil around a public fishing pier for a cost of \$425 to a mechanical harvesting program on Lake Minnetonka for which the DNR provided \$23,804. During 2000 the majority of cooperators chose to spend State funds on treatment of milfoil with herbicide. Three cooperators applied for state funds for mechanical harvesting of milfoil on 13 lakes. Four cooperators applied for state funds to have contractors survey milfoil. In addition, the Exotic Species Program initiated treatment of milfoil in the immediate vicinity of public water accesses operated by the DNR on three lakes in the maintenance management class.

Effectiveness of management of Eurasian watermilfoil in Minnesota lakes

The main goals of milfoil management by the Exotic Species Program are to slow the spread of the exotic to other lakes and to manage nuisances caused by milfoil. Management of nuisances caused by milfoil done with State funds usually involves control of milfoil in areas which are used by the general public. Most milfoil treatments controlled the plant for at least part, if not all, of the summer.

The 1999 effort to reduce the milfoil in Itasca County lakes McKinney and Ice was successful. During 2000, milfoil was not found in Ice Lake, and very few milfoil plants were found in McKinney Lake. Unfortunately, as expected, these high rate Sonar® treatments caused significant damage to the native plant communities in the treated lakes. High intensity management of milfoil in 1999 also appears to have been

Table 13. Minnesota Lakes with Eurasian watermilfoil in the maintenance management class in 2000.

Record #	Lake Name	County	Year milfoil discovered	Record #	Lake Name	County	Year milfoil discovered
1	Ann	Carver	1995	38	Lotus	Carver	1991
2	Auburn	Carver	1989	39	Lower Prior	Scott	1991
3	Augusta	Wright	1993	40	Marion	Dakota	1998
4	Bald Eagle	Ramsey	1989	41	Mary	Wright	1997
5	Bavaria	Carver	1989	42	Medicine	Hennepin	1989
6	Bay	Crow Wing	1992	43	Minnetonka	Hennepin	1987
7	Beebe	Wright	1993	44	Minnewashta	Carver	1989
8	Brownie	Hennepin	1991	45	Nokomis	Hennepin	1995
9	Bryant	Hennepin	1991	46	Oscar	Douglas	1992
10	Buffalo	Wright	1999	47	Otter	Anoka	1989
11	Bush	Hennepin	1990	48	Parkers	Hennepin	1991
12	Calhoun	Hennepin	1989	49	Peavy	Hennepin	1988
13	Cedar	Hennepin	1990	50	Peltier	Anoka	2000
14	Centerville	Anoka	1999	51	Phalen	Ramsey	1997
15	Christmas	Hennepin	1992	52	Pierson	Carver	1991
16	Clearwater	Wright	1989	53	Pulaski	Wright	1991
17	Crooked	Anoka	1990	54	Rebecca	Hennepin	1989
18	Crystal	Dakota	1991	55	Riley	Carver	1990
19	Deer	Wright	2000	56	Rock	Wright	1993
20	Dutch	Hennepin	1989	57	Round	Hennepin	1995
21	Fish	Hennepin	1993	58	Rush	Chisago	1992
22	Forest	Hennepin	1990	59	Sarah	Hennepin	1990
23	Gervais	Ramsey	1995	60	Silver	Ramsey	1992
24	Goose	Wright	2000	61	Snail	Ramsey	2000
25	Green	Chisago	1990	62	Tanager	Hennepin	1988
26	Green	Isanti	2000	63	Upper Prior	Scott	2000
27	Harriet	Hennepin	1991	64	Virginia	Carver	1988
28	Independence	Hennepin	1989	65	Wabasso	Ramsey	1992
29	Island	Ramsey	1991	66	Waconia	Carver	1989
30	Keller	Ramsey	1995	67	Waverly	Wright	1991
31	Knife	Kanabec	1990	68	Whaletail	Hennepin	1996
32	Kohlmans	Ramsey	2000	69	White Bear	Washington	1988
33	Lake of Isles	Hennepin	1988	70	Wirth	Hennepin	1986
34	Libbs	Hennepin	1988	71	Zumbra	Carver	1989
35	Little Long	Wright	1991				
36	Little Waverly	Hennepin	1992				
37	Long	Hennepin	1992				

successful in George Lake and Lake Minnewaska, where milfoil was not found during 2000 (Table 11).

Participation in control efforts by other state agencies, local units of government, and interested groups

The success achieved in management of Eurasian watermilfoil and the problems it causes in Minnesota is due in large part to cooperation between the Exotic Species Program and organizations outside the DNR such as lake associations, and various local units of government, hereafter called cooperators. The Exotic Species Program has also received valuable assistance in management of Eurasian watermilfoil from

staff from DNR's Division of Fisheries and the DNR's Aquatic Plant Management Program in the divisions of Fisheries and Ecological Services.

Research on Eurasian watermilfoil and potential approaches to management in Minnesota

The Exotic Species Program has supported or conducted a number of research projects to improve management of Eurasian watermilfoil. In this section, we briefly summarize the most important or interesting results of recent efforts by researchers.

Potential for biological control of Eurasian watermilfoil

Evaluation of potential biological control agents for Eurasian watermilfoil by researchers at the University of Minnesota is primarily focused on a weevil (*Euhrychiopsis lecontei*), which is a native insect. Declines in milfoil in some lakes have been associated with weevils, while other lakes with weevils have not experienced declines in Eurasian watermilfoil.

Current and proposed future research by University staff will attempt to detect naturally occurring lake-wide Eurasian watermilfoil declines. They will attempt to identify the responsible control agents and assess their occurrence and abundance in five to six new lakes each year. Researchers will investigate the relative importance of factors affecting successful biological control of milfoil with insects, especially the weevil and attempt to manipulate these factors. Although their current focus is on sunfish predation, they will examine other factors such as shoreline development. They will also assess the relationship between available sediment nitrogen and plant community structure and effects of the weevil. They will conduct one or two broader scale releases of milfoil weevils to further assess the effects of additions of weevils on milfoil and the role of fish predation. These results, in conjunction with model predictions based on their experiments, will allow them to determine appropriate circumstances for effective control (Newman, *et al.* 2000). More information about the University of Minnesota's milfoil biocontrol research can be found at: <http://www.fw.umn.edu/research/milfoil/milfoilbc.html>.

Minnesota researchers conducting the weevil studies are continuing to publish results in peer-reviewed journals. During 2000 one paper was published in a peer-reviewed journal (Solarz and Newman 2000). The researchers also have one manuscript in press (Newman and Biesboer. In Press) and another in review (Newman *et al.* In Review).

Experience has shown that development of biological controls may require research conducted over a period of ten years or more. Consequently, the Exotic Species Program's evaluation of the potential for biological control of Eurasian watermilfoil is considered to be a long-term effort, the outcome of which cannot be guaranteed.

The research described above was supported by funding provided through the DNR with appropriations made in 1992, 1993, 1995, 1997, and 1999, by the Minnesota Legislature as recommended by the Legislative Commission on Minnesota Resources

(LCMR). The LCMR recommended continued funding for research on the potential for biological control of milfoil and loosestrife during the FY 2001-2002 biennium. The appropriation made in 2000 was matched 50:50 by the DNR. This match was made from DNR Exotic Species Program funds which come from a surcharge on watercraft licences (see Overview of MN Exotic Species Programs, Funding).

Review of the potential to use fluridone herbicide to selectively control Eurasian watermilfoil.

Most problems caused by milfoil or other aquatic plants in Minnesota are currently managed by the use of herbicides or mechanical harvesting, which control plants in limited, specific parts of bays or lakes where nuisances occur. Operational treatment of whole bays or lakes with herbicide is not allowed in Minnesota because this destroys more vegetation than is necessary to give users access to lakes.

Fluridone herbicide, which is formulated as Sonar™, is usually applied to whole bays or lakes to control Eurasian watermilfoil. In 1993 the DNR initiated a study to determine whether application of fluridone to whole bays or lakes can control Eurasian watermilfoil and have minimal effects on native vegetation. The results of this study and other available information indicated that application of fluridone to whole lakes or bays causes high levels of unavoidable damage to native vegetation and has the potential to affect other aspects of lake ecosystems (Welling *et al.* 1997). Consequently, the DNR has since permitted application of this herbicide to whole lakes or bays to control milfoil in a very few, unique cases. In the last three years only McKinney and Ice lakes in Grand Rapids met the DNR's requirements to allow whole lake treatment with fluridone (see above).

Results from recent research in Michigan (Getsinger *et al.* 2001) showed that the application of fluridone at rates lower than those previously used in Minnesota (Welling *et al.* 1997) controlled milfoil and caused few if any reductions in non-target, native plants. In September, two meetings were hosted by Lake Management, Inc. to discuss the possible use of fluridone to manage milfoil in Minnesota. The meetings were attended by members of various lake associations, some legislators, and DNR staff. In November, staff from the Exotic Species Program made a presentation on this subject to managers in the Division of Fisheries, who are responsible for reviewing and approving applications for whole-lake treatments with pesticides like fluridone. The Division of Fisheries gave conditional approval to the Exotic Species Program to proceed to plan for a series of experimental whole-lake fluridone treatments in 2001, involving perhaps as many as three lakes, in an attempt to reproduce the selective control reported from Michigan.

Management of Eurasian watermilfoil in other states

In 2000, the total number of states known to have milfoil was 45. The only states where it is not known to occur are: Alaska, Hawaii, Maine, Montana, and Wyoming. In Canada milfoil is known to occur in British Columbia, Ontario, and Quebec. The exotic plant also is reported to occur in Manitoba (see below).

Wisconsin

In 1999, Eurasian watermilfoil was known to occur in 319 waterbodies in 75% (54) of Wisconsin counties (personal communication: Sandy Engel, Wisconsin Department of Natural Resources [retired]). Three additional infestations were discovered in 2000 (personal communication: Laura Hermann, Wisconsin Department of Natural Resources, Rhinelander). The Wisconsin DNR does not have a specific program to control milfoil, but is involved in the management, research, and public education efforts for this exotic.

Iowa

During 2000, two additional waterbodies in Iowa were found to have Eurasian watermilfoil (personal communication: Gary Phillips, Iowa Lakes Community College, Estherville). These discoveries bring the total number of sites with milfoil to 16. During 2000 the Iowa Department of Natural Resources continued to monitor boat accesses, survey lakes for the presence of Eurasian watermilfoil, conduct various public awareness activities aimed at preventing the spread of milfoil, and treat a limited number of infested lakes with herbicide.

South Dakota

Eurasian watermilfoil was first found in South Dakota in 1999. The plant is present in a segment of the Missouri River known as Sharpe Lake, which runs between Pierre and Fort Thompson (Personal Communication: Dave Ode, Natural Heritage Program Coordinator, South Dakota Department of Game, Fish, and Parks). Eurasian watermilfoil plants can be recovered with a rake or found on shore, but no extensive mats have yet appeared. No other bodies of water in South Dakota are known to have milfoil.

North Dakota

In 1996, a small bed of Eurasian watermilfoil milfoil was found in the Sheyenne River below Baldhill Dam by a group of Valley City State University students. The milfoil was not seen during the following three years, but it reappeared in 2000 (personal communication: Terry Steinwand, Division of Fisheries, North Dakota Department of Game and Fish, Bismark). This remains the only site in North Dakota where the plant is known to occur.

Manitoba

Eurasian watermilfoil is reported to occur in southwestern Manitoba near Waskada (personal communication: Dr. Eva Pip, University of Winnipeg). The plant, which is quite abundant, was found in a man-made channel that is connected to the Souris River. It is thought that the exotic likely was introduced either on digging equipment or on power boats. The plant was first seen at this location in 1998. There are no other known occurrences of Eurasian watermilfoil in the province.

Ontario

Eurasian watermilfoil was discovered in Thunder Bay Harbor in 1995 (Stephenson *et al.* 1999). The distribution of the plant was limited to a small area in the harbor near a

grain terminal (Personal communication: Peter Lee, Lakehead University, Thunder Bay). This remains the only known occurrence of milfoil in western Ontario. Recent surveys of vegetation in Rainy Lake and Lake of the Woods have not found Eurasian watermilfoil (Personal communication: Alan Dextrase, Ontario Ministry of Natural Resources, Peterborough).

Future plans and needs of the Eurasian watermilfoil program

Priorities for the Eurasian Watermilfoil Program include:

- Keep the public informed about Eurasian watermilfoil and the problems that it can cause;
- Reduce the plant's spread by targeting access inspection and enforcement efforts in areas of the state where infestations occur;
- Monitor the distribution of milfoil in the state with emphasis on verification of reports of new occurrences of milfoil;
- Attempt to control milfoil in Minnesota lakes, especially new populations in areas of the state without other milfoil infestations; and
- Support research on the potential for biological control of milfoil, including Exotic species program match of the proposal recommended by the LCMR for continued funding, as well as research on the biology of this species.

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Management of Purple Loosestrife

2000 Highlights

- Biological control insects significantly damaged 88 of 289 release sites visited. Sites with severe damage (greater than 75% defoliation of infestations) occurred from Houston County in the southeast, to Becker County in the west, and to St. Louis County in the north.
- Approximately 1.5 million purple loosestrife leaf-eating beetles were released at more than 250 sites statewide. This brings to release sites statewide to 567.
- Over 80 percent of insect releases made for biological control of purple loosestrife between 1992 and 1999 have established reproducing populations.
- 66 high priority purple loosestrife infestations were treated with herbicide and insects were released on 26 sites, previously planned for herbicide treatment.
- No purple loosestrife was found at 11 sites where purple loosestrife plants were treated with herbicide in 1999. This control success is limited to small infestations that are treated soon after loosestrife invades an area.
- 14 sites that were treated with herbicide in 1999 had a 75% reduction in the quantity of herbicide needed to control those infestations in 2000. This is directly due to reductions in infestation size from previous treatments.

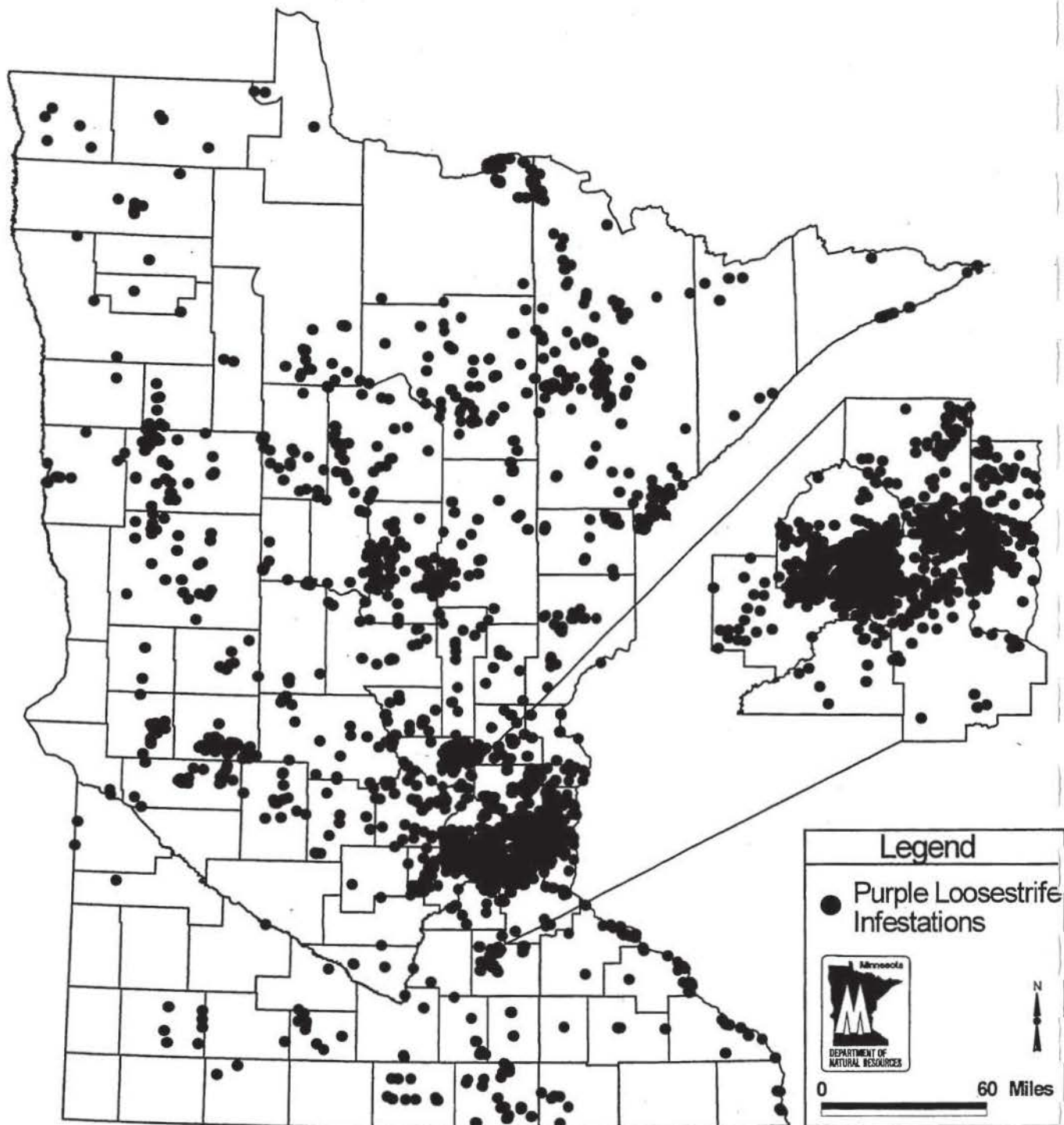
Background

Purple loosestrife (*Lythrum salicaria*, *L. virgatum* and their hybrids) is a wetland plant from Europe and Asia that invades marshes and lakeshores, replacing cattails and other wetland plants. The DNR and other agencies manage purple loosestrife because it harms ecosystems and reduces biodiversity by displacing native plants. The Purple Loosestrife Program was established in the DNR in 1987. State statutes direct the DNR to coordinate a control program to curb the growth of purple loosestrife (see M.S. 84D.02, Subd. 2 in Appendix A) and a significant amount of progress has been made toward the development of a sound approach to manage this harmful exotic. This management program integrates chemical and biological control approaches and cooperates closely with local, state and federal groups involved in purple loosestrife management.

Statewide inventory of purple loosestrife

In 1987, the DNR began to inventory sites in Minnesota where purple loosestrife was established. DNR Area Wildlife Managers, county agricultural inspectors, local weed inspectors, personnel of the Minnesota Department of Transportation, and the general public report purple loosestrife sites to the DNR. The DNR maintains a computerized list or database of sites that includes the observer's name, location, type of site and number of loosestrife plants present (see Figure 8).

Figure 8. Purple Loosestrife infestations in Minnesota as of December, 2000.



In 2000, 130 new purple loosestrife infestations were identified in Minnesota. There are now 2075 purple loosestrife infestations recorded statewide (Table 14). Of those sites the majority (70%) are lakes, rivers, or wetlands. Inventory totals indicate that MN presently has over 58,000 acres infested with purple loosestrife.

Table 14. Purple Loosestrife infestations in Minnesota recorded by the Minnesota Department of Natural Resources in 1999 and 2000.

Site Type	Total sites 1999	New sites - 2000	Total sites 2000
Lake	586	35	621
River	163	21	184
Wetland	627	39	666
Roadsides and Ditches	420	31	451
Other ¹	149	4	153
Total	1945	130	2075

¹ Includes gardens and other misc. sites.

Progress in Management of Purple Loosestrife - 2000

Chemical control of purple loosestrife

Initial attempts by the DNR to control purple loosestrife have relied mainly on the use of herbicides. The most effective herbicide was found to be Rodeo, or glyphosate, which is a broad spectrum herbicide that is also toxic to desirable, native plants. To allow maximum survival of native plants, Rodeo is most frequently applied by backpack sprayer as a 'spot-treatment' to individual loosestrife plants. A second herbicide, 2,4-D, or 2,4-dichlorophenoxyacetic acid, is less frequently used. 2,4-D is more selective than Rodeo because it affects primarily broad-leaved or dicotyledonous plants but it is less effective than Rodeo. A third herbicide, Renovate, or triclopyr, has been applied to purple loosestrife on a trial basis (1991-1997) to test its effectiveness and selectivity. Renovate which is not yet registered for aquatic use in the U.S., will be the herbicide of choice for loosestrife control if it becomes registered because it has proven to be very effective and is more selective than Rodeo (i.e., it is less harmful to non-target plants). Renovate is also less expensive than Rodeo.

Beginning in 1991, a prioritization plan was developed for selecting control sites in public waters and wetlands where herbicide would be used for purple loosestrife control. This was done because there are insufficient resources to apply herbicides to all known purple loosestrife sites in Minnesota. In addition, DNR personnel observed that herbicide treatments do not result in long lasting reductions of loosestrife when

applied to large populations that have been established for a number of years. This is due partly to the plants ability to reestablish from an extensive purple loosestrife seed bank. Research done by the University of Minnesota, under contract to the DNR, demonstrated that long-established stands of loosestrife develop very large and persistent seed banks. Herbicide treatments which kill the existing loosestrife population only create space for additional seeds to sprout. Consequently, small and recently established populations of loosestrife, which are likely to have small seed banks, are given the highest priority for treatment. In addition, because seeds of this species are dispersed by water movements, the DNR tries to keep loosestrife from infesting downstream lakes. Sites located in the upper reaches of watersheds with little loosestrife are treated before those located in watersheds with large amounts of loosestrife. Implementation of the prioritization scheme in 1991 resulted in fewer large sites (> 1000 plants) being treated (Table 15).

Between 1990 and 1999, herbicides were applied to an average of 143 sites per year (Table 15). This summary includes applications made by DNR personnel, commercial applicators working under contract to DNR, and various cooperators; it is not a complete listing of all herbicide applications made in Minnesota. During the summer of 2000, the DNR or contractors visited 138 purple loosestrife stands for herbicide control work. At 45 sites, workers found no loosestrife plants to treat (Tables 15). One site had loosestrife plants which were hand pulled. Insects were released on 26 sites that were initially planned to be herbicide treatments. A total of 66 sites were treated with herbicides. Most of the sites were very small, 58% had less than 100 plants (Table 15). In total, all sites visited used a total of 2.4 gallons of Rodeo, took 518 worker hours, and cost \$22,815 (Table 16).

Biological control of purple loosestrife

Insects for biological control of purple loosestrife were first released at a research site by DNR staff in 1992. This initial release occurred after years of testing to make sure the insects were purple loosestrife specific and would not damage other native plants or agricultural crops. Once the insects were approved for release by the United States Department of Agriculture, insects were provided by Cornell University for release in Minnesota. This research was expanded in 1993, 1995, 1997 and 1999 through funding appropriated by the Legislature as recommended by the Legislative Commission on Minnesota Resources. Four species of insects, two leaf-eating beetles, *Galerucella californiensis* and *G. pusilla*; a root-boring weevil, *Hylobius transversovittatus*; and a flower-feeding weevil, *Nanophyes marmoratus*, have been released as potential biological controls for loosestrife in Minnesota.

Leaf-Eating Beetles: Biocontrol insects released between 1992 and 1999 have established reproducing populations at more than 80 percent of the sites. Insect populations increased significantly at many locations with pronounced damage to loosestrife plants. More than 289 insect release sites were visited during the summer of 2000 to assess the insects establishment and level of control achieved. At 30% (88 sites) of the sites surveyed, the insect populations are rapidly increasing and causing

Table 15. Number of purple loosestrife infestations treated in 2000 by the Purple Loosestrife Program classified by infestation size.

Year	<20 plants	20 - 99 plants	100 -1,000 plants	>1,000 plants	Total number of sites treated	Number of sites visited where no herbicide was used because no plants were found
1990	29	45	48	72	194	0
1991	64	45	50	8	167	33
1992	67	43	56	21	187	40
1993	49	47	52	27	175	19
1994	41	40	49	32	162	26
1995	55	47	38	25	165	38
1996	38	36	36	20	130	23
1997	30	25	36	19	110	22
1998	35	31	36	15	117	27
1999	26	39	32	6	104	27
2000	20	18	26	2	66	45

Table 16. Summary of herbicide applications to purple loosestrife infestations in 2000 by the Purple Loosestrife Program, Minnesota Department of Natural Resources.

DNR Region	Total number of sites visited	Number of sites treated with Rodeo	Number of sites with manual removal	Number of sites requiring no treatment	Hours of Labor	Total Cost
I - Northwest	14	10	0	4	92	\$4432
II- Northeast	43	17	1	25	143	\$5754
III - North Central	30	21	0	9	125	\$5175
IV - Southwest	19	13	0	6	119	\$6000
V- Southeast	6	5	0	1	39	\$1454
VI- Metro	0	0	0	0	0	0
Total	112	66	1	45	518	\$22,815

significant damage to the loosestrife infestations. At 13% of all visited sites, the loosestrife was severely defoliated (90-100%). This includes sites scattered statewide. The most severe defoliation of loosestrife plants occurred in the City of Winona where a 7-acre wetland, that was virtually solid loosestrife, was completely defoliated. Surveys showed that the insects have moved off site to other infested wetlands up to 9 miles from release point in Winona. Sites in Becker, Beltrami, Carlton, Dakota, Freeborn, Goodhue, Hennepin, Houston, Isanti, Itasca, Kandiyohi, Mille Lacs, Ottertail, Pope, Ramsey, Rice, St. Louis, Wadena and Washington counties all have loosestrife infestations that are being heavily damaged by the beetles.

From 1997-2000, rearing efforts were increased by recruiting more partners to rear insects throughout the state. Insect rearing "starter kits" were provided to rearing partners including County Agricultural Inspectors, Minnesota Department of Agriculture staff, Minnesota Department of Transportation staff, DNR Area Wildlife Managers, Nature Centers, 4-H and Garden clubs.

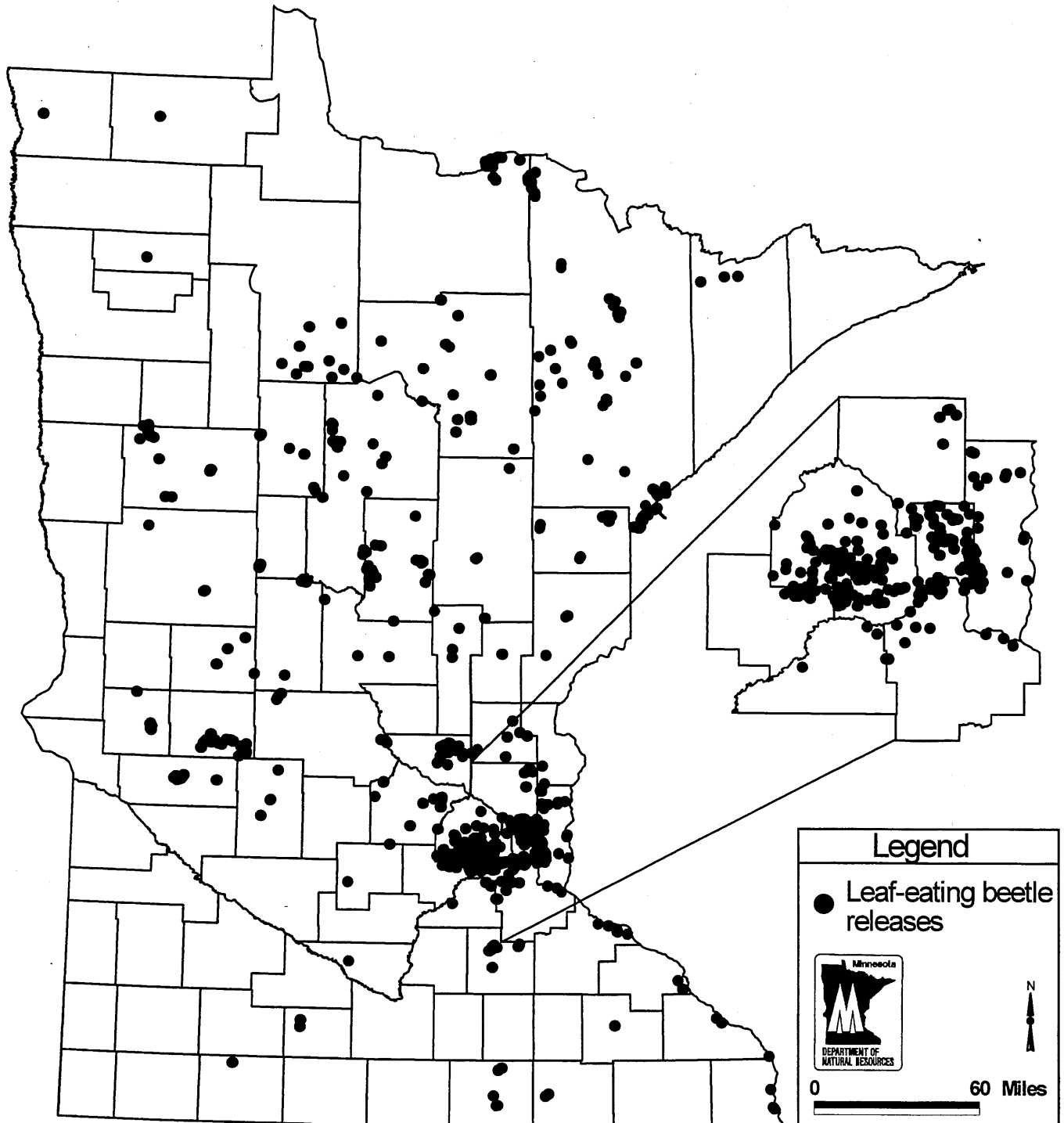
A starter kit is composed of pots, potting soil, insect cages, leaf eating beetles, and other materials necessary to rear 20,000 leaf-eating beetles (*Galerucella* spp.). The insects were then released on high priority areas. Cooperators statewide reared and release more than 1.3 million leaf-eating beetles in 2000. All insect rearing was completed outdoors for ease of production and to produce hardier insects. Leaf-eating beetles were also provided to the U.S. Fish and Wildlife Service (USFWS) at Sherburne National Wildlife Refuge for large-scale outdoor rearing. In total, approximately 1.5 million leaf-eating beetles were produced and released on more than 250 sites statewide. As of December 2000, insects have been released at more than 567 sites statewide (see Figure 9).

With success of insect establishment in the field, organized rearing efforts are anticipated to come to an end in the next couple of years. Resource managers will be able to collect insects from established release sites and move them to new infestations. This collection and move method will reduce the effort and costs needed to further distribute leaf-eating beetles in Minnesota.

Root-Boring Weevils: Initially, only a small number of root-boring weevils were brought to Minnesota. The adult weevils were kept in the lab to maximize egg production. Nearly one thousand eggs were produced from these adults in 1994 and were relocated to seven different field sites around the metro area. Adult root-boring weevils were found in 1995 at all seven release sites. Although their populations were still small, the root-boring weevils survived the winter and reproduced. In 1995, additional root-boring weevils eggs were received from Cornell University for release into loosestrife infested Minnesota wetlands.

Distribution of the root-boring weevil continued in 1997. Cornell University provided 3,850 root-boring weevil eggs during the summer. These eggs were inoculated into loosestrife plants in the field at one location. Because of the weevils slow growth, it will take many years to build up populations in Minnesota wetlands. Cornell University

Figure 9. Leaf-eating beetle, *Galerucella* spp. releases in Minnesota as of December, 2000.



developed a new rearing method for the weevils which significantly sped up production efforts.

In 1999, Cornell University provided 800 adult root-boring weevils for field release. The weevils were released at two sites (one in Ramsey County and one in Washington County). These weevils have mated, laid eggs, and larvae can now be found in the roots of the plants. In 2000, 500 adult weevils were released on existing sites. Weevils released in 1999 have survived the winter and are starting to cause damage to loosestrife plants within the wetlands.

Research on Insects as biological control agents

During 2000, funding from the Minnesota Legislature, as recommended by the LCMR, was used to monitor impacts to loosestrife populations by the insects used as purple loosestrife biological control agents. In particular, the leaf-eating beetles, *Galerucella* spp., were monitored at several locations to assess their impacts on loosestrife seed production, seed germination and carbohydrate stores in roots. The study has shown that *Galerucella* feeding on shoot tips resulted in dramatically fewer seed capsules and shorter inflorescences compared with control plants. The study also showed that *Galerucella* feeding, with complete defoliation, does not immediately kill a plant. More than two years of successive *Galerucella* feeding is required to kill purple loosestrife plants, even when high amounts of defoliation occur. However, *Galerucella* feeding of shoot tips does result in shorter loosestrife plants and reduces seed production. This will reduce the competitiveness of purple loosestrife in wetlands and should help to increase abundance of native plant species.

Research was also sponsored at Cornell University to develop an artificial diet to rear the root-boring weevil, *Hylobius transversovittatus*. In nature, it takes one to two years for the root-boring weevil to go from egg to adult. Using an artificial diet and temperature-controlled growth chambers will reduce this time to three or four months. Cornell University has completed the development of the diet and provided the University of Minnesota with a recipe for making the artificial diet. The University of MN is currently working with the diet to produce weevils for release in Minnesota. In 2000, more than 200 adult weevils were produced from artificial diet. Although insects were produced, it is a slow difficult process. Research continues on ways to speed up weevil production. Weevils produced were released into existing field sites.

Management of purple loosestrife in other states

In 1997, the DNR received two federal grants to rear and distribute insects for purple loosestrife control nationwide. A total of \$312,000 was received from two U.S. Fish and Wildlife Service programs (Federal Aid program-\$212,000; North American Wetlands Conservation Act- \$100,000). The Minnesota DNR contracted with Cornell University to rear and distribute the insects to states and federal agencies involved with loosestrife control. More than 500,000 leaf-eating beetles and 30,000 root-boring weevil eggs were reared and distributed to 30 states and 4 Federal agencies (States include: AL, CA, CT, DE, IA, ID, IL, IN, MD, MA, MI, MN, MT, NE, NH, NJ, NY, OH, OR, PA, RI, SD, TN, UT, VT, WA, WI). Among the recipients were: universities; state Departments of

Natural Resources, Environmental Conservation, Fish and Game or Agriculture; National Wildlife Refuges; Bureau of Reclamation; USDA-APHIS; and the Tennessee Valley Authority.

In 1999, the DNR received a second grant from the USFWS-Federal Aid Program for \$300,000 to continue rearing and distributing the root-boring weevil nationwide. Distribution of insects began during the summer of 2000 where more than 14,000 weevils were distributed to cooperators in 17 states. The rearing and distribution efforts will continue through 2001.

Many states continue to increase their control efforts by rearing and releasing insects in their states. Nationwide, many states are starting to see impacts by the leaf-eating beetles on loosestrife infestations.

Effectiveness

Effectiveness of control efforts will be based on short-term and long-term objectives. Control or eradication of small infestations statewide with herbicides is the primary short-term objective. Each year, a small number of purple loosestrife infestations (11 in 2000) are eradicated with herbicides. This is critical because these infestations are in watersheds that have very few infestations of loosestrife. This effort helps prevent the spread of purple loosestrife into uninfested wetlands and lakeshores.

A long-term objective is to utilize biological controls to reduce the abundance/importance of loosestrife in wetland habitats throughout Minnesota. Biological controls, if effective, will reduce the impact loosestrife has on wetland flora and fauna communities. DNR's goal is to reduce the abundance of loosestrife in wetlands where it is the dominant plant in Minnesota by at least 70% within 15-20 years. Purple loosestrife will likely not be eradicated from most wetlands where it presently occurs, but its abundance will be significantly reduced so that it is only one of many plant species in the community, and not a dominant one. Assessment efforts in 2000 demonstrated that *Galerucella* introductions have severe defoliation of loosestrife populations on some sites. The DNR will continue to track these wetlands to assess how loosestrife abundance changes over time and to determine what combinations of biological control agents provided the desired level of control.

Participation of others in purple loosestrife control efforts

In 2000, the DNR worked with a variety of local governments and other organizations to control purple loosestrife in Minnesota (Table 17). Control information and technical assistance was provided to landowners and local units of government.

The DNR initiated an insect rearing program providing county agricultural inspectors, MDA field staff, and DNR Area Wildlife Managers with a starter kit for rearing their own leaf-eating beetles (described above in the biological control section). There were 64 rearing partners, in the 33 counties who reared an estimated 1.3 million leaf beetles for release in the participating counties (Table 17).

Table 17. List of cooperators in Minnesota during 2000 that were participating in purple loosestrife control efforts and the type of participation.

Government/Organization	Type of Cooperation
University of Minnesota	Partner with DNR in statewide biological control efforts, including rearing, releasing and monitoring of insects.
Leech Lake Indian Reservation, Dept. Of Resource Management	Partner with DNR in biological control efforts, including rearing, releasing and monitoring of insects on or near the Reservation
Mille Lacs Band Ojibwe, Natural Resource Department	Partner with DNR in biological control efforts, including rearing, releasing and monitoring of insects on the Reservation
USFWS,; MN Valle Sherburne NWR y NWR; Upper Miss. NWR	Partner with DNR in biological control efforts, including rearing, releasing and monitoring of insects.
Cornell University, Ithaca NY	Working under contract to the MN DNR to develop an artificial diet for rearing the root-boring weevil.
MN Department of Agriculture	Partner with DNR in statewide biological control efforts including releasing and monitoring insects.
Anoka, Becker, Beltrami, Carlton, Carver, Cass, Crow Wing, Dakota, Douglas, Freeborn, Goodhue, Hennepin, Hubbard, Itasca, Kanabec, Kandiyohi, Koochiching, Mcleod, Meeker, Mille Lacs, Mower, Ottertail, Pope, Ramsey, Rice, Scott, Sherburne, St. Louis, Stearns, Stevens, Swift, Todd, Wadena, Washington, Watonwan, Winona	Counties where insects were reared and released by County Agricultural Inspectors, MDA field staff, MDOT Field Staff, DNR Area Wildlife Managers, 4H Clubs and Schools.

Future Needs for purple loosestrife management

- Continue research on biological controls of purple loosestrife, including the development of insect rearing and release strategies. Implementation strategies are needed for actual distribution in the field and subsequent monitoring of the insects.
- Continue DNR funding of herbicide control efforts on small, high priority infestations.
- Continue to assess effectiveness of management efforts including chemical and biological control.
- Continue to develop new in-state partners (e.g., County Ag. Inspectors, DOT, DNR Area Wildlife Managers, Nature Centers) to expand scale of management efforts.

Management of Flowering Rush

2000 Highlights

- For a second year, DNR Exotic Species Program staff removed flowers from flowering rush in Forest Lake, the only known population in Minnesota which produces fertile seeds.
- DNR Exotic Species Program coordinated the control of flowering rush at a public swim beach in Twin Lakes, Itasca County for a third year.
- Regulations and education have helped reduce the sale of flowering rush in the state. Flowering rush was not sold at MN retail outlets checked by DNR staff.

Background

Flowering rush (*Butomus umbellatus* L.) is a perennial aquatic plant, native to Europe and Asia. It grows along lake and river shores as an emergent plant with three-angled fleshy leaves and may produce an umbel-shaped cluster of pink flowers. Flowering rush may also grow as a non-flowering submersed plant with limp, ribbon like leaves.

The plant spreads primarily vegetatively from thick rhizomes, from small tubers that break off the rhizome, and from small bulblets that form in the inflorescence. Water currents, ice movement (Haber 1997) and muskrats (Gaiser 1949) can easily move these reproductive structures to new locations within a waterbody. There are two varieties of flowering rush differing in genetic composition and sexual reproductive capacity. One variety has a diploid number of chromosomes (26) and the other has a triploid number of chromosomes (39). Both varieties are able to reproduce vegetatively, but the diploid variety produces fertile seeds, while the triploid variety does not. However, triploid plants may be vegetatively more robust than diploid plants (Hroudova *et al.* 1996). These multiple reproductive strategies makes this species difficult to deal with in terms of control, however information on the distribution of fertile vs. sterile populations needs to be considered when trying to control further spread of this exotic species (Eckert *et al.* 2000).

Flowering rush was likely brought to North America in the late 1800's in ship ballast and has also been repeatedly introduced as an ornamental plant. Although flowering rush occurs in Canada and every U.S. state bordering Canada from Vermont to Idaho (Haber 1997), its distribution is disjunct. Resource managers and researchers have expressed concern that flowering rush may grow more aggressively in North America than in its native Europe and may become an aggressive competitor with native wetland vegetation (Anderson 1974, Staniforth and Frego 1980).

Flowering rush in Minnesota

Flowering rush was first recorded in Anoka County, Minnesota in 1968 (Moyle 1968) and has since been located in five other counties (Table 18). Despite its 30 year

presence in the state, the distribution of flowering rush remains disjunct. New introductions are likely the result of intentional plantings from horticultural sales.

The abundance of flowering rush varies greatly within and between waterbodies. Dense stands occur in areas of Detroit Lakes and Twin Lakes, but flowering rush is sparse within stands of native bulrush. There are several stands of flowering rush in the Cannon River extending from Morristown to Wells Lake. Wells Lake is immediately downstream of Cannon Lake in Faribault. Flowering rush was first documented in Cannon Lake in 1972 and in the Cannon River at Morristown in 1977. None has been observed downstream of Wells Lake on the Cannon River thus far. The DNR has looked for and not found the three reported populations of flowering rush in Anoka County, although reports came from reputable sources. These populations are likely still present, but may have declined due to water level changes of the water bodies. Haber (1997) also describes three sites in Canada where flowering rush was introduced, survived for several years and then died.

Researchers from Queen's University concluded that all but one of the known populations of flowering rush in Minnesota are the infertile, triploid variety. The exception is the population in Forest Lake, Washington Co., which is diploid and produces fertile seeds (Eckert pers comm. 1998).

Management of Flowering Rush

Flowering rush is a prohibited exotic plant in Minnesota, which means that it is unlawful to possess, purchase, or sell this exotic in Minnesota. Nevertheless, horticultural sales are the most likely means of introducing this plant into a new area.

In 1999, several large discount stores in the metro area and in Brainerd were found to be selling flowering rush in their garden departments. Many had large watergarden displays selling flowering rush. In 1999 the DNR contacted these businesses and national wholesale distributors and notified them that it is illegal to buy or sell flowering rush in Minnesota. The remaining flowering rush was removed from store shelves. These business and distributors appeared to be unaware of flowering rush's prohibited status in Minnesota, but were willing to comply once notified about the law prohibiting sale and possession of flowering rush. During the 2000 growing season these water garden displays were still present, however flowering rush was not among the plants for sale at the Home Depot, Menards and Wal-Mart stores in the Brainerd, Little Falls, and St. Cloud areas. Flowering rush continues to be sold as an ornamental plant and is advertised through the INTERNET as a desirable, hardy plant for water gardens. Some nursery catalogs now indicate that flowering rush cannot be shipped to Minnesota (Perleberg 1998).

Hand-cutting appears to be the most successful method to seasonally reduce dense stands of emergent flowering rush. The DNR Exotic Species Program again coordinated a flowering rush hand-cutting project at a public swim beach in Twin Lakes, Itasca County for a third year. Flowering rush impedes fishing and swimming activities at this beach and fishing pier. This beach was cut in the springs of 1998 and 1999. In

2000 the beach was cut in both June and September. The care-taker of the beach is pleased with the control of flowering rush by hand cutting and wants to cut again in 2001. The Exotic Species Program will continue to coordinate this effort.

Flowering rush is found throughout the Detroit Lakes area lakes (Big Detroit down stream to Lake Melissa) and is quite abundant in Detroit Lakes specifically. The Pelican River Watershed District continues extensive mechanical harvesting of flowering rush and other aquatic plants in these lakes to reduce the nuisance they cause lake residents and users.

Lake Melissa is the farthest known downstream location in the Pelican River watershed to have flowering rush, thus control of this population is a high priority. A small area of flowering rush had been hand-dug by the DNR in 1996. A small amount of flowering rush was found in this area again in 2000, however it was the submersed growth form this year and was not removed. In 2000, no flowering rush was observed at the outlet of Lake Melissa or in the Pelican River just down-stream of Lake Melissa.

One flowering rush plant was found floating in Sauk Lake during an EWM survey. No rooted plants (either emergent or submergent) were found, although water clarity is fairly low in this lake and it is likely that there could be submerged plants growing in the lake. The Sauk River infestation upstream of Sauk Lake appeared to be at the same level of abundance as previous years.

Since the Forest Lake infestation produces fertile seeds, there may be an increased risk of these plants spreading to neighboring waters. In an effort to reduce this risk, the Exotic Species Program staff removed the umbels (flowers) from the plants in this lake.

The DNR's goals for flowering rush management include: 1) Stop the sale of flowering rush in Minnesota; 2) Monitor sites to assess population changes; 3) Support research to develop and implement better management methods, and 4) Provide lake shore owners in the vicinity of flowering rush infestations with information on the proper way of reducing the abundance of this exotic where it is causing a nuisance without facilitating the spread of this plant within the waterbody.

Research on flowering rush

Researchers from Queen's University in Ontario conducted field surveys of flowering rush populations in Canada and central US, including all existing Minnesota populations for a second year in 1999. The final report for this project is due in the spring of 2001. The DNR Exotic Species Program is supporting the Minnesota portion of this research through funding (A total of \$4,000 during FY00 and FY01).

Table 18. Recorded locations of flowering rush in Minnesota.

County	Water body	DNR Division of Waters No.	Year identified	Source
Anoka	Amelia Lake	02-0014	1968	MDNR survey
	Bass Lake	02-0135	1968	MDNR survey
	Reshanau Lake	02-0009	1970	MDNR survey
Becker	Detroit Lakes	03-0381	1976	Univ MN herbarium collection
	Pelican River	-----	1987	Pelican River Watershed District (PRWD)
	Muskrat Lake	03-0360	1987	PRWD
	Sallie Lake	03-0359	1989	PRWD
	Melissa Lake	03-0475	1993	PRWD
Itasca	Twin Lakes	31-0191	1995	MDNR survey
Rice	Cannon Lake	66-0008	1972	Univ MN herbarium collection
	Cannon River	-----	1977	Univ MN herbarium collection
	Wells Lake	66-0010	1998	Queen's University
Todd	Sauk River	-----	1997	MDNR survey
Washington	Forest Lake	82-0159	1998	MDNR survey

The objectives of the current research project by Queen's University are to determine the geographical and ecological distribution of flowering rush in North America including habitat requirements and geographical variation in sexual fertility of this species. Eckert and his students created an informational website on flowering rush and their research (<http://biology.queensu.ca/floweringrush/>). The website encourages people to report flowering rush locations. Currently the researchers have received reports of new flowering rush locations in New York and Ontario, but no new Minnesota locations. Queen's University researches are looking at the variation in population genetics in the regions where flowering rush occurs in order to determine genetic relatedness within and among regions to better understand the colonization history of these introduced populations. Long-term goals of the research include examining the impact this exotic species has on wetland habitats, determining the most effective control methods, and exploring possible biological controls (Eckert and Lui 1999).

Eckert has determined that most flowering rush populations in North America are fertile and produce an abundance of seeds. The exceptions are populations in central Ohio and most of the populations west of Ohio and Michigan. They have found that all but one of the Minnesota populations are sterile. Sterile populations of flowering rush do not spread over a long distance naturally because their vegetative propagules (such as rhizomes) are susceptible to desiccation. The only population producing fertile seeds in Minnesota is located in Forest Lake. Eckert (1998) predicts that seeds from plants at Forest Lake may be capable of long distance dispersal and may increase the rate of spread of this exotic in Minnesota.

Preliminary results of Eckert's current research provide conclusive evidence that sexual sterility of introduced populations of flowering rush is indeed caused by triploidy. Also the presence of two distinct genetic and reproductive types of flowering rush exist not only in Minnesota, but seem to be the trend norm for all of the flowering rush populations in North America. Eckert (1999) also found that flowering rush known to be purchased from a nursery was sterile.

Management in other countries and states

Known populations of flowering rush exist in several states including North Dakota, South Dakota, Montana, Wisconsin, Ohio, Indiana, New York, Vermont, Idaho, Wisconsin, and Michigan (Haber 1997). Most of these states do not have any regulations regarding the sale of flowering rush.

In states and Canadian provinces adjacent to Minnesota it is legal to buy, sell and possess flowering rush, leading to difficulties in preventing its distribution in Minnesota. New Hampshire is the only other state in the U.S. in which flowering rush has been found where the sale and possession of the plant is prohibited (RSA 487:16-a, Env-Ws 1301.01). Regulations regarding prohibited plants in New Hampshire are very similar to Minnesota rules and statutes of "Prohibited" exotic plants.

Vermont lists flowering rush as "Category One" exotic species, defined as having a demonstrated ability to be highly invasive on a localized or widespread scale and currently having an economic and/or ecological impact in that state (Vermont Agency of Natural Resources 1998). This state also has a fact sheet on flowering rush available on the INTERNET which cites Minnesota's methods on controlling flowering rush.

In Connecticut, flowering rush is on a "watch list" because its aggressive invasiveness into natural habitats may be questionable (Merhoff 1997). However, sale of flowering rush is not prohibited in Connecticut and Vermont (Shackleford *et al.* 1998). In some states, flowering rush is promoted as a desirable plant for landscaping wet sites and for wetland restoration (Ranney *et al.* 1994) or for planting in water treatment wetlands (Feedback no date).

Wisconsin Department of Natural Resources recommends that lake residents control small areas of flowering rush by cutting or digging, based on information they received from the Minnesota DNR. They categorize flowering rush as a potentially invasive

species (WDNR 1997). Canada has prepared a nine-page fact sheet that gives detailed information on the history of spread, biology, and impacts of this exotic (Haber 1997).

Effectiveness of management - 2000

Flowering rush often grows in stands with native vegetation, making it difficult to control this exotic without harming the native plants. Mechanical control by cutting appears the most effective method of reducing dense stands of flowering rush. Cutting is most effective if done early and repeated several times during the growing season (Hroudova 1989). Disadvantages of cutting include that it is not selective, is labor intensive, and does not eliminate the exotic. Digging flowering rush may increase its spread if the entire rhizome is not removed. Herbicide applications, particularly in water, have been ineffective because herbicide is quickly washed away from the plant.

Participation by other groups

Others involved in flowering rush management in Minnesota in 2000 include: DNR Fisheries and Wildlife, DNR Minnesota Conservation Corps (MCC), Pelican River Watershed District, Greenway Township in Itasca County, and Queen's University, Ontario.

Future Needs for flowering rush management

- Continue efforts to prevent introductions of flowering rush in Minnesota. Inform the public, the nursery industry, and other businesses selling flowering rush of the problems associated with this plant and the existing laws against its possession and sale in Minnesota.
- More information is needed on the distribution, reproductive biology, and potential impacts of flowering rush in Minnesota. The DNR will continue to encourage research in these areas.

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Management of Curly-Leaf Pondweed

2000 Highlights

- Exotic Species Staff assisted the Army Corps of Engineers (ACOE) in their study of the effectiveness of the contact herbicide endothall to control curly-leaf pondweed in spring when water temperatures are low. Initial results showed good control of curly-leaf pondweed.
- Information about curly-leaf pondweed and its management was provided to the public through literature, public presentations, public meetings, and watercraft inspections.

Background

Curly-leaf pondweed (*Potamogeton crispus* L) is a perennial, rooted, submersed aquatic vascular plant which was first noted in Minnesota about 1910 (Moyle and Hotchkiss, 1945). Native to Eurasia, Africa, and Australia, this species has been found in most of the United States since 1950, and is currently found in most parts of the world (Catling and Dobson, 1985).

Curly-leaf pondweed has a unique life cycle which gives it competitive advantages over many native aquatic plants. Unlike most native plants, curly-leaf pondweed may be in a photosynthetically active state even under thick ice and snow cover (Wehrmeister and Stuckey, 1978). Therefore, it is often the first plant to appear after ice-out. By late spring it can form dense mats which may interfere with recreation and limit the growth of native aquatic plants (Catling and Dobson, 1985). Curly-leaf plants usually die back in early summer in response to increasing water temperatures, but they first form vegetative propagules called turions (hardened stem tips). New plants sprout from turions in the fall (Catling and Dobson, 1985).

Progress in Management and Research

- Exotic Species Program staff surveyed areas of Lake Benton (Lincoln County) which were treated with iron filings in 1999 in order to determine if there was any carry over effects from the 1999 treatments. Curly-leaf pondweed densities were very low throughout the entire lake, possibly due to severe weather in the spring. Because of the low density of curly-leaf throughout the lake there were no observable differences in curly-leaf densities between the treated and untreated areas.
- Exotic Species Program staff continued to survey the plant communities in curly-leaf infested lakes that were mechanically harvested using a boat - towed cutter in late spring. For the fourth summer in a row Exotic Species Program staff surveyed the aquatic plants in French Lake (Rice County) and Weaver Lake (Hennepin County) where experimental cutting of curly-leaf pondweed was

conducted. It appears that cutting is effective in removing curly-leaf in the cut areas, though annual cutting appears to be required.

- Exotic Species Program staff surveyed the aquatic plant community of Duck Lake (Blue Earth County). During 1998 and 1999, several small sites were cleared of curly-leaf pondweed mechanically using a boat-towed cutter by researchers from Mankato State University. The harvested areas were replanted with the native species, clasping-leaf pondweed (*Potamogeton richardsonii*), obtained from a nearby lake. Clasping-leaf pondweed is doing well in many areas of Duck Lake, as well as many other native aquatic plants. There are still some areas dominated by curly-leaf pondweed in the lake.
- The Army Corps of Engineers (ACOE) continued their 1998 and 1999 studies to evaluate both the efficacy of contact herbicides to control curly-leaf pondweed at low temperatures, and to reduce the next summer's curly-leaf growth by reducing turion production (Exotic Species Annual Report, 1999, 2000). ACOE researchers tested the ability of whole lake endothall treatments to control curly-leaf pondweed and to reduce turion production in small lakes in Minnesota in the spring of 2000. On April 27 and 28, 2000 three small lakes were treated with endothall; the north bay of Gleason Lake (Hennepin County), Blackhawk Lake (Dakota County), and Schwanz Lake (Dakota County). Staff from the ACOE assisted by staff from Exotic Species Program and the City of Eagan surveyed the plant communities in the treated ponds, collected biomass samples, and collected water samples from the treated lakes and two untreated reference lakes. There were noticeably less curly-leaf turions in the treated lakes than in the untreated reference lakes in late summer sampling. Samples will be collected in early spring in 2001 to assess carry over effects of the treatments. All data will be analyzed by the ACOE. A preliminary report of the findings should be available early in 2001.

Effectiveness

The DNR Exotic Species Program has three main goals for curly-leaf pondweed management: 1) to keep an inventory of the known distribution of curly-leaf pondweed in Minnesota, 2) to support, conduct, and communicate research to improve the management of curly-leaf pondweed; and 3) to reduce the intentional and unintentional introduction of curly-leaf pondweed into noninfested waterbodies in Minnesota. A summary of the curly-leaf inventory is found in the 1998 Exotic Species Annual Report (1999). During 2000, we have supported and helped conduct research on new curly-leaf pondweed control methods. In addition, we have communicated information to many people and organizations interested in curly-leaf pondweed management. In particular, one public meeting in Biwabik brought together over 50 people from several lake associations in the area to discuss curly-leaf pondweed problems and control methods with DNR staff from the Division of Fisheries and the Exotic Species Program.

The Exotic Species Program has ongoing programs to educate the public about the transportation of exotic species (see the Watercraft Inspection and Enforcement sections). These programs teach the public to help prevent the movement of any aquatic plant from one water body to another and are very useful in preventing the spread of curly-leaf pondweed.

Future Needs for curly-leaf management

- Continue to gather information about the extent of ecological and recreational problems caused by curly-leaf pondweed in Minnesota.
- Continue public awareness efforts focused on containing curly-leaf pondweed to where it is already found. Opportunities include our watercraft inspection program, literature, and public speaking engagements.
- Continue to provide information on the current state of curly-leaf pondweed in Minnesota and existing management technology through the preparation of a fact sheet, a report on the current state of curly-leaf control, speaking engagements, articles, and work with individual lake managers.
- Continue to provide technical assistance to researchers working on curly-leaf control, and the relationships between curly-leaf populations and lake water quality in Minnesota.
- Explore opportunities for cooperative research on curly-leaf pondweed management with Universities and other government agencies.

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Management of Zebra Mussels

2000 Highlights

- Divers discovered numerous small zebra mussels on rocks and other natural substrate in the St. Croix River from several separated locations. Zebra mussels were also found on plate samplers from Bayport to Prescott. The presence of the abundant mussels led to the designation of the St. Croix River downstream of river mile 25.4 (near the Boonsite Recreation Area) as infested.
- Zebra mussels were reported by lake residents and confirmed by DNR staff to be in Lake Zumbro and the Zumbro River in Olmsted County, the first zebra mussel infested inland waters in Minnesota. A partial winter drawdown was done to kill mussels in shallow areas of Lake Zumbro and reduce the size of the zebra mussel population. While the drawdown was successful in killing large numbers of mussels in the exposed areas, the impacts of this action will not be known until next season.
- Watercraft inspections and public awareness efforts continued and increased in areas near zebra mussel infested waters (see Education & Watercraft Inspections).
- The Minnesota Department of Natural Resources (DNR) continued to work with the Wisconsin Department of Natural Resources (WDNR), National Park Service (NPS) and U.S. Fish & Wildlife Service (USFWS) on efforts aimed against zebra mussels in the St. Croix River.
- A volunteer zebra mussel monitoring program was developed to enlist the public's help in our inventory efforts. Almost 200 people reported from lakes throughout Minnesota. Monitors did not discover zebra mussels in Minnesota lakes, except in Zumbro Lake.

Background

The zebra mussel (*Dreissena polymorpha*) is a small striped exotic bivalve brought to North America in the ballast waters of trans-Atlantic freighters in the late 1980's. Unlike our native mussels, the zebra mussel secretes sticky threads which it uses to firmly attach itself to any hard surface in the water. The bio-fouling nature of this exotic has created numerous problems, such as clogging water pipes for industry and killing native species of molluscs. The zebra mussel can be transported overland to other waters by attaching directly to boats or vegetation caught on boating equipment. The high reproductive capacity and free-floating microscopic larval life stage of the zebra mussel allows rapid dispersal of this exotic within a water body. The zebra mussel has established populations throughout much of the eastern United States and its potential distribution could include most of the U.S. and southern Canada.

Progress on management of zebra mussels - 2000

Progress was made in the following areas that were identified as future needs for 1999:

- DNR coordinated with other agencies on St. Croix River dive searches and public education and information efforts.
- The Exotic Species Program staff attended the 10th International Aquatic Nuisance Species and Zebra Mussel Conference.

Current distribution/inventory of zebra mussels

Zebra mussel population levels throughout the Mississippi River below Lock and Dam 1 continued to reproduce and flourish, while this exotic has not yet been documented above Lock and Dam 1 on the Mississippi River. Zebra mussels continue to reproduce and successfully settle in the Duluth Harbor, with densities in 2000 exceeding all other years.

In 2000, numerous small zebra mussels were found attached to rocks in the St. Croix River. These settled mussels were scattered in various locations over the lower 20 miles of the river. Zebra mussels were also confirmed in Lake Zumbro, an impoundment north of Rochester and the Zumbro River downstream of Lake Zumbro (Fig. 10). The establishment of zebra mussel populations in the lower St. Croix River, Lake Zumbro, and the Zumbro River represent the first significant movement of this exotic in Minnesota.

The DNR provided financial assistance for dive searches for zebra mussels on the St. Croix River in cooperation with other resource agencies and provided technical advice on the design of monitoring activities. DNR Aquatic Invertebrate Biology Laboratory staff also provided assistance to the United States Fish and Wildlife Service and the National Park Service for laboratory work on samples from the St. Croix River. Staff biologists examined microscope slides placed on settling plate samplers in the St. Croix River and collected by NPS and USFWS personnel. Despite discovery of zebra mussels attached to river substrate, all slides from the St. Croix River were negative. DNR staff conducted field searches in Lake Zumbro to determine current distribution within the lake and downstream in the Zumbro River after confirmation of zebra mussel establishment.

The DNR and Minnesota Sea Grant cooperatively implemented a volunteer zebra mussel monitoring program to expand our inventory efforts. A mailing with instructional guidelines and a reporting form was sent out to approximately 1300 lakeshore residents asking them to examine docks, rafts, and watercraft when these were removed in fall to check for zebra mussels. This first year approximately 200 people sent back report forms, with no zebra mussels reported. A database is being developed in the Exotic Species Program for this information.

Volunteers sampled 19 lakes and rivers for zebra mussel larvae (veligers) using Sea Grant produced water sampling kits. The lakes were: Gull, Island, Kabetogama,

Leech, Minnetonka, Namakan, Pelican, Pokegama, Prior, Rainy, Sand Point, Shagawa, Siseebakwet, Vermilion, and Winnibigoshish. No zebra mussel larvae were found in any inland Minnesota waterbody that was monitored.

Public Awareness

DNR's watercraft inspectors conducted inspections of over 200 boats at public access sites on the St. Croix River north of Stillwater, where the National Park Service restricts boat traffic from infested waters. Additionally, almost 3400 inspections were conducted at access sites on the river south of the Federal zone. Access inspections were increased at two of the busiest access sites on the St. Croix after zebra mussels were first confirmed in the river.

Control of zebra mussels

The DNR conducted a trial cold-weather drawdown of Lake Zumbro to kill zebra mussels settled in shallow areas of the lake. While this was not expected to eradicate the mussels, it was attempted to reduce population levels. Field surveys near the end of the drawdown revealed massive zebra mussel mortality in the exposed areas. The DNR will continue to monitor the mussel levels in this lake to see if these actions had any significant impacts.

There are still no environmentally safe control methods available to treat most natural systems. Because control is not a viable option once the zebra mussel becomes established in a lake or river, it is essential that a strong effort remain focused on public education and awareness to prevent spread. Boat checks, access inspections, and talks/displays all serve to make the public aware of this exotic and how to prevent its spread (see Education and Watercraft Inspections sections).

Research on zebra mussels

Research on zebra mussel biology, impacts, and control methods is ongoing in North America. Staff from DNR, Minnesota Sea Grant, and other agencies and organizations attended the 10th International Aquatic Nuisance Species Conference in Toronto, Ontario to keep abreast of ongoing research and research results. Research results are found on several web sites pertaining to Aquatic Nuisance Species.

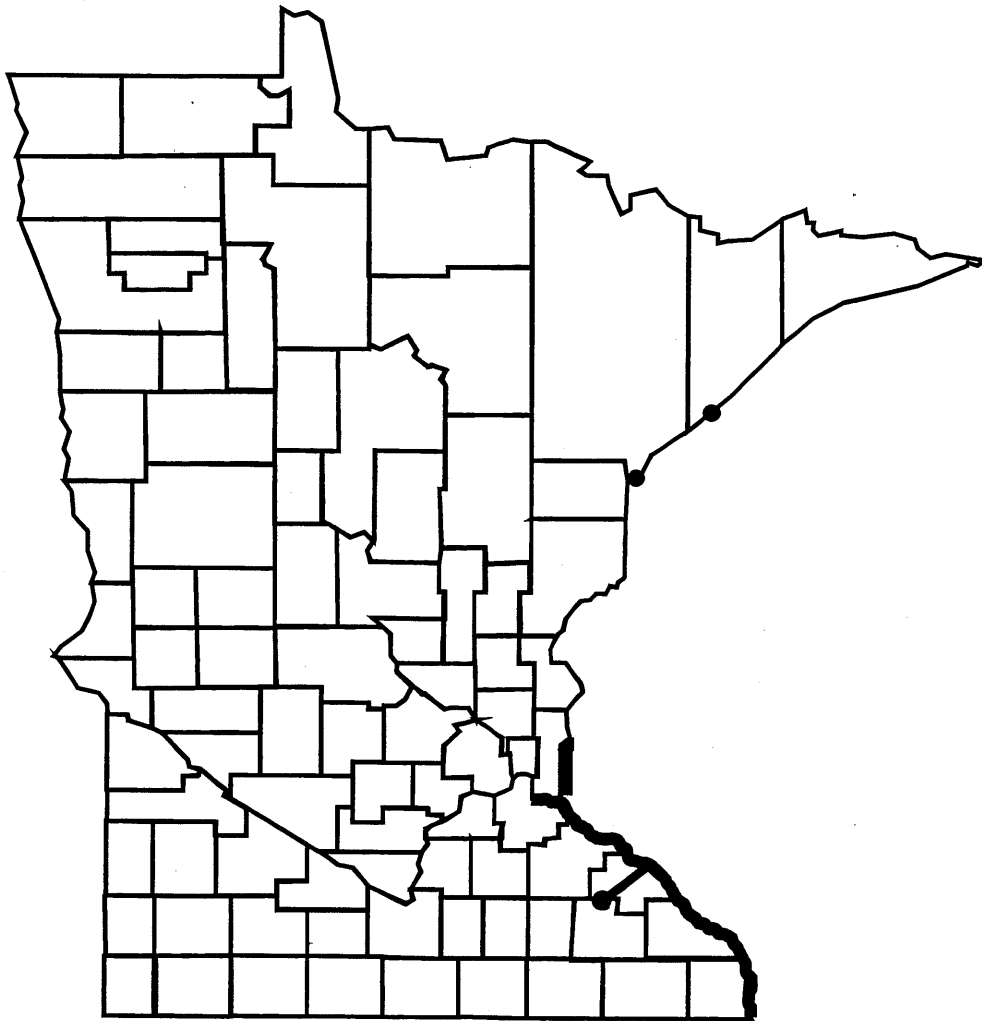
Management of zebra mussels in other states

Management efforts in other states vary according to funding and priorities. With no control options available, management focuses mainly on public awareness to prevent or slow the spread of the zebra mussel. The phrase "management of zebra mussels" must be viewed realistically. Because this organism can withstand a lack of water for extended periods, has no environmentally acceptable control options for natural waters, spreads rapidly once established in a lake or river, and has microscopic life stages, few management options are available. It is highly likely that management of zebra mussels will remain focused on identifying and minimizing vectors which would spread this exotic and developing targeted regulatory, public awareness, and educational efforts.

Effectiveness

The primary goals of DNR's zebra mussel management efforts are to contain zebra mussels to water bodies where they presently occur and to support research to track their impacts and improve control methods. Targeted public awareness and enforcement activities will be used to reduce the spread of zebra mussels by trailered watercraft.

Figure 10. Zebra mussel distribution in Minnesota, December 2000. (Heavy lines indicates Mississippi River from St. Paul downstream, the St. Croix River from the Federal zone to the confluence, and the Zumbro River downstream of Lake Zumbro)



Participation with other groups

An interagency workgroup for the St. Croix River Zebra Mussel Response Plan continued to meet and coordinate efforts to try and prevent the zebra mussel from spreading into the entire St. Croix River. This group met after settled zebra mussels were repeatedly confirmed and discussed what management options should be recommended to the Lower St. Croix Management Commission. The group's final report will be given to the Commission in January 2001.

U.S. Fish and Wildlife Service continued to fund an interstate management plan for coordinated action against aquatic nuisance species in the St. Croix River. The Minnesota DNR, Wisconsin DNR, and Great Lakes Indian Fish and Wildlife Commission received funding assistance for zebra mussel activities on the St. Croix River outlined in the management plan.

Public awareness and education efforts have benefitted from cooperation among the many groups involved in the zebra mussel issue: federal and state agencies, local groups and private industry. Some of these efforts are covered more fully in the Education section.

The DNR coordinated with Rochester Public Utilities to conduct a partial drawdown on Lake Zumbro.

Citizens from many lakes helped monitor for zebra mussels in Minnesota waters. Over 200 reports of zebra mussel presence or absence were submitted to the DNR (see Zebra Mussel Distribution/Inventory). Using Sea Grant-produced water sampling kits, volunteers sampled 19 lakes and rivers for zebra mussel larvae (veligers) including lakes: Gull, Island, Kabetogama, Leech, Minnetonka, Namakan, Pelican, Pokegama, Prior, Rainy, Sand Point, Shagawa, Siseebakwet, Vermilion, and Winnibigoshish. No zebra mussels were found in any inland Minnesota waterbody that was monitored. Preserved specimens of zebra mussels, ruffe, Eurasian watermilfoil, and spiny waterfleas continue to be distributed to volunteers to aid identification.

Future Needs for zebra mussel management

- Continue monitoring and management efforts on the St. Croix River in cooperation with other resource agencies.
- Monitor zebra mussel abundance in Lake Zumbro and the Zumbro River and the success of management efforts.
- Monitor findings of international research efforts including the 2001 International Aquatic Nuisance Species and Zebra Mussel Conference.
- Continue development of volunteer zebra mussel monitoring database; continue mailing to volunteer monitors in upcoming years and examine methods to increase volunteer participation.

Management of Rusty Crayfish

Background

The rusty crayfish (*Orconectes rusticus*) is native to streams and rivers in Illinois, Indiana, and western Ohio. Through human activities over the past thirty years its distribution has expanded so that it is now found in states throughout the northeast and central United States, as far west as New Mexico, north into Ontario, Canada, and is widely distributed in Minnesota. The rusty crayfish lives in permanent water bodies and can grow slightly larger than Minnesota's native crayfish species. It is more aggressive than native species of crayfish, and in many lakes where it was introduced, it has displaced other species of crayfish or altered the community composition of this group. Its activities may also reduce diversity and abundance of native vegetation when rusty crayfish occurs at high densities, however, this reduction has also been seen in some lakes with native crayfish. It is more active than our native species during the day, and thus tends to be more visible to the lake user. To defend itself from fish during daytime activity, the rusty crayfish has somewhat larger claws than native species, and is more prone to aggressive displays towards predators, rather than evasion. While this makes it more difficult for some fish to eat, fish such as walleye and bass have been reported to feed heavily on rusty crayfish.

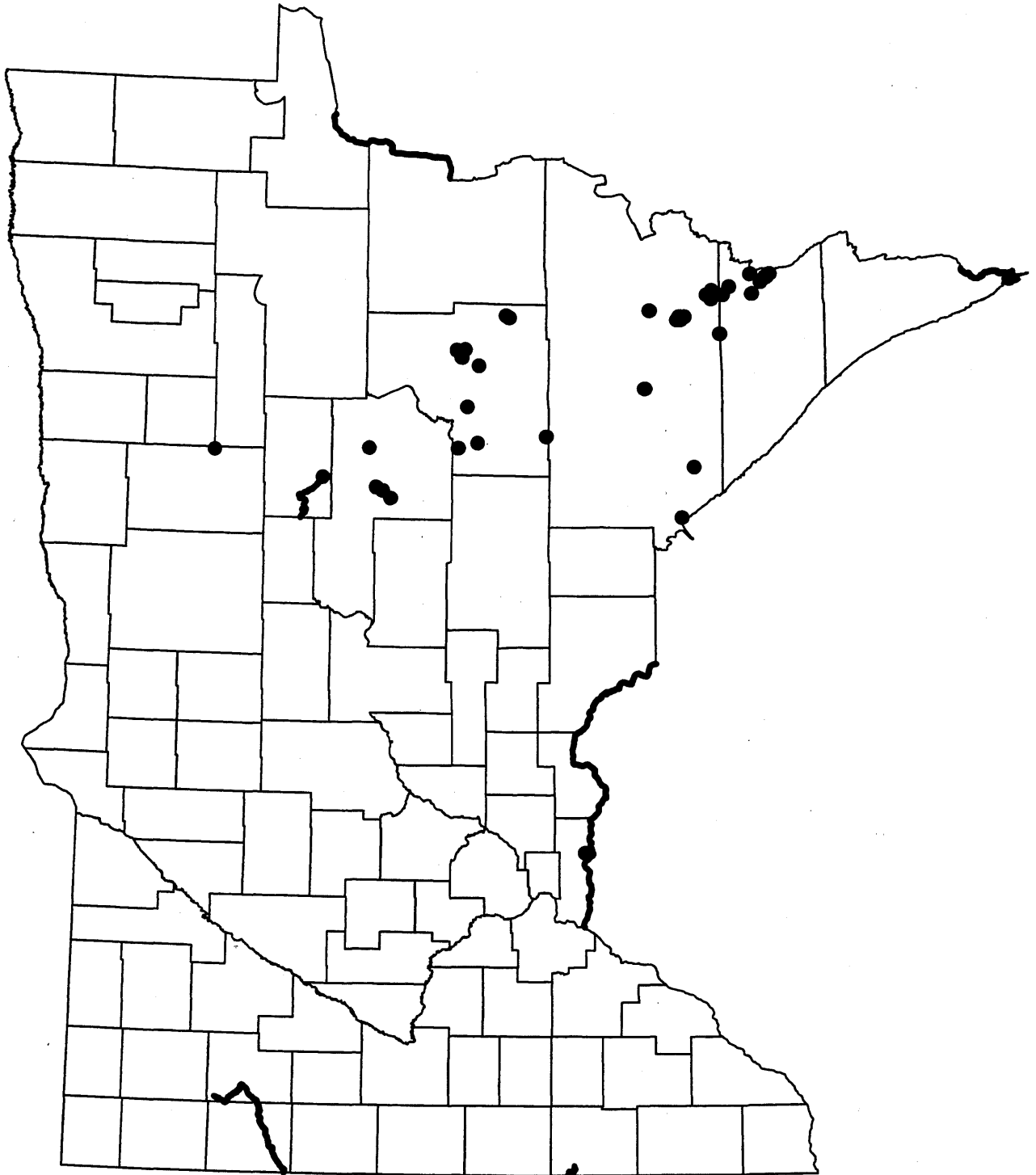
Progress in management of rusty crayfish - 2000

The Minnesota Department of Natural Resources (DNR) Exotic Species Program does not currently conduct management of rusty crayfish and the Department is not aware of any other targeted management activities within the state.

Current distribution of rusty crayfish

Rusty crayfish have been reported in lakes and rivers scattered across the state, from the far northeast down to south-central Minnesota (Figure 11). Division of Fisheries staff periodically report additional lakes where rusty crayfish are present when they find them during routine fisheries survey work. The proximity of "new" lakes to other recorded occurrences suggests that these locations are not new movements, but were simply not identified in earlier surveys. Judging from the widespread geographic distribution, rusty crayfish are likely present in more Minnesota waters than those with confirmed populations. The majority of the lakes found in St. Louis and Lake counties are often interconnected, presenting no barriers to the spread of the rusty crayfish. It is likely that as more lakes are checked, they will also be found to contain this exotic.

Figure 11. Rusty crayfish distribution in Minnesota, December 2000. Data from Helgen (1990) and DNR field surveys. (Heavy lines indicate river segments where localized collections suggest widely dispersed populations).



Control of rusty crayfish

There are no environmentally safe control methods available for the rusty crayfish that can be used in natural systems. While trapping has been suggested as a control option, this action removes mainly large male rusty crayfish which has little effect on population density. A study of trapping in small ponds by the U. S. Fish and Wildlife Service (Bills and Marking 1988) found that while trapping may harvest adults, it was doubtful that it could be used as a successful control method. Additionally, trapping efforts are labor intensive, both in terms of numbers of traps needed and the daily removal and rebaiting of the traps. Finally, intensive commercial trapping efforts often result in creating a crayfish population that is larger in numbers and smaller in body size. Thus, in any large lake, trapping is not likely to succeed in reducing the population or problem.

Management of rusty crayfish in other states

There are no states that have management activities specifically for the rusty crayfish. Wisconsin prohibits the use of live crayfish for bait, and prohibits their release in natural waters. A draft rusty crayfish management plan was written for one lake district (Long Lake, Wisconsin) in 1980 at the request of the Long Lake Inland Lake District members. However, no activities were ever initiated from this management plan, with the exception of annual trapping at set sites to monitor population levels. Discussions with fisheries managers from the Long Lake area indicated that the problems with rusty crayfish have declined to a minimal or non-existent level, aquatic vegetation has re-established in some areas of the lake, and a thriving fisheries is present.

Future Needs for rusty crayfish management

- Survey crayfish through a variety of methods throughout Minnesota waters to better establish extent of rusty crayfish distribution.

References Cited

Bills, J.D. and L.L. Marking. 1988. Control of Nuisance Populations of Crayfish with Traps and Toxicants. *The Progressive Fish Culturist* 50:103-106.

Management of Ruffe

2000 Highlights

- No ruffe have been discovered in inland waters of Minnesota.
- The University of Minnesota's web site on ruffe has been refined and updated. It is a good starting point for information on ruffe (<http://www.fw.umn.edu/research/ruffe/>).

Background

The ruffe (*Gymnocephalus cernuus*) a Eurasian fish of the perch family, was introduced into Minnesota in the mid-1980s. Its likely source of introduction was from ballast water discharge by transoceanic ships. Since the discovery of the ruffe in the St. Louis River near Duluth in 1987, many agencies from Minnesota, Wisconsin, and Ontario as well as the U.S. Fish and Wildlife Service (USFWS) and U.S. Geological Survey, Biological Resources Division (USGS-BRD) have been studying this exotic fish to better understand its impacts on North American fish communities. The rapid increase in the ruffe population, the replacement of fish biomass by ruffe, its continued spread to more locations in the Great Lakes, and its potential spread to inland waters, concern many fish management agencies and sportfishing interests.

Progress in management of ruffe - 2000

Educational activities conducted by the DNR and other cooperating agencies in past years to prevent the spread of ruffe were continued in 2000. Information about the ruffe has been included in brochures and in the state fishing regulations synopsis. Advisory signs remain posted in Wisconsin and Minnesota to alert boaters and anglers of the presence of ruffe in the St. Louis River estuary and watercraft inspections continue at public access points in Minnesota's ruffe infested waters to inform boaters and anglers about ruffe and precautions they should take.

Current distribution and inventory of ruffe

The USGS-BRD, Lake Superior Biological Station has taken the lead role in ruffe population investigations in the Great Lakes and their tributaries. According to their surveys, the density and biomass of ruffe in the St. Louis River estuary have varied annually, and the ruffe population remains above the 10 year average. Although, since 1997 the population has declined and ruffe growth has declined since 1989.

The USFWS Fishery Resources Offices continues to conduct and coordinate surveillance sampling in potential infestation areas in U.S. waters of the Great Lakes. The Ontario Ministry of Natural Resources will conduct surveillance in Canadian waters of Lake Superior and other Great Lakes. Ruffe have continued to expand their range since the original discovery of the St. Louis River estuary population. A reproducing population was discovered in Thunder Bay, Ontario in 1994, and ruffe were discovered in Lake Huron for the first time in 1995. DNR Fisheries staff documented ruffe in

Taconite Harbor for the first time in 1997. In 1999, they were found in Lake Superior as far east as the Firesteel River in Michigan. The new location is seven miles further east than 1998. No ruffe were confirmed in Minnesota inland waters in 2000. There was no detected range expansion of ruffe in 2000 both within the Great Lakes and inland waters.

The DNR is not conducting special surveillance surveys for ruffe in Minnesota inland waters. Section of Fisheries' lake surveys and angler reports will be the primary method of detecting movement of ruffe populations to inland waters.

A map showing the distribution of ruffe in North America is available on line at: http://nas.er.usgs.gov/fishes/images/ruffe_map.gif.

Control of ruffe

The Minnesota and Wisconsin DNR attempted to control ruffe in the Duluth area of Lake Superior and the St. Louis River beginning in 1988 using restrictive angling regulations and stocking of predator fish with the goal of increasing predation on ruffe by native fish. This tactic did not appear to check the ruffe population size or ruffe expansion. No active management of ruffe in the Minnesota waters of the St. Louis River estuary or Lake Superior has occurred due to a lack of effective, acceptable, and selective control methods.

The current goals and objectives of Federal Ruffe Control Program are available at <http://www.fws.gov/index.html> (search for "ruffe control program").

Effectiveness of ruffe management

Predator stocking and restrictive angler regulations in Minnesota and Wisconsin appear to have had little effect in slowing the expansion of the ruffe in Lake Superior and the St. Louis estuary. Those activities were the only control strategies initially available. Regulations, inspections, and other public awareness efforts to prevent the transportation of ruffe to inland waters have, to date, been effective.

Management in other states

The Lake Superior waters of Wisconsin, Ontario, and Michigan, and Michigan waters of Lake Huron contain the only other known populations of ruffe. The fish have not been found in any inland waters of those states or provinces. Wisconsin DNR (WDNR) has established regulations to prohibit possession of ruffe and harvest of bait fish in Lake Superior and its tributaries up to the first fish barriers. Angling regulations, similar to Minnesota's, in the St. Louis River estuary were also used in an attempt to increase predation on ruffe by native fish. WDNR has also prepared a plan to respond to nonindigenous fish introductions in inland lakes. This plan will help provide a decision making process in the event ruffe are found in inland waters of Wisconsin. To date, no state, federal, or Indian entity has used chemical control to manage ruffe in tributaries along the south shore of Lake Superior. Chemical control of ruffe had been proposed for Wisconsin or Michigan waters. Laboratory tests show that ruffe are vulnerable to

available fish toxicants, but most information indicates that treatments would not be effective in preventing the spread of ruffe in open systems like the Great Lakes.

Participation of others in ruffe management

The USGS-Biological Resources Division has been involved in ruffe research and a USFWS biologist is the chairperson of the Ruffe Control Committee. Employees of provinces, tribes, and other Great Lakes states have been involved in development of reports and plans regarding ruffe.

Sea Grant published a *Research Bibliography on Eurasian Ruffe*, which contains 889 citations from 21 countries obtained from journals, technical reports, and recent literature searches. Research literature referenced in the bibliography are available by searching on-line at the National Aquatic Nuisance Species Clearinghouse Web site at www.entryway.com/seagrant/.

Minnesota Sea Grant-sponsored research is ongoing at the Natural Resource Research Institute of U of M - Duluth and the U of M - St. Paul Campus. The research focuses on ruffe response to pheromones.

Future Needs for Ruffe management

If ruffe are to be contained in existing waters, continued efforts in the areas of public awareness, watercraft inspections, regulations, and enforcement will be necessary. The state and cooperators within the state should:

- Support national and regional efforts to reduce the potential for ruffe to enter the Mississippi River via outlets from Lake Michigan such as the Dispersal Barrier Demonstration Project by the U.S. Army Corps of Engineers and long-term solutions.
- Invest in and/or support research to develop environmentally sound control methods by the USFWS and others.
- Support continued biological assessment efforts by the DNR Division of Fisheries, University of Minnesota, USFWS, and USGS-BRD so that the impact of ruffe on native communities can be ascertained.
- Continue monitoring using routine fish sampling and angler reports.
- Expand efforts to increase public awareness of ruffe in areas of Minnesota where introduction of ruffe may occur.

Management of Round Goby

2000 Highlights

- US Army Corps of Engineers made some progress in 2000 toward installing an electrical barrier in the Illinois waterways, as required by the National Invasive Species Act of 1996, but they have continually delayed construction and now the earliest that installation could occur is summer of 2001 (This is more than one year later than we reported in the 1999 report).
- The spread of round gobies in the Illinois waterways, beyond a proposed electric barrier site which the US Army Corps of Engineers failed to install in early 2000, means almost certain introduction of round gobies throughout the Mississippi River watershed. In Minnesota, the Mississippi River up to the Coon Rapids dam, the St. Croix River, and other Mississippi River tributaries are likely to become infested if no barrier exists upstream of the confluence of the Illinois River and the Mississippi River.

Background

The round goby (*Neogobius melanstomus*) is a small bottom-dwelling fish native to the Black and Caspian Seas. The first reported finding of round goby in the Great Lakes was in the St. Clair River, Michigan in 1990. This fish was likely introduced through transoceanic ballast water discharge. The first round gobies in Minnesota were discovered during the summer of 1995 in the Duluth-Superior harbor (St. Louis River estuary). There is documented harm to native fish populations, such as mottled sculpins, where round gobies have invaded. Populations of other species such as logperch and lake sturgeon may be harmed as well. If round gobies enter the Mississippi River basin, they may have harmful impacts on darters, several of which are federally listed threatened and endangered species (personal communication: Tom Busiahn, USFWS). Because round gobies eat zebra mussels, there is also concern about the potential for round gobies to pass contaminants from zebra mussels to game fish such as smallmouth bass. Gobies appear to have another impact on recreational angling — because they can reach high densities and quickly strike at live bait— they can make it difficult to catch game fish such as yellow perch.

The round goby was designated a prohibited exotic species in the Department's permanent rules (see Appendix B). Under Minnesota laws, it is illegal to possess, transport, sell, or import species in this regulatory classification (under Minnesota Statutes 84D.05 and 84D.13 in Appendix A). Preventing these actions can reduce the risk that gobies will be dispersed to inland waters of the state.

Progress in management of round goby - 2000

Because there are not any acceptable management options available to reduce or eliminate the established round goby population, management of gobies has not

occurred in the Duluth-Superior harbor. Prevention of their spread to inland waters continues to be the focus of round goby management in the state.

State efforts to address future needs for round goby management, as identified in the 1998 annual report, are described below.

Round goby identification cards (Minnesota Sea Grant 1995) and fact sheets continue to be distributed to anglers and others in the state by DNR offices and by Minnesota Sea Grant. This information will help ensure that if round gobies are discovered in inland waters they will be reported to the DNR.

At the regional and national level, the DNR's Exotic Species Program supported temporary and long-term management actions for the Illinois waterways to limit round goby spread to the Mississippi River drainage (see cooperation of others). Minnesota's involvement occurred through the Mississippi Interstate Cooperative Resources Association (MICRA), attendance at meetings, and through direct contact with the Army Corp of Engineers in the Chicago District. Also, in response to an inquiry from the USFWS, the DNR wrote the USFWS and encouraged it to conduct research necessary for Environmental Protection Agency registration of a bottom formulation of the piscicide Antimycin as a management tool for round gobies and other benthic exotic fish.

Current distribution of the round goby

From its initial introduction into the St. Clair River, which connects Lake Huron and Lake St. Clair, the round goby has spread to the Detroit River, all the Great Lakes, the Illinois waterways, and to the Lake Superior watershed (see Figure 9). Many round gobies were located in several locations in the Duluth-Superior harbor during 2000. Round gobies have not been identified in any inland waters in the state.

Surveys conducted by the USFWS and others in 2000 found gobies located in the Chicago Sanitary and Ship Canal just upstream from the Des Plaines River. This location is 13 miles further downstream than the furthest previous collection point and a distance of about 44 miles downstream from Lake Michigan. The presence of round gobies in the Illinois waterways beyond a proposed Dispersal Barrier Demonstration Project of the U.S. Army Corps of Engineers (electric barrier) means almost certain introduction of round gobies throughout the Mississippi River watershed. In Minnesota, the Mississippi River up to the Coon Rapids dam, the St. Croix River, and other Mississippi River tributaries are likely to become infested if no barrier exists upstream of the confluence of the Illinois River and the Mississippi River.

Current distribution maps for the round goby are available on line at:
http://nas.usgs.gov/fishes/images/goby_map.gif.

Participation of others - 2000

The U.S. Army Corps of Engineers is responsible for installing a demonstration dispersal barrier in the Illinois waterways to block the movement of round gobies and other harmful exotic species into the Illinois River and throughout the Mississippi River drainage. The Army Corps made changes to the proposed design of the dispersal barrier and delayed issuing the contract to build the project by more than a year. According to the Army Corps, the project will not be finished until summer of 2001 (personal communication: Belden McPheron, Chicago District, U.S. Army Corps of Engineers). This date is well beyond the date previously promised by the Corps.

Recent research conducted by the U. S. Geological Survey, Biological Resources Division (Dawson *et al.* 2000) evaluated newly developed delayed-release formulations of Bayluscide and antimycin for controlling the normally bottom-dwelling organisms without treating the entire water column. Use of bottom-release formulations to control round goby would depend on whether gobies can sense the presence of the chemicals and move to untreated water. Dawson *et al.* (2000) also evaluated the avoidance/attraction behavior of round goby in response to exposures to these chemicals. They found that round goby did not demonstrate avoidance behavior to either chemical. Determinations of minimum effective contact time of these piscicides showed that exposures to either Bayluscide or antimycin for only a few minutes before being transferred to fresh water was lethal to round goby. This USGS research suggests that round goby probably could not escape the effects of these bottom-release formulations by swimming out of the toxified bottom strata.

Future Needs for round goby management

State

- Continue to distribute round goby identification cards and fact sheets as part of the ongoing exotic species public awareness activities in the state.
- Continue watercraft inspections at waters with round goby populations.

Regional/National

- Support management actions that can be taken to limit round goby spread to or within the Mississippi River drainage.
- Invest in and/or support research of environmentally sound control methods and other priorities established at the 1996 Round Goby Conference.

References Cited

- Dawson, V.K., Theresa M. Schreier, and Wendi Larson. 2000. Piscicides as an Emergency Tool for Controlling Range Expansion of the Round Goby (*Neogobius melanostomus*) in the Illinois Waterway. (Abstract) U. S. Geological Survey, Biological Resources Division, Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Road, La Crosse, Wisconsin 54603.
- Minnesota Sea Grant. 1995. *Round Goby Watch Card*.

Management of Eurasian Swine

2000 Highlights

- No wild herds of Eurasian swine are known to exist in Minnesota.

Background

The Minnesota Department of Agriculture (MDA) is responsible for regulating Eurasian swine in Minnesota. Information of this species is included in this report because of the potential harm these animals could cause to terrestrial ecosystems. Eurasian swine (*Sus scrofa* subspecies) and feral swine have escaped from captivity in a number of states and are causing significant problems. Until 1993, Eurasian swine were unregulated in Minnesota, except for testing for disease by the State Board of Animal Health. Many organizations in Minnesota called for Eurasian swine to be prohibited or closely regulated because of the potential ecological harm they could cause if wild populations became established. A Wild Hog Task Force, chaired by MDA conducted a survey of wildlife officials and chief veterinarians in other states to determine the degree of harm caused by wild hogs (Minnesota Department of Agriculture 1993). Many states indicated that free roaming swine damage streams, woodlands, croplands, and wildlife. According to the survey, 32 states consider free-roaming wild hogs a liability.

State legislation in 1993 (see M.S. 17.457 in Appendix A) designated Eurasian swine as a restricted species. This designation was intended to keep Eurasian swine from escaping and becoming naturalized in the state. The legislation did the following:

- created a task force to conduct a study of Eurasian swine in the state and report to the legislature by January 1, 1995;
- made importation, possession, propagation, transportation and release of Eurasian swine unlawful in the state; except for herds that were in existence in the state on March 1, 1993;
- requires animals to be marked to identify ownership;
- requires that escaped animals must be reported to a DNR conservation officer within 24 hours of the escape.
- prescribes the penalty for violating the law as a misdemeanor;
- requires owners to file a bond with the state.

The DNR also adopted amendments to Minnesota Rules 6216 that designate Eurasian Swine as a prohibited exotic species. This designation is consistent with state statutes for Eurasian Swine.

Current distribution of Eurasian swine

No wild populations of Eurasian swine are known to exist in the state. There are five grandfathered herds of Eurasian swine held in captivity in Minnesota and registered with the Board of Animal Health as required by 1993 legislation. There may be additional herds in captivity that have not been registered. Quick and inexpensive methods are not available to determine the genetics of swine, making it difficult to determine if swine herds in Minnesota are Eurasian or domestic (*Sus scrofa domestica*).

Management in other states

A survey conducted in 1993 by MDA revealed that:

- 12 states have organized control efforts to reduce the number of wild hogs;
- 19 states allow hunting of wild hogs, many with year round hunting and no limits;

Participation of others

The MDA is responsible for regulating Eurasian swine in the state. DNR offers its assistance to MDA for control of this species and encourages MDA to fully implement the items identified in the Wild Hog Report (Wild Hog Task Force 1994).

Future Needs for Eurasian swine management

- The DNR will support efforts by MDA to identify non-registered herds and determine the status of registered herds.
- The DNR will support efforts by MDA to inspect facilities holding registered herds.
- The DNR will support efforts by MDA to develop methods to differentiate between domestic and Eurasian swine herds.

References Cited

Minnesota Department of Agriculture. 1993. Summary of a Survey on the Status of Wild Hogs in the United States. Unpublished Report.

Wild Hog Task Force. February 1994. Wild Hog Report. Prepared for the 1994 Legislative Session, Minnesota Department of Agriculture.

Management of Mute Swan

2000 Highlights

- Mute swans were observed in the wild and not confined under a game farm license as required by state law in four Minnesota Counties: Hennepin, Olmsted, Rice, and Wright.

Background

Mute swans (*Cygnus olor*) are native to Europe and Asia and were introduced into the United States from the mid 1800s through the early 1900s (Lever 1987, Ciaranca et al 1997). Mute swans have escaped or been released from golf courses, avicultural and park settings occasionally in Minnesota. There have been documented wild nesting pairs in some locations of the state, such as the Cannon River in Rice County, and in Cass County. Ciaranca et al (1997:1) reports that all North American populations of mute swans originated from release or escape of individuals from captive flocks.

With increasing goose populations, more people may be interested in possessing and releasing mute swans to compete with Canada geese (Mr. Kent Solberg, pers. comm., June 1997). However, this management approach is unlikely to work.

The potential adverse impacts of mute swans is high because: 1) mute swans can be extremely aggressive during the spring and summer breeding season, excluding other wildlife from their breeding territories (Allin, Chasko, and Husband 1987); 2) there is evidence that mute swans have displaced loons on traditional loon nesting sites in Michigan; 3) while Conover and McIvor (1993) did not find significant impacts from mute swans at low population densities, it is difficult to maintain low population levels once mute swans are established. Ciaranca, et. al. (1997) gave overgrazing of aquatic vegetation and displacement of native waterfowl as potential effects on native ecosystems. Delacour (1954) describes mute swans as "jealous and bad-tempered, sometimes persecuting and killing even ducks."

Mute swans are currently regulated in part by the state game farm statutes in M.S. 97A.105 (see Appendix A) and they are designated as a regulated exotic species (see Appendix B). It is illegal to release mute swans into the wild under the game farm and regulated exotic species statutes.

Progress in Management in 2000

During 2000, the DNR recorded and investigated several reports of wild or escaped mute swans in the state. Birds were reported in January near Faribault (Rice County), in September near Cokato (Wright County), and in October near Rochester (Olmsted County). The bird in Bloomington was nesting with a black swan and was sitting on a nest with four eggs. A DNR Conservation Officer reported that no young hatched. When appropriate, the DNR provides information to newly identified mute swan owners to inform them of state regulations regarding mute swans.

Management in other States

In Michigan, Ontario, Wisconsin, and eastern states from Maine to South Carolina, mute swan populations have naturalized and are expanding rapidly causing concern for native species and their habitat (Allin, Chasko, and Husband 1987, Ciaranca et al 1997:1). Lever (1987:26) reported that at Chesapeake Bay one or two pairs escaped captivity during a storm in 1962. The Washington Post reported that in 2000 the Maryland mute swan population, that originated from the 1962 escape, has multiplied to 4,000 individuals.

New York Dept. of Environmental Conservation is concerned about potential impacts of the growing naturalized population of mute swans. In New York, the mute swan is an introduced species that has proven to be troublesome in many ways. Control of the wild population is necessary to prevent and provide relief from potential problems. DEC believes that the public's desire to observe mute swans can be largely met with a smaller naturalized population and by controlled use of captive birds. Therefore, properly licensed individuals will be allowed to keep, raise, and display mute swans, as long as no birds are released or escape to the wild.

The USFWS endorses a mute swan policy adopted by the Atlantic Flyway Council. Among several recommendations are:

- Both state and federal wildlife species should institute programs to prevent the establishment and/or eliminate mute swans.
- States and provinces should seek to make mute swans an unprotected species if this is not already the case.

Future Management Needs

- Verify occurrences of mute swans in the state and take appropriate actions to have the birds confined under game farm licenses or remove the naturalized birds from the wild.
- Develop and distribute informational materials about mute swans and related laws.

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- Allin, C. C., Chasko, G. G., and T. P. Husband. 1987. Mute swans in the Atlantic flyway: a review of the history, population growth, and management needs. Trans. NE Sect. Wildl. Soc. 44: 32-47.
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Prevention

2000 Highlights

- Two studies, one investigating the winter hardiness of aquatic exotic plants and another project assessing the sale of "restricted" aquatic plants into the state were initiated at the University of Minnesota.
- Ballast water management technology advances were made in 2000 through research conducted in Duluth and Two Harbors. State funds helped support the research.

Introduction

Experience in Minnesota and other states has shown that proactive prevention efforts need to be a key component of a comprehensive approach to addressing the exotic species issue. There are many commercial (e.g., international ships and biological supply houses) and recreational activities (e.g., water gardening, boating, and angling) which bring exotic species into Minnesota and move them throughout the state. In addition, control of established populations is expensive (if feasible at all) and eradication is rarely, if ever, achieved. It is therefore important to be aware of the potential of new species to invade and to target prevention efforts on high risk species and high risk pathways.

One of the emerging threats is the increasing level of aquatic plant sales in the state. Aquatic plants represent the largest taxonomic group of aquatic exotics introduced into the Great Lakes area (Mills *et al.* 1993). Major pathways of introduction include accidental escape of cultivated plants and dumping of aquarium waters. Today, new pathways are emerging as activities such as water gardening, wetland restoration projects, and shoreline plantings increase in popularity.

Ballast water discharges from ships are a continuing threat to introduce additional species to Lake Superior and the other Great Lakes. Ballast water management and regulation continues to be a topic of research and discussion in the Great Lakes region, nation, and world.

Background

Aquatic plants

The Exotic Species Program pursued two studies in 1998 to help identify potential sources of introduction of exotic aquatic plants and determine the species of concern. Under contract with the DNR, the Army Corps of Engineers' Aquatic Plant Control Research Program completed a study, "The Potential for Nonindigenous Aquatic Plants to Colonize Minnesota" (McFarland *et al.* 1998). The study suggested that growth of four species, water chestnut (*Trapa natans*), variable milfoil (*Myriophyllum heterophyllum*), hydrilla (*Hydrilla verticillata*) (monoecious biotype), and fanwort

(*Cabomba caroliniana*), was expected to be most severe if introduced into Minnesota waters.

In 1998, the Exotic Species Program initiated a study to evaluate the risk of exotic introductions associated with mail order shipments of aquatic plants into Minnesota (Perleberg 1998). Objectives of this study were: 1) Continue to identify exotic aquatic plant species that may be harmful to Minnesota resources; 2) Identify businesses that sell aquatic plants to Minnesotans; and 3) Evaluate the risk of exotic introductions associated with the sale of aquatic plants.

Mail order catalogs from 30 U.S. and foreign businesses specializing in aquatic plants were reviewed to assess the potential for intentional exotic plant shipments to Minnesota. Aquatic plant orders were placed with three of these businesses to assess the potential for both intentional and accidental introductions of exotics. Results of this study included the following information:

- More than 700 taxa of aquatic plants are available for sale into Minnesota and the majority (96%) of these taxa are exotics.
- At least 66% of the federal and state "restricted" aquatic plant taxa are available for sale into Minnesota.
- At least 31% of the "watch" species identified for the Perleberg (1998) report are available for sale into Minnesota.
- Most businesses surveyed (87%) sell at least one federal or state "restricted" aquatic plant taxa.
- Species prohibited for sale under federal or state regulations or both were intentionally shipped to Minnesota.
- Identification of many taxa is difficult because businesses do not use standardized nomenclature. Taxonomic problems will hinder education and enforcement efforts.

The risks associated with sales of exotic aquatic plants identified by DNR efforts in 1998 were apparent in 1999 when three different issues emerged.

Retail sales of flowering rush, a state prohibited exotic species, occurred in the state at stores from two major retail chains. The DNR confirmed these sales and notified the companies that the sale was illegal. All remaining plants were removed from the stores and the suppliers of the plants were notified by the DNR and they indicated they will not be selling flowering rush in the future.

An exotic bur-reed (*Sparganium erectum*), on the federal noxious weed list, was imported into the state and other midwest states for retail sale as a water garden plant.

The US Department of Agriculture - APHIS took the lead on recovering these plants from retail stores. Many of the plants were removed from sale, but others still exist in the state. The supplier of this plant was also notified that this species cannot be shipped into the country.

Businesses in other states requested permits from the U.S. Department of Agriculture to ship three species of federal noxious weeds to Minnesota for sale as aquarium plants. The Minnesota Department of Agriculture and DNR reviewed the requests and encouraged the USDA to deny the permits and they did.

Ballast water

The ballast water discharged from ships is the leading vector for unintentional introductions of non-native aquatic organisms into the Great Lakes. Ballast water exchange while in open ocean is currently the primary ballast water management practice used by vessels that enter the Great Lakes. It reduces the risk of new introductions through reducing the number of near coastal organisms from foreign harbors that are discharged into Great Lakes waters. But the effectiveness of ballast water exchange is limited by the circumstances of the voyage. New on-board ballast water treatment technology could yield more reliable and practical prevention of species introductions for the Great Lakes and other US waters.

A panel of experts convened by the National Research Council in 1992 cited automatic backwash screen filtration (ABSF) as a promising potential mechanical ballast treatment technology and recommended demonstration of its effectiveness in the field. Over the course of 3 years, the Great Lakes Ballast Technology Demonstration Project - a collaborative effort lead by a maritime industry trade association (Lake Carriers Association) and a non-governmental regional organization (Northeast-Midwest Institute) investigated the effectiveness of automatic backwash filtration and other mechanical ballast water treatment options under shipboard conditions (Cangelosi, *et al.* 2000).

The project with the support of the Great Lakes Protection Fund initiated the first tests of ABSF under shipboard conditions. In 1997, a commercially available high flow ABSF designed by Ontario Hydro Technologies was installed onboard the Seaway-sized bulk carrier *M/V Algonorth* and tested during operations between the Gulf of St. Lawrence and Great Lakes ports. This testing (1500 gpm, two filters in series) provided critical initial information on system design, operations, and filtration biological effectiveness under shipboard conditions. Nevertheless, information on the relative value of refinements to the filter system and the advantages of adding a secondary treatment system could be gained most efficiently through more controlled dock-side experiments.

With the support of the State of Minnesota funding and concurrence of the Legislative Commission on Minnesota Resources (LCMR), the project team designed and implemented a barge-based experimental platform located in Duluth-Superior Harbor of Lake Superior. During the summer of 1998, the team transferred the same pump and

treatment module used onboard the *M/V Algonorth* to the barge platform for intensive mechanical and biological testing.

The barge tests evaluated the following refinements of the filter system:

- In 1998, the two-filter series (prefilter and polishing filter) used on the *M/V Algonorth* was reduced to a one-filter system with a 3/16 inch prescreen at the inlet, thereby cutting in half the space and weight requirements of the filter system;
- The original filter system design by Ontario Hydro Technologies, used in 1997 and 1998, was upgraded to enhance backwash efficiency and facilitate maintenance. This new design was available in 2000 and was evaluated in combination with an ultraviolet radiation secondary treatment.

The project's short list for possible secondary technologies were UV light, ultrasound, and heat. In late winter 1998, the project contracted with Battelle Corporation to undertake a review of those technologies and the industries that surround them. Battelles' final report concluded that ultra violet radiation technology was the most promising of the three technological areas for field testing at the time because this technology had matured to the point that demonstration was feasible and appeared more cost effective than heat.

Prevention Progress in 2000

Aquatic Plants

On July 1, 2000, efforts to further knowledge of exotic aquatic plant sales in the state and assess the risk of exotic aquatic plants invading state waters were initiated as a joint project involving the DNR, Minnesota Sea Grant, and the University of Minnesota. These two studies are funded by the DNR and Minnesota Sea Grant, and under the direction of Dr. Susan Galatowitsch at the University of Minnesota. The studies will continue through June 2002.

The first study is a survey of vendors that expands upon a previous DNR study (Perleberg 1998) by evaluating level of trade of unrestricted plants that include shipments of "restricted" species or misidentified unrestricted taxa. This study will also develop a comprehensive list of aquatic plant vendors and identify how many vendors sell prohibited or regulated exotic species in Minnesota.

A related second study develops methods for assessing cold tolerance, or winter hardiness, for several aquatic plants and their propagules. This is considered important because the ability for many exotic aquatic plants to naturalize in the state may be limited by their ability to survive winter temperatures. Developing a measure for winter hardiness will aid DNR efforts to assess the risk of exotic aquatic plants becoming invasive in the state and aid in prioritizing state prevention efforts.

Ballast Water Technology

An upgraded filter and UV equipment for the Great Lakes Ballast Water Demonstration Project was delivered, installed and shaken-down on the project's barge platform in Duluth by mid-June, 2000. These tests were supported by state funds recommended by the LCMR. June biological evaluation tests of the upgraded filter system proceeded smoothly. It soon became clear that the UV system design did not contemplate the realities of the physical/ chemical characteristics of harbors like Duluth-Superior. In these June tests, a centimeter of St. Louis estuary water absorbed all but 30-40 percent of the 254 nanometer light that the system delivered to it. The UV system vendors indicated that they could readily revise their design to penetrate waters like those of Duluth-Superior, but they could not deliver a new unit before the end of the test season. As a result, the team set out to find additional funds to support a repeat of these trials in a new location, where UV absorption was at the design level of 90% transmittance.

In order to accurately measure the effectiveness of the UV system at the design transmittance, and to allow complete operational testing of the upgraded filter system, the barge was moved to Two Harbors, MN for additional testing in August and September of 2000. The repeated tests were supported by the National Sea Grant Program which awarded the project funds to compare the performance of the Filter/UV combination with cyclonic separation/UV combination. At the DM&RI iron ore terminal, a full suite of operational and biological tests were carried out.

The August-September 2000 trials were identical to the June 2000 trials except that the effect of turbidity on performance of treatment systems was also evaluated by artificially raising turbidity for some tests and not others. For the operational tests, turbidity was artificially raised by funneling water discharge from the diesel pump back to the pump intake, thereby loading the intake stream with clay from the harbor bottom. For the biological tests, an air compressor was used to upset the bottom at a distance of about 10-20 feet from the intake. In both cases, the extent to which the particle count was raised by these operations was measured and monitored throughout the tests.

The results of test conducted in 2000 of the filter upgrade and the filter in combination with UV treatment will be available by spring of 2001. The following are selected results and lessons learned from the 1998 filtration tests as reported in Cangelosi *et al.* (2000):

- The two smallest filters (25 and 50 microns) achieved a high efficiency of removal (96 - 99 percent) macrozooplankton, including zebra mussel veligers. The filters achieved greater than 70 percent removal of the smallest zooplankters (rotifers) and phytoplankton biomass greater than 20 um.
- Width, rather than length, is the zooplankton dimension most determinative of system effectiveness. Rigidity of spines and shell material may also influence filter effectiveness.
- The filters' biological performance was highly consistent on both the barge and the *M/V Algonorth*; the two filter series tested on board the *M/V Algonorth*

yielded no advantages in biological effectiveness over a single filter and 5mm prescreen tested onboard the barge platform. Thus, the more costly complex system is unnecessary from the biological effectiveness standpoint.

- Effectiveness for the test system varies significantly with the properties of the organisms analyzed. That is, effectiveness of filtration for macrozooplankton ranged between 96 and 99 percent, while effectiveness relative to total phytoplankton was only 70 percent. Total bacteria were unaffected by filtration. Therefore, a single number such as "90 percent kill or removal" is an overly simplistic approach to characterizing a standard of effectiveness. Instead, a profile of effectiveness spanning fundamental organism types and life stages will be necessary to adequately characterize system bioeffectiveness, and to make meaningful comparisons between systems.
- The use of a 5 mm (3/16 inch) prescreen, upstream of the filter was successful in protecting the finer screens and demonstrating that two filters in series, as initially used in the *M/V Algonorth* testing, should not be necessary in ballast filtration applications.
- The 25 micron filter, with an overall count efficiency (based upon the total count of all particles above the nominal filter rating) of about 85%, and the 50 micron filter, with an overall count efficiency of about 90%, performed as should be expected. This is strong performance for a real world test with pliable and variable shaped particles.

Participation of others

Ballast water management

In June 2000, the Great Lakes Ballast Technology Demonstration Project distributed a RFP for three full-scale design studies of treatment system installations in specific new or existing ships to elucidate total system requirements. Using a grant from the Great Lakes Protection fund, two teams were awarded three design studies which will be complete by June 2001. Two of the design studies involved Seaway-size vessels. A Ballast Treatment Trade Exposition and Symposium on ballast treatment will conclude the Great Lakes Ballast Technology Demonstration Project in 2001.

Future Needs for Prevention

Evaluation and Awareness of Species

- Continue to identify exotic species that may be likely to enter Minnesota and evaluate their potential to cause problems if they become established in the wild.
- Encourage, fund, and support research to enhance techniques that predict which exotic aquatic plants are likely naturalize and be harmful in Minnesota.
- Develop a database and maintain files at the DNR with literature about exotic aquatic plant and wild animal species to guide regulatory classification.
- Cooperatively develop and distribute information about regulations regarding selling, buying, and introducing aquatic plants and animals in Minnesota.
- Work with industries which might bring prohibited exotic species into Minnesota to reduce the likelihood of those occurrences.

Regulations

- Continue information gathering and research to evaluate, classify, and designate additional exotic species as prohibited, regulated, or unregulated.
- Seek better federal laws that prohibit import and use of invasive animals such as black carp.

Linked watersheds

- Continue regional and national coordination to help prevent or minimize potential introductions of harmful exotic species by entities outside the state.
- Support federal and regional efforts to establish a barrier in the Illinois waterways that is effective against all types of aquatic exotic species.
- Seek cooperative efforts in the Mississippi River basin to establish basin-wide protocols for use and introduction of aquatic species.

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Appendix A - Minnesota Statutes Regarding Exotic Species

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MINNESOTA STATUTES - HARMFUL EXOTIC SPECIES**M.S. 84D.01 DEFINITIONS.**

Subdivision 1. **Terms.** For the purposes of this chapter, the following terms have the meanings given them.

Subd. 2. **Aquatic macrophyte.** "Aquatic macrophyte" means a macroscopic nonwoody plant, either a submerged, floating leafed, floating, or emergent plant that naturally grows in water.

Subd. 3. **Commissioner.** "Commissioner" means the commissioner of the department of natural resources.

Subd. 4. **Department.** "Department" means the department of natural resources.

Subd. 5. **Exotic species.** "Exotic species" means a wild animal species or aquatic plant species that is not a native species.

Subd. 6. **Eurasian water milfoil.** "Eurasian water milfoil" means *Myriophyllum spicatum*.

Subd. 7. **Harmful exotic species.** "Harmful exotic species" means an exotic species that can naturalize and either:

(1) causes or may cause displacement of, or otherwise threaten, native species in their natural communities; or

(2) threatens or may threaten natural resources or their use in the state.

Subd. 8. **Infested waters.** "Infested waters" means waters of the state designated by the commissioner under sections 84D.03, subdivision 1, and 84D.12.

Subd. 9. **Introduction.** "Introduction" means the release or escape of an exotic species into a free-living state.

Subd. 10. **[repealed]**

Subd. 11. **Native species.** "Native species" means an animal or plant species naturally present and reproducing within this state or that naturally expands from its historic range into this state.

Subd. 12. **Naturalize.** "Naturalize" means to establish a self-sustaining population of exotic species in the wild outside of its natural range.

Subd. 13. **Prohibited exotic species.** "Prohibited exotic species" means a harmful exotic species that has been designated as a prohibited exotic species in a rule adopted by the commissioner under section 84D.12.

Subd. 14. **Purple loosestrife.** "Purple loosestrife" means *Lythrum salicaria*, *Lythrum virgatum*, or combinations thereof.

Subd. 15. **Regulated exotic species.** "Regulated exotic species" means a harmful exotic species that has been designated as a regulated exotic species in a rule adopted by the commissioner under section 84D.12.

Subd. 16. **Transport.** "Transport" means to cause or attempt to cause a species to be carried or moved into or within the state, and includes accepting or receiving the species for transportation or shipment. Transport does not include the unintentional transport of a species within a water of the state or to a connected water of the state where the species being transported is already present.

Subd. 17. **Unlisted exotic species.** "Unlisted exotic species" means an exotic species that has not been designated as a prohibited exotic species, a regulated exotic species, or an unregulated exotic species in a rule adopted by the commissioner under section 84D.12.

Subd. 18. **Unregulated exotic species.** "Unregulated exotic species" means an exotic species that has been designated as an unregulated exotic species in a rule adopted by the commissioner under section 84D.12.

Subd. 19. **Watercraft.** "Watercraft" means a contrivance used or designed for navigation on water and includes seaplanes.

Subd. 20. **Waters of the state.** "Waters of the state" has the meaning given in section 97A.015, subdivision 54.

Subd. 21. **Wild animal.** "Wild animal" means a living creature, not human, wild by nature, endowed with sensation and power of voluntary motion.

Subd. 22. **Zebra mussel.** "Zebra mussel" means a species of the genus *Dreissena*.

M.S. 84D.02 HARMFUL EXOTIC SPECIES MANAGEMENT PROGRAM.

Subdivision 1. **Establishment.** The commissioner shall establish a statewide program to prevent and curb the spread of harmful exotic species. The program must provide for coordination among governmental entities and private organizations to the extent practicable. The commissioner shall seek available federal funding and grants for the program.

Subd. 2. **Purple loosestrife and Eurasian water milfoil programs.** (a) The program required in subdivision 1 must include specific programs to curb the spread and manage the growth of purple loosestrife and Eurasian water milfoil. These programs must include: (1) compiling inventories and monitoring the growth of purple loosestrife and Eurasian water milfoil in the state, for which the commissioner may use volunteers;

- (2) publication and distribution of informational materials to boaters and lakeshore owners;
- (3) cooperative research with the University of Minnesota and other public and private research facilities to study the use of nonchemical control methods, including biological control methods; and
- (4) managing the growth of Eurasian water milfoil and purple loosestrife in coordination with appropriate local units of government, special purpose districts, and lakeshore associations, to include providing requested technical assistance.

(b) The commissioners of agriculture and transportation shall cooperate with the commissioner to establish, implement, and enforce the purple loosestrife program.

Subd. 3. **Management plan.** By July 1, 1997, the commissioner shall prepare a long-term plan, which may include specific plans for individual species, for the statewide management of harmful exotic species. The plan must address:

- (1) coordinated detection and prevention of accidental introductions;
 - (2) coordinated dissemination of information about harmful exotic species among resource management agencies and organizations;
 - (3) a coordinated public education and awareness campaign;
 - (4) coordinated control of selected harmful exotic species on lands and public waters;
 - (5) participation by lake associations, local citizen groups, and local units of government in the development and implementation of local management efforts;
 - (6) a reasonable and workable inspection requirement for watercraft and equipment including those participating in organized events on the waters of the state;
 - (7) the closing of points of access to infested waters, if the commissioner determines it is necessary, for a total of not more than seven days during the open water season for control or eradication purposes;
 - (8) maintaining public accesses on infested waters to be reasonably free of aquatic macrophytes;
- and
- (9) notice to travelers of the penalties for violation of laws relating to harmful exotic species.

Subd. 4. **Inspection of watercraft.** The commissioner shall authorize personnel to inspect, for a minimum of 20,000 hours during the open water season, watercraft and associated equipment, including weed harvesters, that leave or are removed from waters of the state.

Subd. 5. **Regional cooperation.** The commissioner shall seek cooperation with other states and Canadian provinces for the purposes of management and control of harmful exotic species.

Subd. 6. **Annual report.** By January 15 each year, the commissioner shall submit a report on harmful exotic species to the legislative committees having jurisdiction over environmental and natural resource issues. The report must include:

- (1) detailed information on expenditures for administration, education, management, inspections, and research;
- (2) an analysis of the effectiveness of management activities conducted in the state, including chemical control, harvesting, educational efforts, and inspections;
- (3) information on the participation of other state agencies, local government units, and interest groups in control efforts;
- (4) information on management efforts in other states;
- (5) information on the progress made in the management of each species; and
- (6) an assessment of future management needs.

M.S. 84D.03 INFESTED WATERS.

Subdivision 1. **Infested waters; restricted activities.** (a) The commissioner shall designate a water of the state as an infested water if the commissioner determines that the water contains a harmful exotic species that could spread to other waters if use of the water and related activities are not regulated to prevent this.

(b) When determining which harmful exotic species comprise infested waters, the commissioner shall consider:

- (1) the extent of a species distribution within the state;
- (2) the likely means of spread for a species; and
- (3) whether regulations specific to infested waters containing a specific species are effective to prevent spread.

(c) The presence of common carp and curly-leaf pondweed shall not be the basis for designating a water as infested.

Subd. 2. **[repealed]**

Subd. 3. **Bait harvest from infested waters.**

(a) The taking of wild animals from infested waters for bait or aquatic farm purposes is prohibited, except as provided in paragraph (b).

(b) In waters that are designated as infested waters except those designated because they contain prohibited exotic species of fish, the taking of wild animals may be permitted for:

- (1) commercial taking of wild animals for bait and aquatic farm purposes according to a permit issued under section 84D.11, subject to rules adopted by the commissioner; and
- (2) bait purposes for noncommercial personal use in waters that contain Eurasian water milfoil.

M.S. 84D.04 CLASSIFICATION OF EXOTIC SPECIES.

Subdivision 1. **Classes.** The commissioner shall, as provided in this chapter, classify exotic species according to the following categories:

- (1) prohibited exotic species, which may not be possessed, imported, purchased, sold, propagated, transported, or introduced except as provided in section 84D.05;
- (2) regulated exotic species, which may not be introduced except as provided in section 84D.07;
- (3) unlisted exotic species, which are subject to the classification procedure in section 84D.06; and
- (4) unregulated exotic species, which are not subject to regulation under this chapter.

Subd. 2. **Criteria.** The commissioner shall consider the following criteria in classifying an exotic species under this chapter:

- (1) the likelihood of introduction of the species if it is allowed to enter or exist in the state;
- (2) the likelihood that the species would naturalize in the state were it introduced;
- (3) the magnitude of potential adverse impacts of the species on native species and on outdoor recreation, commercial fishing, and other uses of natural resources in the state;
- (4) the ability to eradicate or control the spread of the species once it is introduced in the state; and
- (5) other criteria the commissioner deems appropriate.

M.S. 84D.05 PROHIBITED EXOTIC SPECIES.

Subdivision 1. **Prohibited activities.** A person may not possess, import, purchase, sell, propagate, transport, or introduce a prohibited exotic species, except:

- (1) under a permit issued by the commissioner under section 84D.11;
- (2) in the case of purple loosestrife, as provided by sections 18.75 to 18.88;
- (3) under a restricted species permit issued under section 17.457;
- (4) when being transported to the department, or another destination as the commissioner may direct, in a sealed container for purposes of identifying the species or reporting the presence of the species;
- (5) when being transported for disposal as part of a harvest or control activity under a permit issued by the commissioner pursuant to section 103G.615, or as specified by the commissioner;
- (6) when the specimen has been lawfully acquired dead and, in the case of plant species, all seeds are removed or are otherwise secured in a sealed container;
- (7) in the form of herbaria or other preserved specimens;
- (8) when being removed from watercraft and equipment, or caught while angling, and immediately returned to the water from which they came; or

(9) as the commissioner may otherwise prescribe by rule.

Subd. 2. **Seizure.** Under section 97A.221, the commissioner may seize or dispose of all specimens of prohibited exotic species unlawfully possessed, imported, purchased, sold, propagated, transported, or introduced in the state.

M.S. 84D.06 UNLISTED EXOTIC SPECIES.

Subdivision 1. **Process.** After the effective date of the rules adopted under section 84D.12, subdivision 1, clause (1), a person may not introduce an unlisted exotic species unless:

- (1) the person has notified the commissioner in a manner and form prescribed by the commissioner;
- (2) the commissioner has made the classification determination required in subdivision 2 and designated the species as appropriate; and
- (3) the introduction is allowed under the applicable provisions of this chapter.

Subd. 2. **Classification.** (a) If the commissioner determines that a species for which a notification is received under subdivision 1 should be classified as a prohibited exotic species, the commissioner shall:

- (1) adopt a rule under section 84D.12, subdivision 3, designating the species as a prohibited exotic species; and
- (2) notify the person from which the notification was received that the species is subject to section 84D.04.

(b) If the commissioner determines that a species for which a notification is received under subdivision 1 should be classified as an unregulated exotic species, the commissioner shall:

- (1) adopt a rule under section 84D.12, subdivision 3, designating the species as an unregulated species; and
- (2) notify the person from which the notification was received that the species is not subject to regulation under this chapter.

(c) If the commissioner determines that a species for which a notification is received under subdivision 1 should be classified as a regulated exotic species, the commissioner shall notify the applicant that the species is subject to the requirements in section 84D.07.

M.S. 84D.07 REGULATED EXOTIC SPECIES.

Except as provided in rules adopted under section 84D.12, subdivision 2, clause (1), a person may not introduce a regulated exotic species without a permit issued by the commissioner.

M.S. 84D.08 ESCAPE OF EXOTIC SPECIES.

(a) A person that allows or causes the introduction of an animal that is a prohibited, regulated, or unlisted exotic species shall, within 48 hours after learning of the introduction, notify the commissioner, a conservation officer, or another person designated by the commissioner. The person shall make every reasonable attempt to recapture or destroy the introduced animal. If the animal is a prohibited exotic species, the person is liable for the actual costs incurred by the department in capturing or controlling, or attempting to capture or control, the animal and its progeny. If the animal is a regulated exotic species, the person is liable for these costs if the introduction was in violation of the person's permit issued under section 84D.11.

(b) A person that complies with this section is not subject to criminal penalties under section 84D.13 for the introduction.

M.S. 84D.09 AQUATIC MACROPHYTES.

Subdivision 1. **Transportation prohibited.** A person may not transport aquatic macrophytes on any state forest road as defined by section 89.001, subdivision 14, any road or highway as defined in section 160.02, subdivision 7, or any other public road, except as provided in this section.

Subd. 2. **Exceptions.** Unless otherwise prohibited by law, a person may transport aquatic macrophytes:

- (1) that are duckweeds in the family Lemnaceae;
- (2) for disposal as part of a harvest or control activity conducted under an aquatic plant management permit pursuant to section 103G.615, under permit pursuant to section 84D.11, or as specified by the commissioner;
- (3) for purposes of constructing shooting or observation blinds in amounts sufficient for that purpose, provided that the aquatic macrophytes are emergent and cut above the waterline;

- (4) when legally purchased or traded by or from commercial or hobbyist sources for aquarium, wetland or lakeshore restoration, or ornamental purposes;
- (5) when harvested for personal or commercial use if in a motor vehicle;
- (6) to the department, or another destination as the commissioner may direct, in a sealed container for purposes of identifying a species or reporting the presence of a species;
- (7) when transporting a commercial aquatic plant harvester to a suitable location for purposes of cleaning any remaining aquatic macrophytes;
- (8) that are wild rice harvested under section 84.091; or
- (9) in the form of fragments of emergent aquatic macrophytes incidentally transported in or on watercraft or decoys used for waterfowl hunting during the waterfowl season.

M.S. 84D.10 PROHIBITED ACT; WATERCRAFT.

Subdivision 1. **Launching prohibited.** A person may not place or attempt to place into waters of the state a watercraft, a trailer, or plant harvesting equipment that has aquatic macrophytes, zebra mussels, or prohibited exotic species attached except as provided in this section.

Subd. 2. **Exceptions.** Unless otherwise prohibited by law, a person may place into the waters of the state a watercraft or trailer with aquatic macrophytes:

- (1) that are duckweeds in the family Lemnaceae;
- (2) for purposes of shooting or observation blinds in amounts sufficient for that purpose, if the aquatic macrophytes are emergent and cut above the waterline;
- (3) that are wild rice harvested under section 84.091; or
- (4) in the form of fragments of emergent aquatic macrophytes incidentally transported in or on watercraft or decoys used for waterfowl hunting during the waterfowl season.

Subd. 3. **Removal and confinement.** A conservation officer or other licensed peace officer may order:

- (1) the removal of aquatic macrophytes or prohibited exotic species from a trailer or watercraft before it is placed into waters of the state;
- (2) confinement of the watercraft at a mooring, dock, or other location until the watercraft is removed from the water; and
- (3) removal of a watercraft from waters of the state to remove prohibited exotic species if the water has not been designated by the commissioner as being infested with that species.

M.S. 84D.11 PERMITS.

Subdivision 1. **Prohibited exotic species.** The commissioner may issue a permit for the propagation, possession, importation, purchase, or transport of a prohibited exotic species for the purposes of disposal, control, research, or education.

Subd. 2. **Regulated exotic species.** The commissioner may issue a permit for the introduction of a regulated exotic species.

Subd. 2a. **Harvest of bait from infested waters.** The commissioner may issue a permit to allow the harvest of bait from waters that are designated as infested waters, except those designated because they contain prohibited exotic species of fish. The permit shall include conditions necessary to avoid spreading harmful exotic species. Before receiving a permit, a person annually must satisfactorily complete harmful exotic species-related training provided by the commissioner.

Subd. 3. **Standard.** The commissioner may issue a permit under this section only if the commissioner determines that the permitted activity would not pose an unreasonable risk of harm to natural resources or their use in the state. The commissioner may deny, issue with conditions, modify, or revoke a permit under this section as necessary to ensure that the proposed activity will not pose an unreasonable risk of harm to natural resources or their use in the state.

Subd. 4. **Appeal of permit decision.** A permit decision may be appealed as a contested case under chapter 14.

M.S. 84D.12 RULES.

Subdivision 1. **Required rules.** The commissioner shall adopt rules:

- (1) designating infested waters, prohibited, regulated, and unregulated exotic species;
- (2) governing the application for and issuance of permits under this chapter, which rules may include a fee schedule; and
- (3) governing notification under section 84D.08.

- Subd. 2. **Authorized rules.** The commissioner may adopt rules:
- (1) regulating the possession, importation, purchase, sale, propagation, transport, and introduction of harmful exotic species; and
 - (2) regulating the appropriation, use, and transportation of water from infested waters.
- Subd. 3. **Expedited rules.** The commissioner may adopt rules under section 84.027, subdivision 13, that designate:
- (1) prohibited exotic species;
 - (2) regulated exotic species;
 - (3) unregulated exotic species; and
 - (4) infested waters.

M.S. 84D.13 ENFORCEMENT; PENALTIES.

Subdivision 1. **Enforcement.** Unless otherwise provided, this chapter and rules adopted under section 84D.12 may be enforced by conservation officers under sections 97A.205, 97A.211, and 97A.221 and by other licensed peace officers.

Subd. 2. **Cumulative remedy.** The authority of conservation officers to issue civil citations is in addition to other remedies available under law, except that the state may not seek penalties under any other provision of law for the incident subject to the citation.

Subd. 3. **Criminal penalties.** (a) A person who violates a provision of section 84D.05, 84D.06, 84D.07, 84D.08, or 84D.10, or a rule adopted under section 84D.12, is guilty of a misdemeanor.

(b) A person who refuses to obey an order of a peace officer or conservation officer to remove prohibited exotic species or aquatic macrophytes from any watercraft, trailer, or plant harvesting equipment is guilty of a misdemeanor.

Subd. 4. **Warnings; civil citations.** After appropriate training, conservation officers, other licensed peace officers, and other department personnel designated by the commissioner may issue warnings or citations to a person who:

- (1) unlawfully transports prohibited exotic species or aquatic macrophytes;
- (2) unlawfully places or attempts to place into waters of the state a trailer, a watercraft, or plant harvesting equipment that has prohibited exotic species attached;
- (3) unlawfully angles, anchors, or operates a watercraft in a marked area of a Eurasian water milfoil limited infestation; or
- (4) intentionally damages, moves, removes, or sinks a buoy marking, as prescribed by rule, Eurasian water milfoil.

Subd. 5. **Civil penalties.** A civil citation issued under this section may impose civil penalties up to the following penalty amounts:

- (1) for transporting aquatic macrophytes on a forest road as defined by section 89.001, subdivision 14, road or highway as defined by section 160.02, subdivision 7, or any other public road, \$50;
- (2) for placing or attempting to place into waters of the state a watercraft, a trailer, or plant harvesting equipment that has aquatic macrophytes attached, \$100;
- (3) for transporting a prohibited exotic species other than an aquatic macrophyte, \$100;
- (4) for placing or attempting to place into waters of the state a watercraft, a trailer, or plant harvesting equipment that has prohibited exotic species attached when the waters are not designated by the commissioner as being infested with that species, \$500 for the first offense and \$1,000 for each subsequent offense;
- (5) for angling, anchoring, or operating a watercraft in a marked area of a Eurasian water milfoil limited infestation, other than as provided by law, \$100; and
- (6) for intentionally damaging, moving, removing, or sinking a buoy marking, as prescribed by rule, Eurasian water milfoil, \$100.

Subd. 6. **Watercraft license suspension.** A civil citation may be issued to suspend, for up to a year, the watercraft license of an owner or person in control of a watercraft or trailer who refuses to submit to an inspection under section 84D.02, subdivision 4, or who refuses to comply with a removal order given under section 84D.13.

Subd. 7. **Satisfaction of civil penalties.** A civil penalty is due and a watercraft license suspension is effective 30 days after issuance of the civil citation. A civil penalty collected under this section is payable to the commissioner and must be credited to the water recreation account.

Subd. 8. **Appeal of civil citations and penalties.** A civil citation and penalty may be appealed under the procedures in section 116.072, subdivision 6, if the person to whom the citation was issued

requests a hearing by notifying the commissioner within 15 days after receipt of the citation. If a hearing is not requested within the 15-day period, the citation becomes a final order not subject to further review.

M.S. 84D.14 CERTAIN SPECIES NOT SUBJECT TO CHAPTER.

This chapter does not apply to: (1) pathogens and terrestrial arthropods regulated under Minnesota Statutes, sections 18.44 to 18.61; or (2) mammals and birds defined by statute as livestock.

SELECTED MINNESOTA STATUTES - DEPARTMENT OF NATURAL RESOURCES

M.S. 84.027 POWERS AND DUTIES.

Subd. 13. Game and fish rules.

(a) The commissioner of natural resources may adopt rules under sections 97A.0451 to 97A.0459 and this subdivision that are authorized under:

(1) chapters 97A, 97B, and 97C to set open seasons and areas, to close seasons and areas, to select hunters for areas, to provide for tagging and registration of game, to prohibit or allow taking of wild animals to protect a species, and to prohibit or allow importation, transportation, or possession of a wild animal; and

(2) sections 84.093, 84.14, 84.15, and 84.152 to set seasons for harvesting wild ginseng roots and wild rice and to restrict or prohibit harvesting in designated areas; and

(3) section **84D.12** to designate prohibited exotic species, regulated exotic species, unregulated exotic species, and infested waters.

Clause (2) does not limit or supersede the commissioner's authority to establish opening dates, days, and hours of the wild rice harvesting season under section 84.14, subdivision 3.

(b) If conditions exist that do not allow the commissioner to comply with sections 97A.0451 to 97A.0459, the commissioner may adopt a rule under this subdivision by submitting the rule to the attorney general for review under section 97A.0455, publishing a notice in the State Register and filing the rule with the secretary of state and the legislative commission to review administrative rules, and complying with section 97A.0459, and including a statement of the emergency conditions and a copy of the rule in the notice. The notice may be published after it is received from the attorney general or five business days after it is submitted to the attorney general, whichever is earlier.

(c) Rules adopted under paragraph (b) are effective upon publishing in the State Register and may be effective up to seven days before publishing and filing under paragraph (b), if:

(1) the commissioner of natural resources determines that an emergency exists;

(2) the attorney general approves the rule; and

(3) for a rule that affects more than three counties the commissioner publishes the rule once in a legal newspaper published in Minneapolis, St. Paul, and Duluth, or for a rule that affects three or fewer counties the commissioner publishes the rule once in a legal newspaper in each of the affected counties.

(d) Except as provided in paragraph (e), a rule published under paragraph (c), clause (3), may not be effective earlier than seven days after publication.

(e) A rule published under paragraph (c), clause (3), may be effective the day the rule is published if the commissioner gives notice and holds a public hearing on the rule within 15 days before publication.

(f) The commissioner shall attempt to notify persons or groups of persons affected by rules adopted under paragraphs (b) and (c) by public announcements, posting, and other appropriate means as determined by the commissioner.

(g) Notwithstanding section 97A.0458, a rule adopted under this subdivision is effective for the period stated in the notice but not longer than 18 months after the rule is adopted.

M.S. 86B.415 LICENSE FEES.

Subd. 7. **Watercraft surcharge.** A \$5 surcharge is placed on each watercraft license under subdivisions 1 to 5, for control, public awareness, law enforcement, monitoring, and research of nuisance aquatic exotic species such as zebra mussel, purple loosestrife and Eurasian water milfoil in public waters and public wetlands.

History: 1990 c 391 art 9 s 24; 1991 c 199 art 1 s 12; 1991 c 254 art 2 s 19; 1992 c 594 s 10; 1993 c 235 s 3; 1995 c 220 s.

M.S. 97A.105 GAME AND FUR FARMS.Subdivision. 1, **License requirements.**

(a) A person may breed and propagate fur-bearing animals, game birds, bear, moose, elk, caribou, **mute swans**, or deer only on privately owned or leased land and after obtaining a license. Any of the permitted animals on a game farm may be sold to other licensed game farms. "Privately owned or leased land" includes waters that are shallow or marshy, are not actually navigable, and are not of substantial beneficial public use. Before an application for a license is considered, the applicant must enclose the area to sufficiently confine the animals to be raised in a manner approved by the commissioner. A license may be granted only if the commissioner finds the application is made in good faith with intention to actually carry on the business described in the application and the commissioner determines that the facilities are adequate for the business.

(b) A person may purchase live game birds or their eggs without a license if the birds or eggs, or birds hatched from the eggs, are released into the wild, consumed, or processed for consumption within one year after they were purchased or hatched. This paragraph does not apply to the purchase of migratory waterfowl or their eggs.

(c) A person may not introduce **mute swans** into the wild without a permit issued by the commissioner.

M.S. 97A.205 ENFORCEMENT OFFICER POWERS.

An enforcement officer is authorized to:

- (1) execute and serve court issued warrants and processes relating to wild animals, wild rice, public waters, water pollution, conservation, and use of water, in the same manner as a constable or sheriff;
- (2) enter any land to carry out the duties and functions of the division;
- (3) make investigations of violations of the game and fish laws;
- (4) take an affidavit, if it aids an investigation;
- (5) arrest, without a warrant, a person who is detected in the actual violation of the game and fish laws, a provision of chapters 84, 84A, **84D**, 85, 86A, 88 to 97C, 103E, 103F, 103G, sections 86B.001 to 86B.815, 89.51 to 89.61; or 609.66, subdivision 1, clauses (1), (2), (5), and (7); and 609.68; and (6) take an arrested person before a court in the county where the offense was committed and make a complaint. Nothing in this section grants an enforcement officer any greater powers than other licensed peace officers.

M.S. 97A.221 SEIZURE AND CONFISCATION OF PROPERTY.

Subdivision 1. **Property subject to seizure and confiscation.** (a) An enforcement officer may seize:

- (1) wild animals, wild rice, and other aquatic vegetation taken, bought, sold, transported, or possessed in violation of the game and fish laws or chapter 84 or **84D** ; ...

SELECTED MINNESOTA STATUTES - NOXIOUS WEEDS**M.S. 18.75 PURPOSE**

It is the policy of the legislature that residents of the state be protected from the injurious effects of noxious weeds on public health, the environment, public roads, crops, livestock, and other property. Sections 18.76 to 18.88 contain procedures for controlling and eradicating noxious weeds on weeds on all lands within the state.

M.S. 18.76 CITATION.

Sections 18.76 to 18.88 may be cited as the "Minnesota noxious weed law."

M.S. 18.77 DEFINITIONS.

Subd. 8. **Noxious weed.** "Noxious weed" means an annual, biennial, or perennial plant that the commissioner (of agriculture) designates to be injurious to public health, the environment, public roads, crops, livestock, or other property. (MN Department of Agriculture Commissioner's Order declares purple loosestrife, both *L. salicaria* and *L. virgatum* to be a noxious weed.)

M.S. 18.78 CONTROL OR ERADICATION OF NOXIOUS WEEDS.

Subdivision 1. **Generally** Except as provided in section 18.85, a person owning land, a person occupying land, or a person responsible for the maintenance of public land shall control or eradicate all noxious weeds on the land at a time and in a manner ordered by the commissioner (of agriculture), a county agricultural inspector, or a local weed inspector.

Subdivision 2. **Control of purple loosestrife** Except as provided below, an owner of nonfederal lands underlying public waters or wetlands designated under section 103G.201 is not required to control or eradicate purple loosestrife below the ordinary high water level of the public water or wetland. The commissioner of natural resources is responsible for control and eradication of purple loosestrife on public waters and wetlands designated under section 103G.201, except those located upon lands owned in fee title or managed by the United States. The officers, employees, agents and contractors of the commissioner of natural resources may enter upon public waters and wetlands designated under section 103G.201 and, after providing notification to the occupant or owner of the land, may cross adjacent lands as necessary for the purpose of investigating purple loosestrife infestations, formulating methods of eradication, and implementing control and eradication of purple loosestrife. The commissioner, after consultation with the commissioner of agriculture, shall, by June 1 of each year, compile a priority list of purple loosestrife infestations to be controlled in designated public waters. The commissioner of agriculture must distribute the list to county agriculture inspectors, local weed inspectors, and their appointed agents. The commissioner of natural resources shall control listed purple loosestrife infestations in priority order within the limits of appropriations provided for that purpose. This procedure shall be the exclusive means for control of purple loosestrife on designated public waters by the commissioner of natural resources and shall supersede the other provisions for control of noxious weeds set forth elsewhere in Minnesota Statutes, chapter 18. The responsibility of the commissioner to control and eradicate purple loosestrife on public waters and wetlands located on private lands and the authority to enter upon private lands ends ten days after receipt by the commissioner of natural resources of a written statement from the landowner that the landowner assumes all responsibility for control and eradication of purple loosestrife under sections 18.78 to 18.88. State officers, employees, agents, and contractors of the commissioner of natural resources are not liable in a civil action for trespass committed in the discharge of their duties under this section and are not liable to anyone for damages, except for damages arising from gross negligence.

M.S. 18.79 DUTIES OF THE COMMISSIONER [OF AGRICULTURE].

Subd. 1. **Enforcement.** The commissioner of agriculture shall administer and enforce sections 18.76 to 18.88.

Subd. 4. **Rules.** The commissioner may adopt necessary rules under chapter 14 for the proper enforcement of sections 18.76 to 18.88.

Subd. 5. **Order For Control Or Eradication Of Noxious Weeds.** The commissioner [of agriculture], a county agricultural inspector, or a local weed inspector may order the control or eradication of noxious weeds on any land within the state.

MINNESOTA STATUTES - RESTRICTED SPECIES**M.S. 17.457 RESTRICTED SPECIES.**

Subdivision 1. **Definitions.** (a) The definitions in this subdivision apply to this section.

(b) "Commissioner" means the commissioner of agriculture.

(c) "Restricted species means Eurasian wild pigs and their hybrids (*Sus scrofa* subspecies and *Sus scrofa* hybrids), excluding domestic hogs (*Sus scrofa domesticus*).

(d) "Release" means an intentional introduction or escape of a species from the control of the owner or responsible party.

Subd. 2. **Importation; possession; release of restricted species.** It is unlawful for a person to import, possess, propagate, transport, or release restricted species, except as provided in subdivision 3.

Subd. 3. **Permits.** (a) The commissioner may issue permits for the transportation, possession, purchase, importation of restricted species for scientific, research, education, or commercial purposes. A permit issued under this subdivision may be revoked by the commissioner if the conditions of the permit are not met by the permittee or for any unlawful act or omission, including accidental escapes.

(b) The commissioner may issue permits for a person to possess and raise a restricted species for commercial purposes if the person was in possession of the restricted species on March 1, 1993. Under the permit, the number of breeding stock of the restricted species in the possession of the person may not increase by more than 25 percent and the person must comply with the certification requirements in subdivision 7.

(c) A person may possess a restricted species without a permit for a period not to exceed two days for the purpose of slaughtering the restricted species for human consumption.

Subd. 4. **Notice of escape of restricted species.** In the event of an escape of a restricted species, the owner must notify within 24 hours a conservation officer and the board of animal health and is responsible for the recovery of the species. The commissioner may capture or destroy the escaped animal at the owner's expense.

Subd. 5. **Enforcement.** This section may be enforced under sections 97A.205 and 97A.211.

Subd. 6. **Penalty.** A person who violates subdivision 2, 4, or 7 is guilty of a misdemeanor.

Subd. 7. **Certification and identification and identification requirements.** (a) A person who possesses restricted species on July 1, 1993, must submit certified numbers of restricted species in the person's possession to the board of animal health by June 1, 1993.

(b) Restricted species in the possession of a person must be marked in a permanent fashion to identify ownership. The restricted species must be marked as soon as practicable after birth or purchase.

Subd. 8. **Containment.** The commissioner, in consultation with the commissioner of natural resources, shall develop criteria for approved containment measures for restricted species with the assistance of producers of restricted species.

Subd. 9. **Bond; security.** A person who possesses restricted species must file a bond or deposit with the commissioner security in the form and amount determined by the commissioner to pay for the costs and damages caused by an escape of restricted species.

Subd. 10. **Fee.** The commissioner shall impose a fee for permits in an amount sufficient to cover the costs of issuing the permits and for facility inspections. The fee may not exceed \$50. Fee receipts must be deposited in the state treasury and credited to the special revenue fund and are appropriated to the commissioner for the purposes of this section.

History: 1993 c 129 s 3; 1994 c 623 art 1 s 16-18, 46.

Appendix B - Minnesota Rules Regarding Harmful Exotic Species (as amended by emergency rule)

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WATERWAY MARKERS

6110.1500, Subp. 7. Milfoil areas. Buoys or signs indicating an area that is infested with Eurasian watermilfoil may be marked using a solid yellow sign or buoy. If a buoy is used, it shall be no less than four inches in diameter and extend at least 30 inches above the surface of the water. The words "Milfoil Area" must appear on opposing sides of the buoy in at least two-inch high black letters. If a sign is used, it shall be no more than 12 inches in width or more than 18 inches in height and extend 30 inches above the surface of the water at normal water level. The words "Milfoil Area" must appear on the sign in at least two-inch high black letters.

MINNESOTA RULES CHAPTER 6216 - HARMFUL EXOTIC SPECIES

(Revised June 26, 2000 and as amended by emergency rule)

6216.0100 PURPOSE.

The purpose of parts 6216.0100 to 6216.0600 is to prevent the spread of harmful exotic species, including prohibited and regulated exotic aquatic plants and wild animals, into and within the state as authorized by Minnesota Statutes, sections 17.497 and 84D.12, while allowing flexibility for conditional possession of harmful exotic species. Parts 6216.0100 to 6216.0600 also provide a public process for designation of infested waters and classification and designation of exotic species according to criteria in statute.

STAT AUTH: MS s 84.9691; 84D.12

HIST: 20 SR 2292(NO. 43); L 1996 c 385 art 2 s 7; 22 SR 2076

6216.0200 DEFINITIONS.

Subpart 1. **Scope.** For the purposes of parts 6216.0100 to 6216.0600, the terms used have the meanings given to them in Minnesota Statutes, section 84D.01, unless otherwise noted in this part.

Subp. 1a. **Applicant.** "Applicant" means a person who applies for a Minnesota Department of Natural Resources prohibited exotic species permit or regulated exotic species permit according to part 6216.0265, a water appropriation permit or public works permit according to Minnesota Statutes, chapter 103G, or an infested water permit according to part 6216.0500, subpart 6, or who requests a determination of the appropriate classification of an unlisted exotic species for introduction according to Minnesota Statutes, section 84D.06.

Subp. 2. **Commissioner.** "Commissioner" means the commissioner of natural resources of Minnesota or the commissioner's designated representative.

Subp. 3. **Department.** "Department" means the Minnesota Department of Natural Resources.

Subp. 3a. **Free-living state.** "Free-living state" means to be unconfined or outside the control of a person, and:

A. in the case of animals other than fish, includes the ability to fly, walk, or swim out of human control;

B. in the case of a fish or aquatic plants, the following locations shall be considered to be in a free-living state:

- (1) waters identified as public waters;
- (2) natural or artificial waters that are continually or intermittently connected to public waters; or
- (3) water-using facilities, such as fish hatcheries, aquatic farms, zoos, and minnow retail or wholesale operations, with outflows that provide direct access for species to enter public waters; and

C. in the case of a fish or aquatic plant, the following locations are not considered a free-living state:

- (1) artificial ponds such as water gardens that have no outlet to public waters;
- (2) waters whose shorelines are entirely within the land owned by a person, not continually or intermittently connected to public waters, and not identified by the department as public waters; or
- (3) water-using facilities, such as fish hatcheries, aquatic farms, zoos, and minnow retail or wholesale operations, with outflows that do not provide direct access for species to enter public waters.

Subp. 4. **Repealed, 22 SR 2076**

Subp. 4a. **Introduction.** "Introduction" has the meaning given in Minnesota Statutes, section 84D.01, subdivision 9. Introduction does not include the immediate return of an exotic species to waters of the state from which it was removed.

"Introduce" means the act of introduction.

Subp. 5. **Littoral area.** "Littoral area" means any part of a body of water 15 feet deep or less.

Subp. 6. **Person.** "Person" has the meaning given in Minnesota Statutes, section 645.44, subdivision 7.

Subp. 7. **Public waters.** "Public waters" means public waters as defined under Minnesota Statutes, section 103G.005, subdivision 15, that have been designated as public waters under the public waters inventory pursuant to Minnesota Statutes, section 103G.201.

STAT AUTH: MS s 84.9691; 84D.12

HIST: 20 SR 2292(NO. 43); L 1996 c 385 art 2 s 7; 22 SR 2076

6216.0230 NOMENCLATURE.

The scientific taxonomic nomenclature used in parts 6216.0100 to 6216.0600 follows the nomenclature assigned by the following sources, which are incorporated by reference. The sources are available through the Minitex interlibrary loan system and are not subject to frequent change:

A. The American Fisheries Society, Common and Scientific Names of Fishes from the United States and Canada (fifth edition 1991);

B. John J. Mayer and I. Lehr Brisbin, Jr., Wild Pigs in the United States (1991);

C. The American Ornithologists' Union, Checklist of North American Birds (sixth edition 1983 and subsequent supplements);

D. John T. Kartesz, A Synonymized Checklist of the Vascular Flora of the United States, Canada, and Greenland (second edition 1994);

E. Ronald M. Nowak, Walker's Mammals of the World (fifth edition 1991);

F. A.J. Healy and Elizabeth Edgar, Flora of New Zealand, volume III (1980);

G. C.J. Webb, W.R. Sykes, and P.J. Garnock-Jones, Flora of New Zealand, volume IV (1988); and

H. Flora of North America Editorial Committee, Flora of North America North of Mexico, volume 3 (1997) (for waterlilies only).

STAT AUTH: MS s 84D.12

HIST: 22 SR 2076

6216.0250 PROHIBITED EXOTIC SPECIES.

Subpart 1. **Designation.** The species in subparts 2 to 5 and any hybrids, cultivars, or varieties of the species are designated as prohibited exotic species.

Subp. 2. **Aquatic plants.** The following aquatic plants are designated as prohibited exotic species:

A. African oxygen weed (*Lagarosiphon major*) (Ridley) Moss ex Wagner;

B. aquarium watermoss or giant salvinia (*Salvinia molesta*) Mitchell;

C. Australian stonecrop (*Crassula helmsii*) (Kirk) Cockayne;

D. curly-leaf pondweed (*Potamogeton crispus*) Linnaeus;

E. Eurasian water milfoil (*Myriophyllum spicatum*) Linnaeus;

F. European frog-bit (*Hydrocharis morsus-ranae*) Linnaeus;

G. flowering rush (*Butomus umbellatus*) Linnaeus;

H. hydrilla (*Hydrilla verticillata*) (Carl von Linnaeus) Royle;

I. Indian swampweed (*Hygrophila polysperma*) (Roxburgh) T. Anders;

J. purple loosestrife (*Lythrum salicaria*, *Lythrum virgatum*, or any variety, hybrid, or cultivar thereof) Linnaeus;

K. water aloe or water soldiers (*Stratiotes aloides*) Linnaeus; and

L. water chestnut (*Trapa natans*) Linnaeus.

Subp. 3. **Fish.** The following fish are designated as prohibited exotic species:

A. bighead carp (*Hypophthalmichthys nobilis*) Richardson;

B. black carp (*Mylopharyngodon piceus*) (Richardson) Peters;

C. grass carp (*Ctenopharyngodon idella*) Valenciennes;

D. round goby (*Neogobius melanostomus*);

E. rudd (*Scardinius erythrophthalmus*) Linnaeus;

F. ruffe (*Gymnocephalus cernuus*) Linnaeus;

G. sea lamprey (*Petromyzon marinus*) Linnaeus;

H. silver carp (*Hypophthalmichthys molitrix*) Valenciennes;

I. white perch (*Morone americana*) Gmelin; and

J. zander (*Stizostedion lucioperca*) Linnaeus.

Subp. 4. **Invertebrates.** The following invertebrate is designated as a prohibited exotic species:
zebra mussel (*Dreissena* spp.).

Subp. 5. **Mammals.** The following mammals are designated as prohibited exotic species:

A. Asian raccoon dog, also known as finnraccoon (*Nyctereutes procyonoides*);

B. Eurasian swine, European wild boar (*Sus scrofa scrofa*) Linnaeus;

C. European rabbit (*Oryctolagus cuniculus*); and

D. nutria, any strain (*Myocastor coypu*).

STAT AUTH: MS s 84.9691; 84D.12

HIST: 20 SR 2292(NO. 43); L 1996 c 385 art 2 s 7; 22 SR 2076

6216.0260 REGULATED EXOTIC SPECIES.

Subpart 1. **Designation.** The species in subparts 2 to 5 are designated as regulated exotic species.

Subp. 2. **Aquatic plants.** The following aquatic plants are designated as regulated exotic species:

A. Carolina fanwort or fanwort (*Cabomba caroliniana*) A. Gray;

B. parrot's feather (*Myriophyllum aquaticum*) (da Conceicao Vellozo) Verdcourt; and

C. nonnative waterlilies (*Nymphaea* spp.) Linnaeus, or any variety, hybrid, or cultivar thereof. Native Minnesota waterlilies are: *Nymphaea odorata* Aiton subsp. *odorata* Aiton, *N. leibergerii* Morong, and *N. Odorata* Aiton subsp. *tuberosa* (Paine) Wiersema & Hellquist.

Subp. 3. **Fish.** The following fish are designated as regulated exotic species:

A. alewife (*Alosa pseudoharengus*) Wilson;

B. common carp, koi (*Cyprinus carpio*) Linnaeus;

C. goldfish (*Carassius auratus*) Linnaeus;

D. rainbow smelt (*Osmerus mordax*) Mitchell; and

E. tilapia (*Tilapia*, *Oneochromis*, *Sartheradon* spp.).

Subp. 4. **Invertebrates.** The following invertebrates are designated as regulated exotic species:

A. Chinese mystery snail, Japanese trap door snail (*Cipangopaludina* spp.) Hannibal;

B. rusty crayfish (*Orconectes rusticus*) Girard; and

C. spiny water flea (*Bythotrephes cederstroemi*) Schoedler.

Subp. 5. **Birds.** The following birds are designated as regulated exotic species:

A. Egyptian goose (*Alopochen aegyptia*) Linne;

B. mute swan (*Cygnus olor*) Gmelin; and

C. Sichuan pheasant (*Phasianus colchicus strachii*).

STAT AUTH: MS s 84D.12

HIST: 22 SR 2076

6216.0265 PERMITS FOR PROHIBITED AND REGULATED EXOTIC SPECIES.

Subpart 1. **Requirement.** No person may possess, import, purchase, propagate, or transport a prohibited exotic species without a permit from the commissioner issued according to this part, except as authorized by Minnesota Statutes, section 84D.05. No person may introduce a regulated exotic species without a permit from the commissioner issued according to this part, except as authorized in subpart 2. A regulated exotic species permit is not required for a person to possess, import, purchase, propagate, transport, own, or sell a regulated exotic species.

Subp. 2. **Exemptions and alternate permits for regulated exotic species.** In lieu of an additional permit issued under Minnesota Statutes, section 84D.11, permits and licenses issued under Minnesota Statutes, sections 17.4981 to 17.4994 and chapter 97C, and rules adopted thereunder, may authorize the introduction of regulated exotic species, provided that the conditions specified in those permits and licenses are in accordance with the conditions specified under this part.

Subp. 3. **Prohibited exotic species permit limitation.** A person may apply for a permit for prohibited exotic species only for the purposes of disposal, control, research, or education according to Minnesota Statutes, section 84D.11, subdivision 1.

Subp. 4. **Eligibility; prohibited exotic species permit.** An applicant for a prohibited exotic species permit must:

A. have experience in the skills necessary for handling potentially harmful species, including:

(1) knowledge of precautions necessary to prevent spread through handling; or

- (2) previous experience handling harmful exotic species without allowing escapes;
- B. maintain a facility or transportation equipment that prevents the escape of exotic species;
- C. if the applicant is an individual, be at least 18 years of age at the time the application is received by the department; and
- D. if the applicant is a corporation, limited partnership, or other business entity, be qualified to do business in Minnesota as shown by a certificate of authority to transact business in Minnesota or a certificate of limited partnership from the Minnesota Secretary of State.

Subp. 5. Permit application.

A. Written application for a permit for a prohibited or regulated exotic species shall be made on a form prescribed by the commissioner and shall contain the following:

- (1) the legal name, address, daytime and evening telephone numbers, and, if an individual, date of birth of the applicant;
 - (2) the scientific and common names of either the prohibited exotic species that the applicant desires to propagate, possess, import, purchase, or transport or the regulated exotic species that the applicant desires to introduce;
 - (3) a detailed description of the activity the applicant will be undertaking;
 - (4) a detailed description of the facilities or transportation equipment to be used and an explanation of how the equipment is sufficient to prevent an unauthorized introduction of a prohibited exotic species;
 - (5) a description of the applicant's experience in handling the same or similar species;
 - (6) a written contingency plan for eradication or recapture in the event of an unauthorized introduction of the prohibited exotic species; and
 - (7) an agreement to comply with the requirements of parts 6216.0100 to 6216.0600.
- B. The commissioner may request additional information from the applicant in writing after the application is received if necessary to evaluate the potential risk to the state's resources.
- C. The commissioner shall review the permit applications and respond to the applicant within 30 days of receipt of the application or the additional information requested in item B.

Subp. 6. Inspection of facilities or equipment. After receipt of an application for a prohibited exotic species permit, and a determination by the commissioner that the applicant has satisfied all the initial requirements for a permit as described in this part, the commissioner may inspect the applicant's holding facilities or other containment or transportation equipment. Facilities holding prohibited exotic species under permit are subject to inspection by the commissioner at any reasonable time.

Subp. 7. Transferability. A permit issued under this part is not transferable.

Subp. 8. Expiration date and renewal. All prohibited exotic species and regulated exotic species permits expire at midnight on December 31 of each year, unless otherwise specified in the permit. Applications for renewal of permits shall be made by October 1 of the year the permit expires. Applications for renewal shall describe any changes to the information initially required in subpart 5.

Subp. 9. Revocation of permit.

- A. The commissioner may revoke all or part of a permit issued under this part when:
- (1) the commissioner determines that a permittee has failed to comply with parts 6216.0100 to 6216.0600; or
 - (2) it is necessary to protect the interests of the public, to protect native plant and animal populations in the state, or to otherwise protect the state's natural resources.
- B. Except in an emergency situation when delay would threaten the state's natural resources, the commissioner shall, at least 14 days prior to the effective date of the revocation, inform the permit holder in writing of the nature of the revocation and of the conditions that, in the commissioner's opinion, require revocation.
- C. Within 30 days of receipt of a notice of revocation, the permit holder may apply for an amendment to the permit or request a hearing before the commissioner to contest the revocation, to support the permit holder's proposed amendment, or both.
- D. The permit shall be revoked on the date stated on the revocation notice until such time that the decision is reversed or modified.

Subp. 10. Disclaimer of liability. A prohibited exotic species permit or regulated exotic species permit issued under this part is permissive only. No liability is assumed by the state or any of its officers, agents, or employees by issuing a prohibited or regulated exotic species permit or by any acts or operations of the permittee or any prohibited or regulated exotic species in possession of the permittee.

Subp. 11. **Effective date.** A person possessing, importing, purchasing, selling, propagating, transporting, or introducing a prohibited exotic species on June 2, 1998, must apply for a permit within 60 days of June 2, 1998.

STAT AUTH: MS s 84D.12

HIST: 22 SR 2076

6216.0270 UNREGULATED EXOTIC SPECIES.

Subpart 1. **Designation.** The species in subparts 2 to 5 are designated as unregulated exotic species. These exotic species are not subject to regulation under Minnesota Statutes, chapter 84D.

Subp. 2. **Fish.** The following fish are designated as unregulated exotic species:

- A. Atlantic salmon (*Salmo salar*) Linnaeus;
- B. brown trout (*Salmo trutta*) Linnaeus;
- C. coho salmon (*Oncorhynchus kisutch*) Walbaum;
- D. Chinook salmon (*Oncorhynchus tshawytscha*) Walbaum;
- E. pink salmon (*Oncorhynchus gorbuscha*) Walbaum;
- F. rainbow trout (*Oncorhynchus mykiss*) Walbaum; and
- G. subtropical, tropical, and saltwater fish, except anadromous species.

Subp. 3. **Invertebrates.** The following invertebrates are designated as unregulated exotic species: subtropical, tropical, and saltwater invertebrates.

Subp. 4. **Mammals.** The following mammal is designated as an unregulated exotic species: rat (*Rattus norvegicus* and *Rattus rattus*).

Subp. 5. **Birds.** The following birds are designated as unregulated exotic species:

- A. chuckar partridge (*Alectoris chuckar*) Gray;
- B. helmeted Guinea fowl (*Numida meleagris*) Linnaeus;
- C. house sparrow (*Passer domesticus domesticus*) Linnaeus;
- D. Hungarian partridge, gray partridge (*Perdix perdix*) Linnaeus;
- E. peafowl (*Pavo cristatus*) Linnaeus;
- F. pigeon or rock dove (*Columba livia*) Gmelin;
- G. ring-necked pheasant (*Phasianus colchicus*) Linnaeus; and
- H. starling (*Sturnus vulgaris vulgaris*) Linnaeus.

STAT AUTH: MS s 84D.12

HIST: 22 SR 2076

6216.0280 ESCAPE OF EXOTIC SPECIES.

Subpart 1. **Reporting.** To report an unauthorized introduction of prohibited, regulated, or unlisted exotic animal species, in compliance with Minnesota Statutes, section 84D.10, a person shall notify the department's area or regional conservation officer or the exotic species program staff in the department's St. Paul office by telephone within 48 hours after learning of the unauthorized introduction.

Subp. 2. **Information required.** The following information shall be provided to the department about the unauthorized introduction:

- A. the quantity and species;
- B. the location of the introduction;
- C. the date and time the introduction occurred or was discovered;
- D. the last known location of the species; and
- E. the reporter's address and daytime and evening telephone numbers.

STAT AUTH: MS s 84D.12

HIST: 22 SR 2076

6216.0290 PROCESS FOR REVIEW OF PROPOSED INTRODUCTIONS OF UNLISTED EXOTIC SPECIES.

Subpart 1. **Applications and information required.**

A. A person who seeks to introduce an unlisted exotic species in the state according to Minnesota Statutes, section 84D.06, shall submit an application on a form prescribed by the commissioner. The form shall request the following information:

- (1) the name, address, and telephone number of the applicant;

- (2) the scientific and common names, family, and reference used for the scientific name of the unlisted exotic species proposed for introduction;
- (3) the number of individual plants or animals proposed for introduction;
- (4) the reason and need for the proposed introduction;
- (5) the potential to use native species for the same purpose;
- (6) the location for the proposed introduction;
- (7) scientific-based information about the native range of the unlisted exotic species;
- (8) the source of the actual individual organisms proposed to be introduced;
- (9) scientific-based information about the ability of the unlisted exotic species to naturalize, displace native species, and harm natural resources or their use in similar climates and latitudes; and
- (10) an assessment of the potential adverse impacts on native Minnesota species and ecosystems, including scientific-based information about:
 - (a) the potential to introduce disease or parasites to native fish or wildlife populations;
 - (b) the potential for interbreeding or hybridizing with native fish or wildlife;
 - (c) the potential predation on native fish or wildlife; and
 - (d) any possible competition with native fish, wildlife, or aquatic plants for food, habitat, water, or other resources.

B. The commissioner may request additional information in writing after the application is received if necessary to assess the potential impacts of an introduction.

Subp. 2. **Application review.** The commissioner shall reject an application within ten working days after receipt of the application if the application does not contain the information required in subpart 1.

Subp. 3. **Review period.** Within 60 days of receipt of an application that contains the information in subpart 1, the commissioner shall assess the apparent risk of the introduction in the state and classify the species according to Minnesota Statutes, section 84D.04, subdivision 2. If the commissioner determines during the 60-day period that there should be a public comment period for the proposed introduction, or the commissioner determines that additional information is necessary to adequately evaluate the proposed introduction, the commissioner may extend the review period and state the basis of the extension in writing to the applicant. The review period may be extended to a date 30 days from the end of the public comment period or receipt by the department of the additional information requested from the applicant.

Subp. 4. **Review process.** Prior to classification of an unlisted exotic species and making a final assessment on a proposed introduction, the commissioner may:

- A. seek information and opinions from technical experts;
- B. solicit public comment and hold public hearings on the proposed introduction;
- C. consult with other potentially affected jurisdictions; and
- D. in the case of an animal species, request a certificate of veterinary inspection or other appropriate certification that the animal is pathogen-free.

Subp. 5. **Comment period and comments.** If the commissioner determines that a public comment period is necessary on the proposed introduction, the commissioner shall promptly proceed to publish a notice in the EQB Monitor, which is published by the Environmental Quality Board. A 30-day period for review and comment begins the day a notice of the public comment period is published in the EQB Monitor. Written comments to the commissioner during the public comment period may address the accuracy and completeness of material contained in the application, additional information regarding the proposed introduction that is not contained in the application, or potential impacts that may warrant further investigation before the commissioner acts on the proposed introduction.

Subp. 6. **Designation and notification.** After completion of the review of a proposal to introduce an unlisted exotic species and making a determination of the appropriate classification, the commissioner shall designate the species and notify the applicant as required under Minnesota Statutes, section 84D.06.

STAT AUTH: MS s 84D.12

HIST: 22 SR 2076

6216.0300 DESIGNATION, NOTICE, AND MARKING OF INFESTED WATERS.

Subpart 1. **Designation of infested waters and notice.** The commissioner shall designate infested waters. The commissioner shall publish the names of designated water bodies in the State Register before May 1 of each year and provide notice through other available means where practical. The

department shall post signs describing the infestation at all public accesses to designated water bodies. At any time, the commissioner may designate additional water bodies or remove from designation those water bodies which no longer are infested waters.

STAT AUTH: MS s 84.9691; 84D.12

HIST: 20 SR 2292(NO. 43); 22 SR 2076

6216.0350 DESIGNATED INFESTED WATERS.

Subpart 1. **Listing of waters infested with Eurasian water milfoil.** The following water bodies are designated by the commissioner as infested with Eurasian water milfoil (*Myriophyllum spicatum*). Activities at these waters are subject to parts 6216.0100 to 6216.0600, Minnesota Statutes, section 84D.13, and other applicable laws.

		DNR Protected Waters
Name		Inventory Number
A. Anoka County		
(1) Cenaiko Lake		02-0654
(2) Centerville lake		02-0006
(3) Crooked Lake		02-0084
(4) Lake George		02-0091
(5) Otter Lake		02-0003
(6) Peltier		02-0004
(7) Unnamed lake in Springbrook Nature Center		02-0688
B. Carver County		
(1) Ann Lake		10-0012
(2) Auburn Lake		10-0044
(3) Bavaria Lake		10-0019
(4) Firemen's Lake		10-0226
(5) Lotus Lake		10-0006
(6) Lake Minnewashta		10-0009
(7) Pierson Lake		10-0053
(8) Riley Lake		10-0002
(9) Schutz Lake		10-0018
(10) Stone Lake		10-0056
(11) Lake Virginia		10-0015
(12) Lake Waconia		10-0059
(13) Lake Zumbra		10-0041
C. Chisago County		
(1) Ellen lake		13-0047
(2) Green Lake		13-0041
(3) Rush Lake		13-0069
D. Crow Wing County		
(1) Bay Lake		18-0034
(2) Ripple river, between Bay Lake and Tame Fish lake		18-0000
(3) Ruth Lake		18-0212
E. Dakota County		
(1) Crystal Lake		19-0027
(2) Lac Lavon		19-0347
(3) Lake Marion		19-0026
(4) Schultz lake		19-0075
(5) Twin Lakes		19-0028
F. Douglas County		
(1) Oscar Lake		21-0257

G. Hennepin County

(1) Arrowhead Lake	27-0045
(2) Bass lake	27-0098
(3) Brownie Lake	27-0038
(4) Bryant Lake	27-0067
(5) Bush Lake	27-0047
(6) Lake Calhoun	27-0031
(7) Cedar Lake	27-0039
(8) Christmas Lake	27-0137
(9) Dutch Lake	27-0181
(10) Eagle Lake	27-0111
(11) Fish Lake	27-0118
(12) Forest Lake	27-0139
(13) Gleason lake	27-0095
(14) Lake Harriet	27-0016
(15) Hiawatha Lake	27-0018
(16) Lake Independence	27-0176
(17) Lake of the Isles	27-0040
(18) Libbs Lake	27-0085
(19) Little Long Lake	27-0179
(20) Long Lake	27-0160
(21) Medicine Lake	27-0104
(22) Minnehaha Creek	27-0000
(23) Lake Minnetonka	27-0133
(24) Niccum's Pond	private
(25) Lake Nokomis	27-0019
(26) Parker's Lake	27-0107
(27) Peavy Lake	27-0138
(28) Lake Rebecca	27-0192
(29) Rice Lake	27-0116
(30) Round Lake	27-0071
(31) Lake Sarah	27-0191
(32) Schmidt Lake	27-0102
(33) Swan Lake	27-0000
(34) Tanager Lake	27-0141
(35) unnamed wetland	27-0900
(36) Whaletail Lake	27-0184
(37) Wirth Lake	27-0037

H. Isanti County

(1) Green Lake	30-0136
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I. Itasca County

(1) Ice Lake	31-0372
(2) McKinney Lake	31-0370
(3) North Twin	310-190

J. Kanabec County

(1) Knife Lake	33-0028
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K. Kandiyohi County

(1) Green Lake	34-0079
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L. Meeker county

(1) Stella Lake	47-0068
(2) Lake Washington	47-0046

M. Mille Lacs county

(1) Lake Mille Lacs	48-0002
(2) from the mouths of each tributary of Lake Mille Lacs upstream to the first public road	

N. Olmsted County	
(1) George Lake	55-0008
O. Pope County	
(1) Gilchrist Lake	61-0072
(2) Lake Minnewaska	61-0130
P. Ramsey County	
(1) Bald Eagle Lake	62-0002
(2) Lake Gervais	62-0007
(3) Island Lake	62-0075
(4) Keller Lake	62-0010
(5) Kohlmans Lake	62-0006
(6) McCarron Lake	62-0054
(7) Lake Owasso	62-0056
(8) Phalen Lake	62-0013
(9) Round Lake	62-0012
(10) Silver Lake	62-0001
(11) Spoon creek, between Keller and Phalen lakes	62-0000
(12) Snail lake	62-0073
(13) Sucker Lake	62-0028
(14) Turtle Lake	62-0061
(15) Lake Vadnais	62-0038
(16) Lake Wabasso	62-0082
Q. St. Louis County	
(1) Gilbert Pit Lake	69-1306
R. Scott County	
(1) Lower Prior Lake	70-0026
(2) Upper Prior Lake	70-0072
S. Stearns county	
(1) unnamed wetland along Clearwater river	73-0312
T. Todd County	
(1) Sauk Lake	77-0150
U. Washington County	
(1) Powers Lake	82-0092
(2) White Bear Lake	82-0167
(3) St. Croix River	82-0001
V. Wright County	
(1) Augusta Lake	86-0284
(2) Beebe Lake	86-0023
(3) Buffalo Lake	86-0090
(4) Clearwater Lake	86-0252
(5) Clearwater River, downstream of Clearwater Lake	86-0000
(6) Deer Lake	86-0107
(7) Goose Lake	86-0108
(8) Lake Mary	86-0156
(9) Little Waverly Lake	86-0106
(10) Lake Pulaski	86-0053
(11) Rock Lake	86-0182
(12) Sugar Lake	86-0233
(13) Waverly Lake	86-0114
U. Multiple Counties	
(1) Mississippi River, downstream of St. Anthony Falls	

Subp. 2. **Listing of waters infested with round goby.** The following water bodies are designated by the commissioner as infested with round goby (*Neogobius melanostomus*). Activities at these waters are subject to parts 6216.0100 to 6216.0600, Minnesota Statutes, section 84D.13, and other applicable laws.

DNR Protected Waters

Name	Inventory Number
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Multiple Counties	
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(1) Lake Superior	16-0001
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(2) St. Louis River, downstream of the Fond du Lac dam	
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Subp. 3. **Listing of waters infested with ruffe.** The following water bodies are designated by the commissioner as infested with ruffe (*Gymnocephalus cernuus*). Activities at these waters are subject to parts 6216.0100 to 6216.0600, Minnesota Statutes, section 84D.13, and other applicable laws.

DNR Protected Waters

Name	Inventory Number
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Multiple Counties	
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(1) Lake Superior	16-0001
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(2) St. Louis River, downstream of the Fond du Lac dam	
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Subp. 4. **Listing of waters infested with spiny water flea.** The following water bodies are designated by the commissioner as infested with spiny water flea (*Bythotrephes cederstroemi*). Activities at these waters are subject to parts 6216.0100 to 6216.0600, Minnesota Statutes, section 84D.13, and other applicable laws.

DNR Protected Waters

Name	Inventory Number
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A. St. Louis County	
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(1) Fish Lake	69-0491
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(2) Island Lake	69-0372
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B. Multiple Counties	
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(1) Lake Superior	16-0001
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(2) Cloquet River from Island Lake to the St. Louis River	
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(3) St. Louis River, downstream of the Cloquet River	
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Subp. 5. **Listing of waters infested with white perch.** The following water bodies are designated by the commissioner as infested with white perch (*Morone americana*). Activities at these waters are subject to parts 6216.0100 to 6216.0600, Minnesota Statutes, section 84D.13, and other applicable laws.

DNR Protected Waters

Name	Inventory Number
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Multiple Counties	
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(1) Lake Superior	16-0001
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(2) St. Louis River, downstream of the Fond du Lac dam	
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Subp. 6. **Listing of waters infested with zebra mussels.** The following water bodies are designated by the commissioner as infested with zebra mussels (*Dreissena* spp.). Activities at these waters are subject to parts 6216.0100 to 6216.0600, Minnesota Statutes, section 84D.13, and other applicable laws.

DNR Protected Waters	
Name	Inventory Number
A. Olmsted county	
(1) Lake Zumbro	55-0400
B. Washington county	
(1) St. Croix River, downstream of the St. Croix Boomsite Recreation Area, managed by Minnesota Department of Transportation, at river mile 25.4.	
C. Multiple counties	
(1) Lake Superior	16-0001
(2) Mississippi River, downstream of St. Anthony Falls	
(3) St. Louis River, downstream of the Fond du Lac dam	
(4) Zumbro River, downstream of Lake Zumbro	

6216.0400 RESTRICTED ACTIVITIES ON INFESTED WATERS; PERMITS.

Subpart 1. **Taking bait from infested waters.** The taking of wild animals from infested waters for bait or aquatic farm purposes is prohibited, except:

A. by permit according to part 6254.0200 and Minnesota Statutes, sections 84D.03, subdivision 3, and 84D.11, subdivision 2a; and

B. harvest for bait purposes from waters that are designated as infested waters solely because they contain Eurasian water milfoil is allowed for noncommercial personal use.

Subp. 1a. Permit application.

A. Written application for a permit to harvest wild animals from infested waters for bait or aquatic farm purposes shall be made on a form provided by the commissioner and shall contain:

(1) the applicant's legal name, business name, license number, address, and daytime and evening telephone numbers;

(2) the names of the waters and counties where the applicant desires to harvest wild animals for bait or aquatic farm purposes; and

(3) a description of the harvest and transportation equipment to be used, including boats, motors, and trailers.

B. An application for a permit according to part 6254.0200 and Minnesota Statutes, sections 84D.03, subdivision 3, and 84D.11, subdivision 2a, must be mailed or delivered to the Minnesota DNR-Commercial Fisheries Program Coordinator, 500 Lafayette Road, St. Paul, MN 55155-4012.

C. An application for a permit under this part must be submitted by March 1 to be considered for permits that are effective on April 10 of the same year.

Subp. 1b. **Expiration; renewal; transferability.** Permits issued under this part expire at midnight on April 9 of each year, unless otherwise specified in the permit. An application for renewal shall describe any changes to the information submitted in the prior year. A permit issued under this part is not transferable.

Subp. 1c. Revocation of permit.

A. When the commissioner determines that a permittee has failed to comply with conditions of the permit, the commissioner may issue a warning or, if deemed necessary for the protection of the aquatic resources, revoke all or part of a permit. The commissioner may revoke the permit if deemed necessary for the protection of the aquatic resources. When it is determined that a third offense has occurred, the commissioner must revoke the permit.

B. Except in an emergency situation when delay would threaten the state's natural resources, the commissioner shall, at least seven days before the effective date of the revocation, inform the permit holder in writing of the nature of the revocation and of the conditions that, in the commissioner's opinion, require revocation.

C. Upon notice of revocation, the permit holder may apply for an amendment to the permit or request a contested case hearing to contest the revocation. The permit is revoked on the date stated in the revocation notice until such time that the decision is reversed or modified.

Subp. 2. Restrictions on sport gill netting for whitefish and ciscoe in infested waters. If the commissioner designates waters that are open to sport gill netting for whitefish and ciscoe as infested waters, the commissioner may close the gill netting season for the designated water body require that gill nets used in the infested waters not be used in other water bodies, or require that nets used in infested waters must be dried for a minimum of ten days or frozen for a minimum of two days before they are used in noninfested waters. The commissioner shall publish the names of designated water bodies and new requirements or closures in the State Register and provide notice through media releases and other available means where practical. In addition, the commissioner shall post notice of the restrictions at public access points to designated water bodies.

Subp. 3. Commercial fishing restrictions in infested waters. Nets, traps, buoys, anchors, stakes, and lines used for commercial fishing or turtle, frog, or crayfish harvesting purposes that are used in infested waters must be dried for a minimum of ten days or frozen for a minimum of two days before they are used in noninfested waters. All aquatic vegetation must be removed from nets and other equipment when they are removed from infested waters. Commercial operators must notify the department's regional or area fisheries office or a conservation officer when removing nets or equipment from infested waters and before resetting those nets or equipment in noninfested waters.

6216.0500 TRANSPORTATION AND APPROPRIATION OF WATER FROM INFESTED WATERS.

Subpart 1. Transporting water and wild animals from infested waters. Water from infested waters may not be used to transport wild animals except as provided in subpart 4. Live fish taken under a commercial fishing license may be transported from infested waters to other waters or holding facilities from May 1 to October 31 with a transportation permit issued by the department pursuant to Minnesota Statutes, section 17.4985.

Subp. 2. Disposition of water used to transport wild animals from infested waters. Water used to transport live wild animals from infested waters pursuant to subpart 1, including water from waters or facilities permitted to hold fish from infested waters, may be disposed of only at sites approved in writing by the commissioner.

Subp. 3. Persons leaving select infested waters. A person leaving infested waters designated as having populations of zebra mussel or spiny water flea must drain bait containers, other boating-related equipment holding water excluding marine sanitary systems, and livewells and bilges by removing the drain plug before transporting the watercraft and associated equipment on public roads.

Subp. 4. Diversion, appropriation, and transportation of infested waters. Infested waters may not be transported on a public road or off property riparian to infested waters except:

- A. in emergencies, such as fire emergencies;
- B. as specified in a water appropriation or public waters work permit issued by the commissioner pursuant to Minnesota Statutes, chapter 103G; or
- C. under a permit issued pursuant to this part.

Infested waters may not be diverted to other waters without a permit issued pursuant to this part, or as authorized in a public waters work permit or water appropriation permit issued by the commissioner pursuant to Minnesota Statutes, chapter 103G.

Subp. 5. Fish hatchery or aquatic farm operations in infested waters.

A. Natural lakes or wetland basins that are designated as infested waters will not be licensed by the department pursuant to Minnesota Statutes, section 17.4984, for aquatic farms or pursuant to Minnesota Statutes, section 97C.211, as private fish hatcheries.

B. Artificial water basins that have populations of prohibited or regulated exotic species may be used for aquatic farm or private hatcheries under license by the department. After notifying a licensee that an artificial water basin has a prohibited or regulated exotic species, the commissioner may require that nets, traps, buoys, stakes, and lines that have been used in such artificial water basins must be dried for a minimum of ten days, or frozen for a minimum of two days, before they are used in noninfested waters.

All aquatic plants must be removed from nets and other equipment that are removed from the artificial water basins.

C. The commissioner may license aquatic farm or private fish hatchery facilities to use infested waters as a source for the facilities' water. The commissioner may require that the waters be treated to eliminate prohibited or regulated exotic species.

D. Fish raised in artificial water basins that have populations of prohibited or regulated exotic species, or in any facility using infested water as a source, must be sold directly to a wholesale buyer for processing except:

(1) the commissioner may by permit allow the stocking or transport of such fish where the receiving waters contain populations of the same prohibited or regulated exotic species as the source facility's waters; or

(2) the commissioner may by permit allow the stocking or transport of such fish in water bodies that do not contain populations of prohibited or regulated exotic species if the source facility uses adequate treatment to remove the prohibited or regulated exotic species from the facility.

Subp. 6. **Infested waters diversion or transportation permits.** Applications for permits issued pursuant to this part, to divert or transport water from infested waters, shall be made on forms obtained from the commissioner and shall contain information as the commissioner may prescribe. The department shall act upon the application within 90 days of receipt. Failure on the part of the department to act upon the permit within the required time shall not be construed as approval of the application. Permits shall state all the conditions and limitations upon which they are based. A permit may be modified at any time by the department.

6216.0600 VIOLATIONS; CONFISCATIONS.

Unless a different penalty is prescribed, a violation of parts 6216.0265, 6216.0280 to 6216.0290, or 6216.0400 to 6216.0500 is a misdemeanor as set forth in Minnesota Statutes, section 84D.13. Where a violation has occurred, the department may confiscate the prohibited, regulated, or unlisted exotic species immediately upon discovery wherever found and, at the department's discretion, destroy it. Where infested water is being appropriated, or diverted or transported without a permit, or otherwise contrary to the provisions of parts 6216.0100 to 6216.0600, the department may order that the activities cease. Any expense or loss in connection with enforcement of the order shall be borne by the permittee or responsible person.