Harmful Exotic Species of Aquatic Plants and Wild Animals in Minnesota

Annual Report 1996

for the year ended December 31

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1996 Annual Report Highlights

1) Minnesota's ability to address exotic species was improved in 1996.

- The Minnesota Legislature responded to a proposal from the Department of Natural Resources (DNR) and revised, expanded, and consolidated statutes intended to limit the introduction and spread of harmful exotic species of wild animals and aquatic plants.
- The revised statutes include a comprehensive system to classify exotics according to the likelihood that a species might survive and become established in Minnesota, the magnitude of its potential negative effects, and the potential to control the species.
- The DNR began implementation of the new classification system by listing seventeen *prohibited exotics,* species of plants and animals that have high potential to cause problems in Minnesota, including Eurasian watermilfoil, hydrilla, purple loosestrife, grass carp, and ruffe (Minnesota Rules chapter 6216). Prohibited exotic species are subject to the state's strongest restrictions on possession, sale, or transport of exotic species.
- Minnesota's potential to limit the spread of exotics was greatly increased in 1996 because the Legislature included in the revised statutes a prohibition on transport of nearly all aquatic plants.

2) The DNR and Minnesota Sea Grant continued efforts to limit the spread of exotic species by maintaining high levels of awareness among Minnesotans.

- The DNR used 1996 to inform the public about the prohibition on transport of aquatic plants. This effort included three educational road checks. The DNR anticipates issuing citations in 1997.
- DNR's watercraft inspectors completed the mandated 20,000 hours of inspections at public water accesses on infested waters.
- DNR and Minnesota Sea Grant continued efforts including: public awareness radio spots, press releases and newspaper articles, billboards, displays at fairs and boat shows, traveling educational trunks, and numerous presentations to various groups of citizens.

3) Limited spread of exotic species was documented in Minnesota during 1996.

- Eurasian watermilfoil was discovered for the first time in five new Minnesota lakes during 1996. This number of new infestations is less than one-half the number of discoveries typically made annually between 1989 and 1992.
- Zebra mussels, ruffe, and round goby did not appear to have spread to any inland lakes or rivers in Minnesota. In addition, no new lakes with flowering rush were documented.

4) The DNR continued to manage exotic species, particularly Eurasian watermilfoil and purple loosestrife, in 1996.

- The DNR provided funding and technical assistance for management of milfoil on 48 lakes, 80% of the lakes with milfoil and that were eligible for state funds.
- The DNR continued to control purple loosestrife using Integrated Pest Management, an approach that uses both herbicides and biological control insects. Insects were introduced to 34 new sites in 1996 and biological control of loosestrife continues to show promise.

Executive Summary

This report describes the progress made during 1996 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 monitoring and management of harmful exotic aquatic plant and wild animal species. These are species that may harm communities of native plants and animals, limit water recreation, and increase operating costs for industry.

Exotic Species Program funding is derived primarily from a $5 surcharge on the registration of watercraft. The surcharge generates approximately $1,100,000 annually and additional funding comes from other sources. Activities documented in this report occurred both in state fiscal year 1996 (FY96) and fiscal year 1997 (FY97). A breakdown of FY96 expenditures by major category, as well as expenditures planned in FY97, are shown in Table 1.

Table 1. Water recreation account spending (in thousands of $'s) by the exotic species program in fiscal year 1995 (FY95) and fiscal year 1996 (FY96) and projected spending in fiscal year 1997 (FY97).

	FY95	FY96	FY97
Administration	101	122	108
Program Support	119	108	98
Public Awareness	111	147	202
Control/Management	356	198	304
Inspections/Enforcement	300	334	369
Research	195	98	135
Totals	**$ 1,281**	**$ 1,007**	**$ 1,216**

The expenditure of Exotic Species Program funds is focused on:

- monitoring the distribution of harmful exotic aquatic plants and wild animals;
- containing them to sites where they presently occur in Minnesota (public awareness and inspection/enforcement);
- reducing their impact on Minnesota ecosystems (control/management); and
- supporting the development of better control methods (research).

The program's progress in these areas is described for Eurasian watermilfoil, purple loosestrife, zebra mussels, flowering rush, ruffe, rusty crayfish, round goby, and curly-leaf pondweed.

Statutes adopted by the 1996 Legislature (84D) and rules adopted by the DNR (Minnesota Rule 6216) established the framework Minnesota will use to regulate harmful exotic species. The statutes established a four-tier classification system (*prohibited, regulated, unregulated,* and *unlisted*) for exotic species. The DNR will use its rule making authority to assign exotic wild animals and aquatic plants to the *prohibited, regulated,* or *unregulated* categories, a process which will establish the level of regulation and types of allowable uses for each species. "*Unlisted*" exotic wild animals and aquatic plants will need to be reviewed by the DNR before they can be introduced into a free living state in Minnesota. The statutes now prohibit the transportation of all aquatic plants on public roads (with some specific exceptions), a change that will simplify efforts to prevent the spread of Eurasian watermilfoil and other harmful exotic plants, as well as attached zebra mussels.

Maintaining a high level of public awareness about exotic species and methods to minimize their spread in Minnesota is an important goal of the Exotic Species Program. In 1996, radio time and billboard space were purchased, public service announcements and press releases were distributed, and staff were present at the State Fair and various trade shows to reach the general public. Targeted efforts to reach resort owners, watercraft owners, and members of lake associations were also conducted. To evaluate and improve the effectiveness of public awareness efforts, the Exotic Species Program partially funded a DNR survey of watercraft users (MDNR 1996). The survey included questions about where boaters learned about exotic species, whether their boating practices had changed because of exotic species, and what actions would cause them to be more careful about cleaning their boats and boating equipment. Information from the survey will be used to evaluate the effectiveness of current public awareness efforts and guide future changes.

Awareness of exotic species and the problems they cause is not a guarantee that the boating public is adequately cleaning their watercraft and that the threat of inadvertent spread has been eliminated. In 1996, watercraft inspectors spent 21,833 hours at public water accesses on infested waters. Inspectors work with boaters to insure that they understand how to clean their watercraft before they leave a lake or river. Over 42,000 boaters were contacted directly during the summer, another 11,630 had Exotic Alert Tags placed on their boat trailers. Special inspection efforts were also made in conjunction with 29 fishing tournaments, seven sailing regattas, and the first two weekends of the waterfowl hunting season.

Establishing a prohibition on the transport of all aquatic vegetation (with specific exceptions) on public roads removed the major barrier (plant identification difficulties) to effective enforcement of exotic species transportation laws. The Department made a commitment to the 1996 Legislature to use road checks conducted in 1996 to educate the public about the new laws without issuing citations. Three educational road checks were conducted by Conservation Officers with the help of volunteers from the Minnesota Lakes Association. Important information about rates of violation was collected and a number of written and verbal warnings were issued. Additional enforcement activity was focused on the Mississippi and St. Croix Rivers. Conservation Officers focused on educating boaters using the Mississippi River (below the Twin Cities) that they must empty bilges, live wells, and bait buckets so that they do not transport zebra mussels. Zebra mussels were found on three boats on the St. Croix River during 1996 and the DNR required these boats be removed and cleaned.

Field surveys in 1996 found variable rates of spread of the exotic species managed by the Exotic Species Program. Infestations of Eurasian watermilfoil were confirmed in five new lakes, four in the Twin Cities Metro area, and one in Pope County south of Alexandria. There was no evidence that zebra mussels, ruffe, or round goby moved into Minnesota's inland lakes within the last year.

The Exotic Species Program, alone or in cooperation with local groups, undertook a wide variety of control actions in 1996. Eurasian watermilfoil control efforts were conducted on about 50 lakes, 130 sites were sprayed to control purple loosestrife, and flowering rush control activities were continued in the Detroit Lakes area. Surveys will be conducted in 1997 to determine the effectiveness of these control efforts.

Research efforts to improve control methods, both chemical and biological, were continued. Additional funding recommended by the Legislative Commission on Minnesota Resources and appropriated by the Legislature was particularly important in this effort. A biological-control method for managing purple loosestrife is being tested at numerous sites throughout the state (34 new sites were established in 1996). This effort is part of a rapidly expanding national effort to manage this exotic plant. Four biocontrol insect species have now been introduced, over-wintered, and become established at sites in Minnesota. Research at the University of Minnesota continued in 1996 aimed at developing a biological control approach for Eurasian watermilfoil.

The Exotic Species Program worked cooperatively with numerous groups in 1996. Local government units and lake associations often provide cooperative funding for control efforts. In 1996, these groups assisted with control of Eurasian watermilfoil, purple loosestrife, and flowering rush. The Exotic Species Program Coordinator's membership on the Great Lakes Panel on aquatic nuisance species provided many contacts outside Minnesota. The DNR's public awareness efforts are coordinated with a broad array of local, state, and federal groups. These include: Minnesota Lakes Association, Minnesota Sea Grant, Manitoba Environment, National Park Service, and U.S. Fish and Wildlife Service. Likewise, research contracts with the University of Minnesota and Cornell University, as well as contacts with groups such as Wisconsin and Michigan Departments of Natural Resources and the Army Corps of Engineers are enhancing the improvement of control methods.

Minnesota continues to have one of the most comprehensive and aggressive approaches to managing exotic species. Many state and federal agencies look to Minnesota for guidance. Exotic Species Program staff are cooperating with state, regional, and federal agencies to improve and enhance management, research, and public awareness efforts.

Future Needs

Numerous management needs are identified in this report for 1997 and beyond; many are refinements of existing approaches. A clear need has been identified to broaden public awareness, inventory, and containment efforts to address the threat that expanding zebra mussel populations pose to Minnesota. This harmful exotic is currently restricted to the rivers with commercial barge traffic in southeastern Minnesota, but there is high potential for zebra mussels to spread to inland waters -- the appearance of this exotic on aquatic plants attached to boats leaving the Mississippi River clearly illustrates this risk. There is a clear need to broaden the use of enforcement efforts to reduce the risk that watercraft are transporting harmful exotic species between water bodies. There is also a clear need to develop strategies to prevent the introduction of additional exotic

species into Minnesota that could cause ecological or economic harm if they become established. The Statutes adopted in 1996 established a framework (based on four classes of exotic species) for regulating the introduction of exotic species into Minnesota. The Department will assign exotic species to these classes through the rule making process. Finally, the continued expansion of the ruffe population in Lake Superior and the discovery of the round goby in Duluth Harbor have increased the need for emphasis on exotic fish species.

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 Fish and Wildlife 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 which harm agricultural crops. Information about control and prevention 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 (see M.S. 84D.02, Subd. 3 in Appendix A). According to statute, this 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.

Additional sections on regulations, enforcement, 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 may be the focus of future management efforts is also included.

Overview of Minnesota Exotic Species Program

History of the Exotic Species Program in Minnesota

Although harmful exotic species have been present in Minnesota for many years (e.g. common carp and sea lamprey), a 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. Minnesota was the first state in the country to create a program for purple loosestrife control. 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). Subsequently, and in response to the arrival of additional harmful exotic species in the state, the potential for more introductions, and the high cost of existing control activities, the state moved to initiate a proactive response to the exotics problem.

Responsibilities assigned to the DNR

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 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.

The purpose of the Exotic Species Program is to curb the spread, and minimize current and future harmful effects, of exotic species that can naturalize in the state and either:

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

(2) threaten or may 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). Individual species plans are also prepared by the DNR. Preparing a statewide plan and species specific plans will be 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 if they contain harmful exotic species that could spread to other waters if lake water use and related activities are not regulated. The current *infested waters* list is included (Appendix C).

Prevention activities, such as identifying potentially harmful species in other areas of North America, predicting pathways of spread, and developing technical solutions to introduction and spread, are important. The Exotic Species Program plans to initiate or participate in a number of prevention efforts in 1997. For example, an assessment is planned of the potential for non-native aquatic plants to be invasive in Minnesota. This effort will be done under contract with the U.S. Army Corps of Engineers' Aquatic Plant Research Program. A second project will be the development the engineering standards necessary to eliminate harmful exotic species from infested waters. These standards will guide management efforts when infested waters are appropriated or

diverted. A final example is the Great Lakes regional demonstration project to eliminate exotic organisms in the ballast tanks of large ships. The DNR supported a proposal to the Legislative Commission on Minnesota Resources to fund a future portion of this project.

Program staff

Responsibilities for overall coordination of the DNR's program are assigned to Jay Rendall, Exotic Species Program Coordinator, within the Division of Fish and Wildlife's Administrative Services Section. Exotic species policy, rulemaking, legislation, state representation on the Great Lakes Panel on Aquatic Nuisance Species, and involvement with federal exotic species issues are coordinated by this position.

Program activities such as species management, watercraft inspections, and research coordination are carried out primarily by the Ecological Services' staff in the Division of Fish and Wildlife. Existing staff and their primary responsibilities are as follows:

Exotic Species Program Coordinator	William (Jay) Rendall (297-1464)
Purple Loosestrife Coordinator	Luke Skinner (297-3763)
Eurasian Watermilfoil Coordinator	Charles (Chip) Welling (297-8021)
General Exotic Species Issues	Donna Perleberg (218-828-6132)
General Exotic Species Issues	Wendy Crowell (282-2508)
Clerical	Debbie Hunt (296-2835)
Watercraft Inspections	Michelle Bratager (297-4891)
Zebra Mussels	Gary Montz (297-4888)

Other staff support

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

Division of Fish and Wildlife Supervision of the exotic species staff is carried out by the Supervisor of the Aquatic Plant Management Program, Ecological Services Section. The Monitoring and Control Unit Supervisor (Ecological Services) is responsible for managing the watercraft surcharge budget and other issues related to implementation of exotic species activities. Pesticide Enforcement specialists from Ecological Services and Aquatic Plant Management specialists in the Section of Fisheries are also involved in survey and control of purple loosestrife, Eurasian watermilfoil, and flowering rush. In addition to these staff, other individuals from the Division of Fish 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 ecologically harmful exotic species. An exotic species enforcement coordinator within the Division of Enforcement was appropriated in November 1996 and will 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 1996, 28 corps members spent over 20,000 hours inspecting boats at public water accesses on lakes and rivers in Minnesota infested with exotic species. Corps members also assist Conservation Officers at road checks and access checks. A summary of their efforts is included in this report (see Watercraft Inspections).

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

Funding

Funding for the DNR's exotic species activities is derived primarily from the surcharge on watercraft. The surcharge for a three year license period is $5, or $1.67 per year, and generates approximately $1,100,000 per year. Additional appropriations, primarily for specific research efforts, have come from the Environment and Natural Resources Trust Fund and Minnesota Resources Fund (Table 1).

Contracts

A large portion of the research and control activity carried out by the exotic species program is done under contract. Research to identify and test organisms capable of biologically controlling ecologically harmful exotic species is contracted with various research facilities. In 1996, biological control research for Eurasian watermilfoil and purple loosestrife was done under contract with the University of Minnesota. This research is described in greater detail in the individual management chapters. The majority of control of purple loosestrife and Eurasian watermilfoil conducted by the DNR is carried out by licensed herbicide applicators under state contract. Local lake associations, conservation districts, or local governments share the cost of the contract work on larger Eurasian watermilfoil control efforts.

Federal and Regional Coordination

The DNR Exotic Species Program staff often participate in regional or federal activities regarding harmful exotic species. DNR Exotic Species Program Coordinator, Jay Rendall, is the current Minnesota representative to the Great Lakes Panel on aquatic nuisance species and was its Vice-chair in 1996. Participation on this panel, established by the federal Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, and reauthorized by the National Invasive Species Act of 1996, 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.

Luke Skinner, Purple Loosestrife Coordinator, has been involved in regional and national efforts to use biological controls to manage purple loosestrife. He has participated in meetings with the U.S. Fish and Wildlife Service and 22 other Midwestern states to develop a regional plan for biological control implementation. He is also a member of the National Biological Control Planning Committee established to develop national guidelines for implementation of biological controls for purple loosestrife.

Chip Welling, Eurasian Watermilfoil Program Coordinator, has been working with the U.S. Army Corps of Engineers on cooperative research on biological controls for Eurasian watermilfoil.

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, Aquatic Biologist and zebra mussel specialist, and Jay Rendall have participated in the development and implementation of the St. Croix River Zebra Mussel Response Plan.

Future Needs for the Exotic Species Program

- Prepare a statewide plan for the management of harmful exotic species by July 1, 1997 (M.S. 84D.02 Subd. 3).
- Contract with the Army Corps of Engineers (Aquatic Plant Control Research Program) to conduct an assessment of Exotic Aquatic Plants that are in the U.S. but have not yet reach MN.
- Support state funding, as recommended by the LCMR, to demonstrate new methods to remove exotic species from ballast water of Great Lakes ships.

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.

Regulations

1996 Highlights

- During 1996, state laws intended to minimize the introduction and spread of harmful exotic species of wild animal and aquatic plants in the state were revised, expanded, and consolidated into a new chapter of statutes, 84D (see Appendix A). Four exotic species classifications were established: prohibited exotic species; regulated exotic species; unlisted exotic species; and unregulated exotic species. The new statutes prohibit the transport of aquatic plants on public roads.

- Several pathways by which harmful exotic species may spread were addressed when the DNR adopted new rules regarding harmful exotic species (Minnesota Rule 6216, see Appendix B). The new rules also designate several species as prohibited exotic 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.

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 have been modified almost annually 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.

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 ecologically harmful species are present in waters near Duluth as a result of ballast water discharges, this legislation is important to protect Minnesota waters from future introductions of harmful species.

Progress in Regulations - 1996

Several items identified as future needs in the 1995 annual report (Exotic Species Program 1995) were addressed during 1996. They included state statute revision, rule adoption, and passage of federal legislation.

State Statutes

The DNR led a successful effort to have state statutes regarding harmful exotic species recodified, expanded, and modified in a new chapter (M.S. 84D - Harmful Exotic Species). The purpose of this effort was to improve the clarity, relationships of the parts, and understanding of the laws. The changes included in the 1996 legislation are described below:

- Four new exotic species classifications were established: *prohibited* exotic species; *regulated* exotic species; *unlisted* exotic species; and *unregulated* exotic species.

1. *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 summary of regulations on next page).

2. Species designated as *regulated* exotic species have less of a known or predicted threat to the State's resources and use. *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.

3. 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.

4. *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).

When classifying an exotic species into the above categories the DNR must consider several factors including: 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 previous milfoil transportation law (M.S. 18.317) was replaced with a prohibition on the transportation of all aquatic macrophytes (with some appropriate exceptions) on public roads (see M.S. 84D.09 in Appendix A). This change establishes an enforceable law that will prohibit the transport of Eurasian water milfoil, incidental transport of zebra mussels attached to aquatic plants, and transport of other potentially harmful exotic aquatic plants.

- The DNR obtained new statutory authority to regulate exotic species of wild animals and aquatic plants that are intended for introduction into a free-living state (see M.S. 84D.06 in Appendix A). This new policy prohibits the introduction of *unlisted* exotic species (not *prohibited*, *regulated*, or *unregulated*) without notification of the commissioner, review by the commissioner, and approval through permit or by designating the *unlisted* exotic species as an *unregulated* exotic species.

- Authority was established for conservation officers to: 1) confine watercraft to a mooring, dock or other location until attached *prohibited* species can be removed; 2) order removal of watercraft from waters of the state that are not infested waters in order to remove *prohibited* exotic species.

- The raising of mute swans, which are a harmful exotic species, must be done under a game farm license and these animals may not be introduced into the wild (M.S. 97A.105).

Explanation of regulations associated with Minnesota's exotics species classifications.

Regulatory Classification	Transportation	Importation, Sale, Possession, Propagation	Introduction into a free living state	Response to escapes
Prohibited (current examples: Eurasian water milfoil, ruffe, and zebra mussel)	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 (current examples: none potential species: smelt and Sichuan pheasant)	Allowed	Allowed	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 (any exotic species that is not listed as prohibited, regulated or unregulated)	Allowed	Allowed	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 Species assigned to this category will most likely be very abundant and therefore not controllable through regulations or they will not be considered to be harmful. (Current examples: none potential species: ringneck pheasant and starling)	Allowed (These species are not subject to regulation under Minn. Stat. 84D. Although may be regulated through other laws.)	Allowed	Allowed	No requirements.

Minnesota Rules

The DNR adopted rules that became effective on April 29, 1996. The rules designate several species as *prohibited* exotic species (see M.R. 6216.0250 in Appendix B). This designation means that those species may not be possessed, imported, sold, propagated, transported or introduced in the state. Also, under Minnesota Rules 6216, the following restrictions were placed on activities in *infested waters* (all violations are misdemeanors):

- the taking of wild animals from infested waters for bait is prohibited;
- equipment used for commercial fishing purposes in infested waters must be dried for a minimum of ten days or frozen a minimum of two days before they are used in noninfested waters; and
- boaters, anglers, or other water users and their equipment may not enter marked areas of a water body where limited infestations of Eurasian watermilfoil have been specifically identified and delineated.

The following restrictions were placed on the transportation and appropriation of infested waters (all violations are misdemeanors):

- water from infested waters may not be used to transport fish;
- water used to transport live fish from infested waters may be disposed of only at sites approved in writing by the commissioner;
- persons leaving infested waters that contain populations of spiny waterflea or zebra mussels must drain bait containers, other boating-related equipment holding water, and livewells and bilges by removing the drain plug before transporting the watercraft and associated equipment on public roads;
- infested waters may not be transported on a public road or off property riparian to infested waters except in emergencies or under permit; and
- infested waters may not be diverted to other waters without a permit.

Additional rules to prevent the spread of harmful exotic species were required under the statutes passed by the 1996 Legislature. The DNR has initiated that rule-making process. On June 24, 1996, the DNR published a request for comments in the State Register as required preceding the development of rules. The DNR is in the process of drafting the required rules.

Federal

As identified in the 1995 report (Exotic Species Program 1995), the DNR supported the passage of the National Invasive Species Act of 1996 (NISA), which reauthorized federal public law 101-646 (initially passed as the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990). Components of NISA included:

- expanding the Coast Guard's authority to regulate discharge of ballast water in Great Lakes waters to authority in all U.S. waters for the purpose of reducing the introduction of exotic organisms into the country;

- requiring the Secretary of Transportation to issue guidelines to control the spread of zebra mussels and other aquatic nuisance species via recreational activities, such as boating and fishing; and

- giving the Department of the Army responsibility for identifying methods for preventing and reducing the dispersal of nonindigenous species through the Chicago Shipping and Sanitary Canal into the Mississippi River drainage.

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. A 1996 survey of boaters using public accesses (MDNR 1996) supports this view. Most survey respondents indicated that laws prohibiting transport of harmful exotics would be effective in getting them to take steps to prevent further spread of exotics (67.5% indicated that laws would be "very effective" or "moderately effective"). In contrast, only 11.5% of surveyed boaters indicated laws would not be effective.

Future Needs For Regulations

State

- Under Minnesota Statutes 84D.12, the DNR is required to adopt new rules:
  (1) designating prohibited, regulated, and unregulated exotic species;
  (2) governing the application for and issuance of permits related to harmful exotic species,
  (3) governing notification under section 84D.08; and
  (4) designating, and governing the marking and use of, limited infestations of Eurasian water milfoil.

  The DNR is in the process of developing these rules and intends to have a draft for public review in spring of 1997.

Federal

- 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.

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Exotic Species Program. 1995. Ecologically Harmful Exotic Aquatic Plant and Wild Animal Species in Minnesota. Annual Report for 1995. Minnesota Department of Natural Resources, St. Paul, MN.

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.

Expenditures

Appropriations and activities

Exotic Species Program funding is derived primarily 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 $1,100,000 annually and additional program funding comes from other sources. Funding for Department of Natural Resources' efforts to control exotic species was first appropriated in 1988 and gradually increased to meet the growing problems these species posed. A summary of appropriations to the program for fiscal years (FY)1990 through 1997 is provided in Table 2 along with projections for fiscal year 1998.

This report covers activities in Calendar year 1996, which includes half of two fiscal years, FY96 and FY97 (which begin on July 1 and end on June 30). To provide a comprehensive review of expenditures that occurred during 1996, we report both expenditures that were incurred in FY96 and those planned in FY97 (Table 3). The following assumptions and definitions were used to report on expenditures.

Administration

Administrative expenditures include clerical staff, telephones, general postage, office rent, and staff time spent on administrative activities. Administrative staff time includes training or professional development activities, assistance with other division or department projects, and personal leave (holiday, sick, and vacation time).

Program support

Program support includes expenditures and activities which primarily benefit the entire exotics program, not one of the particular program components listed below. They include:

State program coordination: preparation of state plans and reports, hearings, promulgation of rules, as well as the general oversight and planning of program activities. Expenditures 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, seek federal funding for state management plans, and participate in regional meetings on exotic species issues.

Equipment: purchases and repair of boats, trailers, computers, and similar items.

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.

Control, Management, and Inventory

Expenditures in this category include staff time, in-state travel expenses, fleet charges, commercial applicator contracts, and supplies to prepare for, conduct, supervise, and evaluate control activities.

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.

Fiscal Year 1996 (FY96)
Expenditures on exotic species activities during FY96 (July 1, 1995 - June 30, 1996) totaled $1,209,000 and are shown in Table 3. Expenditures from watercraft license surcharge revenues in the Water Recreation Account, the primary source of funding, are listed along with spending from other accounts. The Exotics Species Program has other accounts (e.g. revenues from the sale of public awareness material are deposited in a Publications Account, reimbursement received from local groups for DNR-funded cooperative control efforts are deposited in a Coop Account) that are also used to support program activities. These funds are spent on the same type of program activity from where they were derived (e.g. funds in the Publication Account are used to purchase new publications). Expenditures from other Department accounts, (e.g., the Game and Fish Account and the General Fund) reflect staff in the Section of Ecological Services, who are not hired as exotic species specialists but who 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 $1,007,000 of Water Recreation Account surcharge expenditures by the Exotic Species Program during FY96 was less than the $1,136,000 appropriated (Table 2). Fiscal year 1996 was the first year of the state biennium and some projects planned for the biennium were not started during the first year. Similarly, projected expenditures in FY97 are higher than the amount appropriated, reflecting the carryover of projects and funds into the second year of the biennium. Funds appropriated from the Water Recreation Account but not spent during the FY96/97 biennium are returned to the Water Recreation Account.

FY96 expenditures differed from those reported in FY95 in some categories (Table 1). Year-to-year variations in expenditures are expected and reflect changes in program needs. For example, the number of lakes where control of Eurasian watermilfoil becomes necessary varies from year-to-year, producing variation in Control/Management spending. Likewise, public awareness needs change with time. The Exotic Species is currently developing new televisions spots to aid in its public awareness efforts. The cost of developing and airing these new spots will increase "public awareness" spending in FY97. Inspections/Enforcement is one category where program expenses show a steady increase. The increase reflects the Department's belief that preventing the introduction of new exotic species to Minnesota and containing the spread of species already in Minnesota are two of the most effective strategies available. More money will be spent on efforts to inspect watercraft that leave "infested" waters and to enforce Minnesota's exotic laws. The following chapters describe in detail the activities that were conducted using FY96 funds.

Fiscal Year 1997 (FY97)
Since FY97, which runs from July 1, 1996 to June 30, 1997, was only partially completed when this report was completed, planned expenditures, not actual expenditures to date, are reported. Anticipated program spending by category is shown in Table 3. Appropriations ($1,087,000) from the Water Recreation Account to the Exotic Species Program were lower in FY97 than in FY96 (Table 2). However, as described above, funds carried forward from FY96 as well as those appropriate for FY97 are available and are shown in the projected budget. The following chapters describe in detail the activities that have been and will be conducted using FY97 funds.

Table 2. Appropriations for DNR Exotic Species Programs, fiscal years 1990-1998.

	FY 90	FY 91	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98
Purple loosestrife (PL)	$125,000 from Water Recreation Account for PL program ($1 watercraft surcharge) and $100,000 from Minnesota Future Resources Fund for research	$125,000 from Water Recreation Account for PL program ($1 watercraft surcharge) and $100,000 from Minnesota Future Resources Fund for research			$75,000 from Minnesota Environment and Natural Resources Trust Fund for research	$75,000 from Minnesota Environment and Natural Resources Trust Fund for research	$75,000 from Minnesota Environment and Natural Resources Trust Fund for research	$75,000 from Minnesota Environment and Natural Resources Trust Fund for research	$37,500 recommended by Legislative Commission on Minnesota Resources for research ($37,500 match from program funds)
Eurasian watermilfoil (EWM)	$125,000 from Water Recreation Account for EWM program ($1 watercraft surcharge)	$125,000 from Water Recreation Account for EWM Program ($1 watercraft surcharge)		$160,000 from Minnesota Future Resources Fund for research	$125,000 from Minnesota Environment and Natural Resources Trust Fund for research (requires a $100,000 nonstate match)	$125,000 from Minnesota Environment and Natural Resources Trust Fund for research (requires a $100,000 nonstate match)	$75,000 from Minnesota Environment and Natural Resources Trust Fund for research	$75,000 from Minnesota Environment and Natural Resources Trust Fund for research	$37,500 recommended by Legislative Commission on Minnesota Resources for research ($37,500 match from program funds)
Aquatic exotic species (including Eurasian watermilfoil and purple loosestrife)			$416,000 from Water Recreation Account ($2 watercraft surcharge)	$657,000 from Water Recreation Account ($3 watercraft surcharge)	$1,011,000 from Water Recreation Account ($5 watercraft surcharge)	$1,112,000 from Water Recreation Account ($5 watercraft surcharge	$1,136,000 from Water Recreation Account ($5 watercraft surcharge)	$1,087,000 from Water Recreation Account ($5 watercraft surcharge)	$1,109,000 from Water Recreation Account ($5 watercraft surcharge)

Table 3. Exotic species related expenditures in fiscal year 1996 (FY96) and projected expenditures in FY97 (in thousands of dollars)

	Water Recreation Account		Other Exotic Accounts		Other Dept. Accounts		Env. And Natural Resources Trust Fund	
	1996	1997	FY96	FY97	FY96	FY97	FY96	FY97
Administrative/Operations								
Rent	20	21						
Phones / postage / Misc.	11	11						
Staff Administrative Activities	14	10						
Staff Personal leave (Vacation, Holiday, Sick)	48	32						
Clerical	29	34						
Program Support								
State program coordination	88	73			22	20		
Support regional / federal activities	10	20						
Equipment	10	15						
Public Awareness								
Communications plan, workshops, presentations, radio spots, billboards	147	202	2	4	1	1		
Control, Management, and Inventory								
Eurasian watermilfoil	144	144	21	50				
Purple loosestrife	40	92		5		1		
Zebra mussel	10	33						
Flowering rush	4	5						
Curly-leaf pondweed	0	5						
General	0	25						
Inspections/Containment								
MCC - access inspections	283	289						
Enforcement - road checks	51	70						
Research								
Purple loosestrife	25	22	4		1	1	75	75
Eurasian watermilfoil	67	100	6	1	1	1	75	75
Flowering rush	3	8						
Zebra mussels	3	5						
Total	1007	1205	33	60	25	24	150	150

Education / Public Awareness Activities

1996 Highlights

- Recommendations to avoid spreading harmful exotic species by seaplanes were developed and were communicated to state and national seaplane pilot associations.

- The DNR has contracted with a production company to assist in developing and producing two 30 second television spots regarding zebra mussels and Eurasian watermilfoil for the 1997 boating season.

- The Department of Natural Resource's (DNR) new "Aquatic Exotics" video produced for elementary school age children received a Telly Award in the "Education" and "Children" categories.

- The Exotic Species Program helped fund a DNR boater survey (MDNR 1996). Information from the survey will be used to assist in determining the most effective methods of communicating with boaters about harmful exotic species.

- The DNR and Minnesota Sea Grant continued cooperative efforts to maintain high levels of public awareness about exotics and exotic issues.

Background

The DNR has been making substantial efforts to increase public awareness and understanding of harmful exotic species. The Exotic Species Program's communication efforts are built around the theme of "Clean boats, Clean waters". This theme captures the desired outcome (clean waters) and the proposed strategy to achieve that result. To be effective, it requires that Minnesotans have a strong sense of personal responsibility, and according to a 1994 survey of boaters (see Effectiveness section), they do (Minnesota Sea Grant 1994).

The Exotic Species Program's public awareness efforts have been designed to:

1) make the public aware of potentially negative environmental impacts caused by some exotics;

2) help the public identify specific exotic species;

3) outline actions that boaters, anglers, seaplane pilots, waterfowl hunters, and others must do to reduce the spread of these exotics; and

4) summarize control approaches.

Progress in public awareness - 1996

Key components of the Exotic Species Program's 1996 communication efforts included:

- maintaining signs at public water accesses;
- including information about harmful exotic species in the fishing, boating, and waterfowl regulations;
- running radio advertisements, promoting "Clean boats, Clean waters", during Fishing Opener, Memorial Day, Fourth of July, and Labor Day weekends;
- posting billboards on key travel routes away from infested waters;
- staffing displays at sport shows and the Minnesota State Fair;
- preparing and distributing press releases throughout the year;
- preparing and distributing radio public service announcements to all Minnesota stations; and
- distributing brochures about aquatic exotic species to all watercraft registration sites for distribution to watercraft owners.

Radio was used in 1996 to reach boaters and anglers in several ways. Paid advertising on larger Twin Cities stations including WCCO-AM, KQRS-FM, KFAN-AM, WKLX-FM, KSTP-FM, KQQL-FM, and KTCZ-FM. These stations were selected for their listener profile which matched the desired demographics of boater owners. Forty-two out-state stations were also used in 1996 including stations in the Duluth, Brainerd, Alexandria, St. Cloud, Winona, and Lake City markets. Radio ads were run during high activity weekends including the fishing opener, Memorial Day, Fourth of July, and Labor Day.

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.

Thirteen billboards were posted along major highways leading from infested waters and into popular vacation areas. Five billboard locations were in the Twin Cities metro area, three near Duluth, and five in southeastern Minnesota along the Mississippi River.

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

Various presentations were conducted for university classes, high schools, teacher workshops, the St. Paul Power Squadron, Minnesota Seaplane Pilots Association, Minnesota Turf and Grounds

Foundation Conference, North American Lake Management Society's 16th International Symposium 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. Results of the survey suggest that Minnesota's exotic species education and information programs are having an impact on boater awareness and behavior toward the spread of exotic species. According to the survey reports,

> ***"More effort has been expanded 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). The survey will provide information about how boaters rated the effectiveness of various public awareness efforts. Information from that survey will be used to further 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. Billboards posted in the summer of 1996 were jointly sponsored by the DNR and the Province of Manitoba. Our most popular 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.

Established in 1991, the University of Minnesota Sea Grant's Exotic Species Information Center (formally the Zebra Mussel Information Center) educates water users on how to protect water resources from invasive aquatic exotic species. The Center is comprised of extension, communications, and education specialists, who serve as a primary source of information on zebra mussels and other Great Lakes exotic species. Resources that the Center offers include a comprehensive library of printed materials, videos, slides, graphics, and specimens of exotic species.

The Center provides information about harmful invasive exotic species to local, state, regional, federal and international audiences, reaching people from business, water appropriating industry and municipalities, the media, researchers, educators and students, lake associations, boating and angling groups, marina operators, charter captain associations, bait harvest and aquaculture industries, government agencies, and the general public.

The Center serves as a liaison among interest groups and business, and local, state and federal agencies. The Center collaborates with the DNR's Exotic Species Program to develop, produce,

and coordinate distribution of information statewide. Activities of the Center are funded by appropriations through the National Oceanic Atmospheric Administration to the National Sea Grant College Program and the Great Lakes Sea Grant Network.

The Center's 1996 extension and education activities in Minnesota included:

- Responding to 511 public requests for printed materials, training manuals, videotapes, and slides on exotic species and issuing news releases & numerous newsletter articles;

- Representing Minnesota on regional task forces on aquatic nuisance species including the: Ruffe Control Committee of the ANS Task Force; Great Lakes Panel on ANS, Information/Education Sub-Committee; Western Zebra Mussel Task Force; as well as chairing the Great Lakes Sea Grant Ruffe Outreach Committee.

- Over 4,000 people received exotic species awareness or training information at conferences, workshops, training sessions, meetings, trade shows, and fairs;

- 150,000 "Ruffe WATCH" ID cards were reprinted and distributed Great Lakes-wide;

- 100,000 "Round Goby WATCH" ID cards were produced and distributed Great Lakes-wide;

- Over 350 of the leader training package "Mussel Menace: Zebra Mussels and You" have been distributed nationwide to audiences where impacts of the zebra mussel are imminent.

- Fifteen "Exotic Aquatics" traveling trunks were produced and distributed to ten regional lending centers which are available to teachers to instruct middle school age kids: Over 2,000 students and 30 teachers have enjoyed using the three trunks available by reservation from MN Sea Grant;

- As a joint project with the Great Lakes Sea Grant Network creating a new Web site, the Sea Grant Non-Indigenous Species Site or sgnis (http://www.ansc.purdue.edu/sgnis/), which contains a comprehensive collection of research publications and education materials on zebra mussels and other nonindigenous species produced by Sea Grant programs across the country. Sgnis is linked to Minnesota Sea Grant's Web Site (http://www.d.umn.edu/~seagr/).

- Leading an effort to plan and conduct an "*International Symposium on Biology and Management of Ruffe*", featuring the world's 30+ foremost experts on ruffe from Eurasia and North America. That will be held March 21-23, 1997 at the Sheraton Inn, Ann Arbor, Michigan. The symposium will include five Eurasian synthesis papers on ruffe that will be presented to an expected audience of 175-200.

Future needs for public awareness

- Continue to raise awareness of zebra mussels in southeast Minnesota near the Mississippi and St. Croix rivers.
- Cooperatively develop public awareness efforts with specific groups that have not received significant attention in previous years, such as the aquaculture industry, live bait dealers association, waterfowl hunters, and seaplane pilots.
- Find ways to increase interagency communication, e.g., by publishing and distributing the exotic species newsletter, On the Loose, for resource professionals.
- Review the need for a new exotic species informational sign at all public and private water accesses on uninfested waters.
- Revise the sign used at infested waters and repost them in spring 1997.

References Cited

Minnesota Sea Grant. 1994. Exotic Species and Freshwater Boating Survey. University of Minnesota, Duluth, Minnesota.

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.

Watercraft Inspections

1996 Highlights

- During the 1996 boating season, 42,587 boater contacts were made to educate the public about harmful aquatic exotic species.
- Zebra mussels were observed attached to vegetation removed from boats exiting the Mississippi River.
- Spiny water flea were found on boats exiting Lake Superior near Grand Marais.

Background

The potential for boaters to accidentally move aquatic exotic species from one lake to another has been clearly recognized as a serious threat to Minnesota's aquatic ecosystems. For this reason, the 1991 Minnesota Legislature mandated DNR conservation officers to 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) calling for 10,000 hours of inspections of watercraft leaving "infested" water bodies containing harmful aquatic exotic species such as Eurasian watermilfoil, spiny waterflea, 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.

Watercraft Inspectors, employed through the DNR's Minnesota Conservation Corps, conduct inspections at public water access sites on infested waters. 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 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 - 1996

Inspections begin on May 1 and end on October 15 as prescribed in state statute. Within this 24 week period in 1996, 21,833 inspection hours were logged and 42,587 watercraft/trailer units were inspected.

Accomplishments and responsibilities of MCC Watercraft Inspectors:

- Assisted the Division of Enforcement with three educational road checks,
- Answered questions at the Exotic Species display during each day of the 1996 Minnesota State Fair,

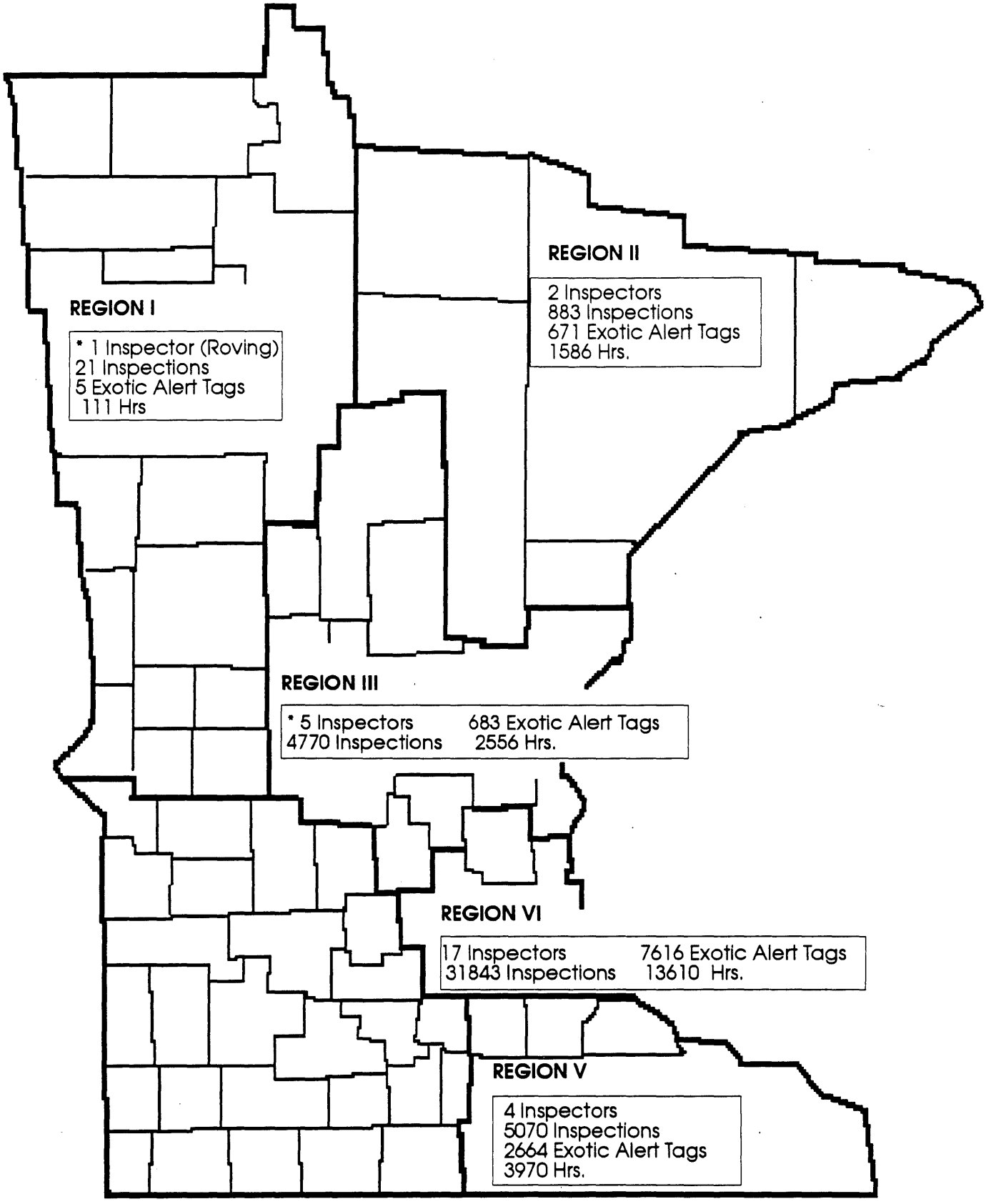
- Conducted inspections at 29 different fishing tournaments throughout the state,
- Conducted inspections at seven sailing regattas throughout the state,
- Conducted inspections for duck hunters during the first two weekends of the waterfowl hunting season,
- Distributed Exotic Alert Tags on 11,639 vehicles with trailers at access points on infested waters, and
- 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.

A total of 28 inspectors worked through the summer providing information to the public on watercraft inspections and exotic species (Table 4 and Figure 1). Inspection effort was distributed across the state in rough proportion to the number of public water accesses (PWA) on infested water bodies. The actual distribution of time for each region reflects both the number of PWAs on infested water bodies and the level of public use at those accesses. For example, as shown in Table 4, the metro area received 62% of the hours with only 46% of the PWAs. However, the metro area includes some of the most heavily used recreation lakes in the state, thus requiring the additional inspection time.

Table 4. MCC Watercraft exotic species inspection hours and number of public water accesses on infested waters by region for 1996.

Area	Number of PWA's (% of total PWA's)	Hours Accomplished (% of total hours)
Region I - Northwest	2 (1%)	111 (1%)
Region II - Duluth/Superior	22 (15%)	1,586 (7%)
Region III - Central	19 (13%)	2,556 (12%)
Region V - Mississippi River	38 (25%)	3,970 (18%)
Region VI - Metro	70 (46%)	13,610 (62%)
State-wide Total	151 (100%)	21,833 (100%)

Figure 1. 1996 MCC Watercraft Inspections at Public Water Accesses on Infested Waters.



*Roving Inspector spent time in Regions I & III.

The number of inspections conducted per day varies due to weather conditions and boater activity. Overall the number of inspections conducted in 1995 and 1996 were very similar (Table 5). The DNR believes that focusing inspection activities during typical high use periods, such as holidays and weekends, contributes to maintaining a large number of boater contacts.

Table 5. Number of watercraft inspections at infested waters conducted by MCC Watercraft Inspectors in 1995 and 1996.

Area	Number of Watercraft Inspected in 1995	Percentage of Inspections in 1995	Number of Watercraft Inspected in 1996	Percentage of Inspections in 1996
Region I - Northwest	147	<1%	21	<1%
Region II - Duluth/Superior	1,004	2%	883	2%
Region III - Central	3,563	8%	4,770	11%
Region V - Mississippi River	4,251	10%	5,070	12%
Region VI - Metro	33,991	79%	31,843	75%
State-wide Total	42,956	100%	42,587	100%

Effectiveness

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. The percentage of boats/trailers carrying vegetation as they exited an infested water body varied widely by county (Table 6). 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 recreational boating traffic. The results summarized in Table 6 show that in many counties over 30% of the boats existing infest waters were found with vegetation. These rates demonstrate the clear risk that boaters will transport aquatic vegetation (and exotics) from lake to lake if boats are not properly inspected and cleaned.

Table 6. Vegetation found on boats and trailers exiting infested waters in 1996 (these amounts are determined at the access before watercraft have been cleaned).

Counties	Percent of Watercraft & Trailers exiting with Vegetation (%)	Number of Watercraft & Trailers Exiting
Region I - Northwest		
Douglas	33	6
Pope	50	2
Region II - Duluth/Superior		
Cook	4	27
Lake	4	48
St. Louis	7	506
Region III - Central		
Chisago	51	814
Crow Wing	26	99
Kanabec	28	72
Stearns	41	272
Todd	33	3
Wright	31	926
Region V - Mississippi River		
Goodhue	8	318
Houston	19	299
Wabasha	4	535
Winona	12	1,539
Region VI - Metro		
Anoka	67	150
Carver	33	1,173
Dakota	9	814
Hennepin	35	7,991
Ramsey	36	3,803
Scott	14	741
Washington	1	525
State Total	29	20,663

Zebra mussels

In the fall of 1996, a survey was conducted of sailboats and powerboats that had been docked in Lake Pepin all summer. The boats had been removed and pressure washed for winter storage. After the pressure wash, zebra mussels remained on over half of the boats (46 out of 80). The mussels were found in crevices that the pressure wash did not reach. This example illustrates the importance of thoroughly inspecting a watercraft before transporting it to another water body.

While inspecting boats exiting the Mississippi River, inspectors observed zebra mussels attached to the vegetation which had been removed from the watercraft during the inspection. This occurred several times over the summer in Winona County at Dresbach and Interstate 90 accesses about 25 miles north of the Iowa border. Again, this illustrates the importance of removing all vegetation from a watercraft to avoid spreading zebra mussels to another water body.

An inspector in the Winona area discovered a 55 gallon barrel encrusted with several thousand zebra mussels. The barrel had been removed from the river by a clean up crew in the Lake City area and was used at the Minnesota State Fair. It proved to be a great attraction as many fair goers stopped to look and ask questions about the zebra mussels. For many people seeing is believing.

Spiny Water Flea

Spiny water flea were observed attached to boats exiting Lake Superior in the Grand Marais area. Spiny water fleas are small and difficult to see during watercraft inspections. While this is the first year inspectors have observed spiny water flea, it is likely this is not the first time this exotic has been transported on boats.

Public Awareness

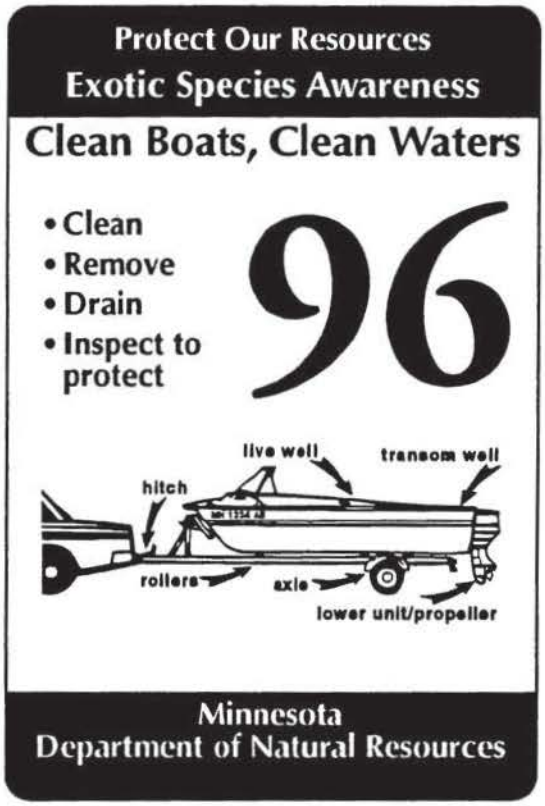
According to survey information collected by Watercraft Inspectors, awareness of exotic species laws is high among Minnesota boaters. State-wide awareness appears to be slightly higher in 1996 than in 1995 (Table 7). The decrease in awareness in Region II may be due to the lower percentage of inspections conducted in the Duluth area in 1996. The Duluth area tends to have higher levels of awareness when compared to areas north of Duluth. The exotic species program continues to use a variety of media (print, radio, and TV to keep exotic species awareness up: see previous section, Education/Public Awareness Activities). However, awareness of exotic species laws does not measure whether boaters are cleaning their watercraft adequately. Road checks of trailered watercraft and other enforcement efforts are necessary to evaluate compliance with existing exotic species laws.

Table 7. Awareness of exotic species laws in Minnesota in 1995 and 1996.

	1995		1996	
Counties with Exotic Species Infestations	**Percent of Individuals who answered "yes" when asked whether they were aware of Exotic Species Laws**	**Number of Individuals who were asked whether they were aware of Exotic Species Laws**	**Percent of Individuals who answered "yes" when asked whether they were aware of Exotic Species Laws**	**Number of Individuals who were asked whether they were aware of Exotic Species Laws**
Region I - Northwest Douglas Pope	63%	147	57%	21
Region II - Duluth/Superior Carlton Cook Lake St. Louis	92%	943	64%	883
Region III - Central Chisago Crow Wing Kanabec Stearns Todd Wright	69%	3,714	86%	4770
Region V - Mississippi River Goodhue Houston Wabasha Winona	72%	4,251	82%	5070
Region VI - Metro Anoka Carver Dakota Hennepin Ramsey Scott Washington	81%	33,901	85%	31843
State-wide Total	79%	42,956	84%	42,587

Decal Program for trailered watercraft

Over 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. Return boaters with a decal are given a brief reminder to drain water and remove vegetation from their boats. The decals have been used for two years now and have been well received by the public. Nearly 28,000 decals handed out over the 1996 boating season also remind boaters to inspect their boat when inspectors are not present.



Personal Watercraft

Personal Watercraft (jet skies, water scooters) present a new challenge for watercraft inspection efforts. They are the fastest growing segment of the watercraft industry and account for nearly one third of all new boat sales (MDNR 1995); personnel watercraft registrations in Minnesota were up 30% in 1996. These machines rely on the intake and expulsion of water to propel them. Along with water, they may take in vegetation. The enclosed pump housing of a personal watercraft provides an ideal dark and damp environment to give vegetation a greater chance of surviving until entering another body of water. Personal watercraft owners must take special precautions when inspecting and cleaning their watercraft. The craft should be visually inspected for vegetation at the water intake and exit points. When the watercraft is out of the water the engine should be started to expel excess water and vegetation. Inspectors are stressing these two points to all personal watercraft operators. These two precautionary measures will reduce the risk of spreading harmful exotic species.

Future needs/recommendations for watercraft inspections:

- Continue inspections for 20,000 hours during the 1997 boating season.
- Develop a brochure to instruct Personal Watercraft owners and operator's on how to clean and inspect for vegetation.
- Record the number of 1995 and 1996 stickers observed on trailers to determine number of new boater contacts by watercraft inspectors in 1997.

References Cited

Minnesota Department of Natural Resources. 1995. Personal Watercraft Laws for Minnesota.

Enforcement

1996 Highlights

- The Department of Natural Resources (DNR) sought changes in statute, during the 1996 Legislative Session, to prohibit transport of all aquatic vegetation (rather than Eurasian watermilfoil exclusively). The new law passed and went into effect for the 1996 boating season. This action removed the major enforcement barrier (plant identification difficulties) to effective enforcement of exotic species transportation laws and will help reduce the chances of zebra mussels being spread when attached to aquatic vegetation.

- A Conservation Officer with statewide responsibility for coordinating exotic species enforcement activity was appointed.

- Three educational road checks of trailered boats were held to increase public awareness and to gather information on violation rates of the new law prohibiting transportation of aquatic vegetation. Aquatic vegetation was found on an average of 23% of all watercraft inspected.

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 have been expanded to detect illegal transportation of these organisms, including zebra mussels, and ruffe. With the appointment of a new exotics enforcement coordinator, our goal is to increase the quantity and efficiency of exotics enforcement through better communication, coordination, and timing of enforcement activities.

Educational road checks - 1996

Three educational road checks were conducted during the 1996 boating season. The Department of Natural Resources teamed with Minnesota Lakes Association volunteers to educate the public on the new laws prohibiting the transportation of aquatic vegetation. The Department made a commitment to the legislature to use 1996 road checks to educate the public about the new laws without issuing citations. A number of written and verbal warnings were issued to violators at the road checks.

Road checks can be a very effective method of drawing public attention to an issue. Never-the-less, 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. During the 1996 road checks the Department gathered information on the violation rates for transporting aquatic vegetation. The rates ranged from 8% to 54%. This information will be evaluated to determine whether these rates justify proceeding with future road checks.

Table 8. Summary of the numbers of trailered watercraft inspected by the DNR during the educational road checks conducted in 1996.

Location	Number of watercraft inspected	Did officers check under watercraft covers?	Number of watercraft with aquatic plants (%)	Number of watercraft with Eurasian watermilfoil (%)	Comments
Hwy. 8, Chisago Co.	188	yes	102 (54%)	4(2%)	Over half the plants were found "inside" boats.
U.S. Rt. 10, Anoka Co.	389	no (Est. half the boats were covered.)	33 (8%)	3 (1%)	As many as 200 boats choose to by-pass this road check.
Hwy. 71, Hubbard Co.	18	no (14 boats were covered.)	3 (17%)	0 (0%)	Rain and late in boating season.
Totals	595	---	138 (23%)	7 (1%)	---

The Chisago road check exhibited the highest percentage of watercraft carrying vegetation (Table 8). Over half the vegetation was found inside the boats. For the Anoka and Hubbard road checks, boat covers were not removed. It is likely that the number of watercraft with aquatic plants (the violation rate) would have been higher had boat covers been removed at the Anoka and Hubbard checks.

In addition to the observations of vegetation on watercraft, a spiny waterflea was found on the tow line of a boat. The educational road checks were voluntary, thus vehicles were not required to stop. During the Anoka road check a large number of vehicles did not stop. (Table 8).

Public water access and other exotics enforcement activities

Mississippi River

Conservation Officers conducted other exotics enforcement activities along the Mississippi River focusing on educating the public about the transportation of zebra mussel infested waters. Boaters using the Mississippi River must empty bilges, live wells, and bait buckets so that they do not transport zebra mussel infested water from the Mississippi. Officers conducted about 80 hours of enforcement time over the summer along the Mississippi River including accesses near Hastings, Red Wing, Lake City, Kellog, Winona, and La Cresent. Approximately 450 contacts were made with some verbal warnings issued for failure to drain water. Again, no citations were issued.

Waterfowl Hunting Season

Conservation officers conducted exotics enforcement during the waterfowl hunting season to inform hunters about the laws prohibiting transportation of aquatic vegetation. Hunters must remove all vegetation from their boats, decoys, and anchors before leaving the boat access (except the law allows the transport of emergent vegetation cut above the water line for use on shooting blinds). Conservation officers worked 17 hours and contacted 131 boaters 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 at several lakes frequented by waterfowl hunters where 30 boater contacts were made.

Fishing Tournaments

Conservation Officers participated in public education and enforcement efforts at Lake Minnetonka public water accesses during the Minnetonka Top 100 Bass Tournament. In 1995, there had been exotic species regulation compliance issues for this particular group which justified the enforcement effort. This year several written warnings were issued for transporting aquatic vegetation during pretournament fishing. During the actual tournament there was a high level of compliance among all tournament participants. No citations were issued to tournament anglers, although, one citation was issued to a non-tournament participant for transporting aquatic vegetation.

St. Croix River

DNR Conservation officers required three boats with attached zebra mussels to be removed from the water and cleaned. The mussels were discovered by commercial divers contracted by the DNR to inspect overwintered boats and commercial barges in the St. Croix. Between 30 and 100 zebra mussels were observed per boat. After cleaning, the boats were reinspected before being authorized to be re-launched.

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 the spread, there must be a balanced mix of public education and awareness efforts, voluntary compliance from the general public, and enforcement of the regulations.

A 1996 survey of boaters using public accesses (Minnesota Department of Natural Resources 1996) supports this view. The majority of respondents indicated that road checks to enforce the laws prohibiting transport of harmful exotics would be effective (see Table 9).

Table 9. Boater response to survey question on whether roadchecks would be effective.

Type of User	Very or moderately effective	Not effective
Public water users	73%	13%
Lake residents	70%	9%
Private/marina users	66%	14%

*respondents answering "slightly effective" or "not sure" are not represented in the table.

Future plans and needs regarding enforcement:

- With Attorney General approval, additional road checks will be conducted next summer. Our goal is to conduct 8-12 major road checks between June and August.
- Focus additional enforcement activity near lakes with Eurasian watermilfoil infestations.
- Exotics information will continue to be included in "Resort Packets" that Conservation Officers deliver to Minnesota resorts.
- Conduct inspections, public education, and enforcement efforts at public accesses and fishing tournaments, sailing regattas, and other special events throughout the summer.
- Include Conservation Officers at the State Fair exotics display.

Management of Eurasian Watermilfoil

1996 Highlights

- Minnesota Department of Natural Resources (DNR) staff discovered one new lake with Eurasian watermilfoil near Alexandria, Minnesota, which is outside the Twin Cities area, during 1996.
- DNR staff confirmed the presence of Eurasian watermilfoil in four additional lakes in the Twin Cities area during 1996. There now are 79 Minnesota lakes, rivers, and streams with this exotic.
- The DNR Exotic Species and Aquatic Plant Management programs worked with cooperators on 48 Minnesota lakes during 1996 to manage Eurasian watermilfoil.
- 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. The Exotic Species Program manages milfoil because it can limit recreational activities on water bodies and alter aquatic ecosystems by displacing native plants (DNR 1994). This report describes the Exotic Species Program's efforts in 1996 to manage this exotic plant and limit its spread in Minnesota.

Progress in management of Eurasian watermilfoil - 1996:

Prevention of spread of Eurasian watermilfoil in Minnesota

The Exotic Species Program and the boating public appear to be succeeding in their efforts to limit the spread of milfoil in Minnesota. Outside the Twin Cities area, only one new lake with Eurasian watermilfoil was discovered during 1996. DNR staff from the Glenwood office of the Section of Fisheries discovered the exotic during a survey of vegetation in Gilchrist Lake, which is located in Pope County, 30 miles south of Alexandria (Figure 2). In the Twin Cities area, the presence of Eurasian watermilfoil in four lakes was confirmed by DNR staff after receiving reports from the public in 1996. The total of five lakes discovered to have milfoil in 1996 was within the range discovered annually since 1993, but still lower than the number found in any of the four years from 1989 to 1992 (Table 10). Eurasian watermilfoil is now known to occur in four rivers or streams and 75 lakes in Minnesota.

Table 10. Numbers of lakes or rivers and creeks in which Eurasian watermilfoil was discovered in different years in Minnesota.

Year	Number of Lakes in which milfoil was discovered	Number of Creeks and Rivers in which milfoil was discovered	Cumulative number of water bodies of milfoil
1987	1	0	1
1988	6	0	7
1989	14	1	22
1990	11	1	34
1991	14	0	48
1992	10	2	60
1993	5	0	65
1994	2	0	67
1995	7	0	74
1996	5	0	79

There may well be additional Minnesota lakes with milfoil that have not yet been discovered. The participation of the public in reporting new occurrences of milfoil remains critical. As in previous years, most reports received in 1996 of suspected occurrences of milfoil turned out to be another plant species. The Exotic Species Program continues to investigate likely reports as soon as possible because early detection and treatment of milfoil is the key to limiting the spread of milfoil within a water body.

Management of Eurasian watermilfoil in Minnesota lakes

In the spring of 1996, the Exotic Species Program classified the 74 bodies of water known to have milfoil on the basis of surveys done in 1995. For management purposes, the Exotic Species Program assigns bodies of water to one of six classes (Table 11). Fifteen lakes were designated for high-intensity management and 41 were designated for maintenance management (see below). Two lakes were included as untreated reference lakes in the DNR's study of fluridone herbicide. Another 12 bodies of water were determined to be ineligible for management with State funds, principally because they do not have public water accesses (see Table 11). Lastly, four bodies of water with milfoil are flowing waters (water courses) where management of this exotic is not usually attempted.

The five lakes that were discovered in 1996 to have milfoil included one lake designated for high-intensity management, three lakes designated for maintenance management, and one lake determined to be ineligible for management with state funds (Table 11).

Figure 2. Distribution in Minnesota of water bodies infested with Eurasian watermilfoil in 1996.

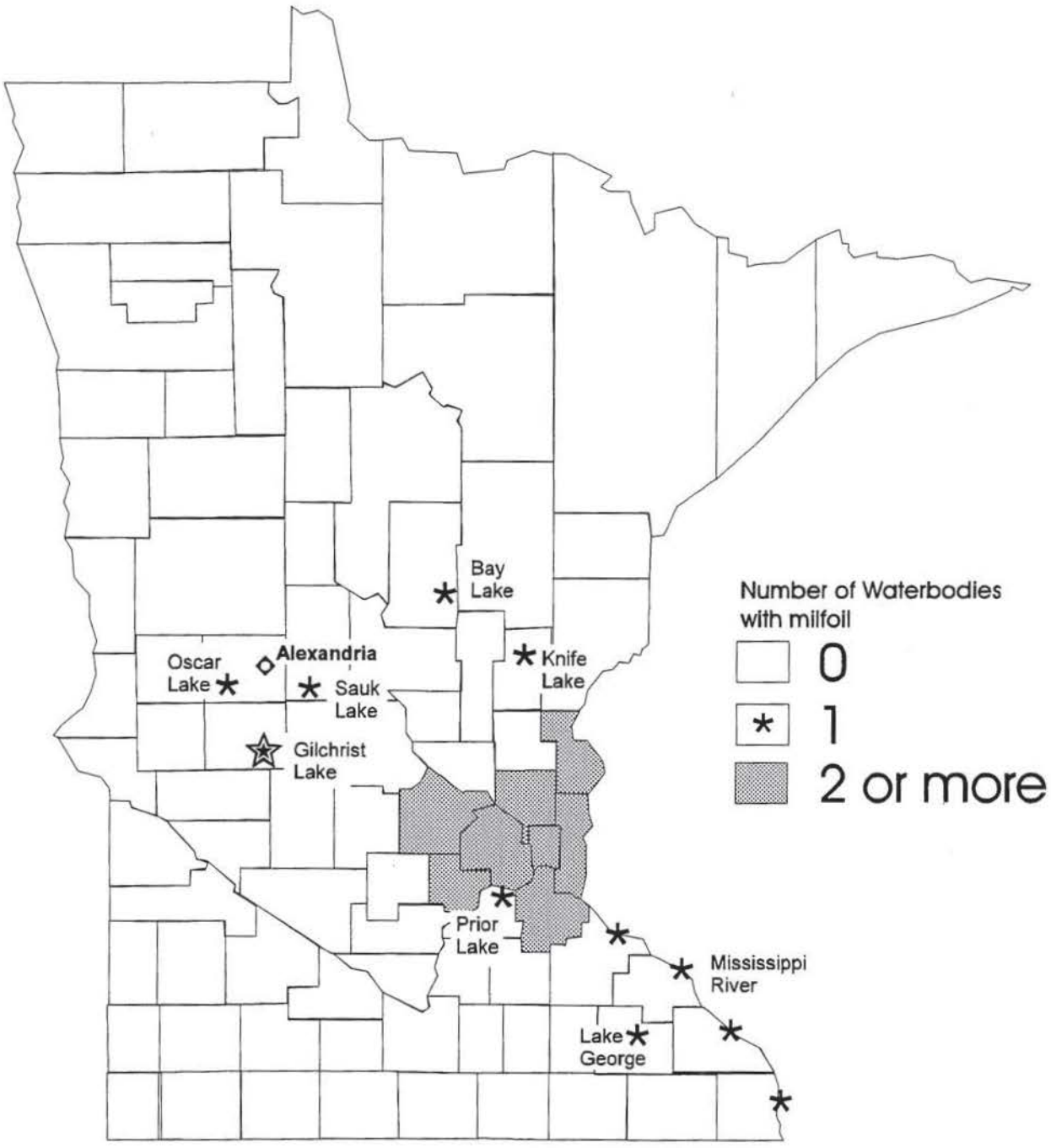


Table 11. Classification of bodies of water in Minnesota with Eurasian watermilfoil during 1996.

Classification	Spring	New in Summer	Fall
Eligible for management with State funds			
High-intensity management (high intens.)	15	1	12
Maintenance management (maint.)	41	3	48 (4 from high intens.)
Fluridone herbicide study (reference)	2		2
Ineligible for management with State funds			
Public water but no public access	8	1	9
Not public water	4		4
Other			
Flowing water (water courses)	4		4
Total	**74**	5	**79**

The Exotic Species Program estimates that the DNR will pay $125,000 to contractors and cooperators for management of Eurasian watermilfoil in Minnesota during 1996 (Table 12), an amount greater than that spent during 1995. In addition to the dollars paid to contractors and cooperators during 1996, the Exotic Species Program had additional costs of staff time and logistical expenses related to control of milfoil (see Table 3). The number of lakes where DNR funds were spent for management of milfoil in 1996 was nearly 30% greater than the number in the previous year.

It is likely that in the future we will experience years when the amount of spring runoff will be low and spring and summer weather will be hot and sunny, that is, drought conditions. Under such conditions, the growth of milfoil and the costs of management are likely to be greater than they were during recent years.

Table 12. Summary of the numbers of Minnesota lakes with Eurasian watermilfoil where management of this exotic species was done with State funds provided through the Minnesota Department of Natural Resources.

Year	Maintenance Management		High Intensity Management			Total	
	Number of lakes	Funds from DNR ($)	Number of lakes	Funds from DNR ($)	(Additional funds from cooperators)	Number of lakes	Funds from DNR ($)
1992	---	---	23	64,000	(62,000)	23	64,000
1993	---	---	23	95,000	(62,000)	23	95,000
1994	13	76,000	14	42,000	(37,000)	27	118,000
1995	24	76,000	11	33,000	(15,000)	35	109,000
1996	39	120,000[1]	9	26,000	(2,000)	48	146,000

[1] This is an estimate of the amount of DNR funds that will be spent because some of the projects eligible for reimbursement have not been completed.

High-intensity management of Eurasian watermilfoil in Minnesota

High-intensity management' is a term used by Smith et. al. (1991:36) to describe costly and aggressive efforts to reduce the abundance of a plant within a lake and slow its spread to other lakes. High-intensity management is usually undertaken by the Exotic Species Program either on lakes with small (usually not more than two acres), recently discovered populations of milfoil or on lakes in areas of Minnesota where there are few if any other lakes with milfoil. Examples of such lakes are Bay and Oscar in Crow Wing and Douglas Counties, respectively, which, due to their location, present a high risk of spread in areas with no other milfoil lakes. For this reason, the Exotic Species Program will continue to take the lead in control efforts on high-intensity lakes.

The Exotic Species Program conducted high-intensity management on the 15 lakes with Eurasian watermilfoil assigned to this classification in spring and on one of the five lakes discovered to have milfoil in 1996 (Table 11). These efforts began with surveys of all 16 lakes by staff of the Exotic Species Program. Following these surveys, applications of herbicide were made to nine of these lakes by commercial applicators under contract to the DNR. On one lake only two milfoil plants were located by SCUBA divers from the Exotic Species Program and no application of herbicide was made. No attempts were made to control milfoil on three of these lakes where rooted milfoil could not be located by staff of the Exotic Species Program. On another three lakes, no attempts were made by the Exotic Species Program to control milfoil because the plant was found to be abundant or widespread or both. Consequently, these lakes were assigned to the maintenance management classification and responsibility for initiation of control was shifted to a local cooperator, to whom State funds and technical assistance were offered.

Maintenance management of Eurasian watermilfoil in Minnesota during 1996

Maintenance management' is a term used by Smith et. al. (1991:36) to refer to attempts to manage nuisances but not necessarily achieve long-term reductions in growth of milfoil. It includes efforts to prevent spread of milfoil from lakes by reducing the amount of milfoil growing near public water accesses. Most of the lakes in this classification are located in areas of Minnesota where there are many other lakes with milfoil. In most lakes where maintenance management is done, milfoil is abundant and causes nuisances for users of these lakes. Maintenance management done with State funds usually involves control of milfoil in areas that are located either off-shore or near public water accesses. These areas are commonly used by the general public, as opposed to nearshore areas, which are used primarily by riparian owners.

The Exotic Species Program offered State funding and technical assistance to cooperators on all 48 lakes with Eurasian watermilfoil in the maintenance management classification at the end of 1996. Management using State funds was planned on 39 of these 48 lakes. These efforts ranged from application of herbicide to one to two acres of milfoil at a cost less than $500 to a mechanical harvesting program on Lake Minnetonka for which the DNR made $24,500 available. Most management involved applications of herbicide to milfoil on lakes that were eligible for reimbursement at levels between $1,500 and $8,500. In 1996, management also included development by consultants of long-term plans for dealing with milfoil on individual lakes. 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.

Research on Eurasian watermilfoil in Minnesota

The Exotic Species Program either supports or conducts a number of research projects designed to improve management of Eurasian watermilfoil. Each of these projects has produced one or more detailed reports. In this section, we will briefly summarize the most important or interesting results of recent efforts by researchers. The continued progress in research designed to improve management of milfoil depends on the efforts of organizations outside the DNR including the University of Minnesota, the Army Corps of Engineers Waterways Experiment Station (WES), Winona State University, and the Suburban Hennepin Regional Park District which are strongly supported by the Exotic Species Program.

Potential for biological control of Eurasian watermilfoil

- Evidence of possible declines in milfoil in Minnesota study sites was collected and is being evaluated.

During 1996, the abundance of Eurasian watermilfoil decreased in five of nine study sites. Some of these declines may be associated with weevils. In Cenaiko Lake, limited sampling indicated a decrease in abundance of milfoil and evidence of damage to plants as severe as that observed in a previous study conducted under controlled conditions (Newman et. al. 1996). The most dramatic decrease occurred in Otter Lake and likely was caused not by weevils, but by very low levels of oxygen during the past winter that severely damaged or killed the milfoil plants. Following decreases in milfoil, increases in the abundance of other submersed plants appear to be important in preventing milfoil from returning to high levels of abundance.

Introduction by researchers of weevils into two lakes during 1996 did not produce high densities of weevils and failed to cause significant decreases in the abundance of milfoil. Suspected explanations for this result include predation on weevils by fish or resistance of plants to the insects.

A key unresolved question in this research is: What factor, or combination of factors, limits the populations of weevil in the study sites? Mortality of weevils during winter appears to be less important than mortality during summer. The researchers believe that predation on weevils by sunfish has the potential to limit populations of these insects, particularly in lakes where densities of weevils are low. Further investigation of causes of mortality and factors limiting weevil populations is needed.

Minnesota researchers conducting the weevil studies are making good progress, including publication of results in peer-reviewed journals. Two papers were published this year (Newman et. al. 1996, Solarz and Newman 1996), a third manuscript on this research was accepted for publication by a journal (Sutter and Newman In Press), and a fourth is under review (Newman et. al. In Review).

Experience has shown that development of biological controls, if an effective agent can be found, 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 1993 and 1995 by the Minnesota Legislature as recommended by the Legislative Commission on Minnesota Resources (LCMR). The DNR applied to the LCMR for continued funding for research on the potential for biological control of milfoil and loosestrife during the next biennium (FY 1998-1999). This project is included in the LCMR's recommendations to be submitted to the Legislature during the 1997 session.

The appropriation made in 1993 required a match of $200,000. The Minnesota Lakes Association provided $8,000 of the match and the balance was provided as 'in-kind' services by WES. The research by WES included three projects. A project done by Middlebury College under contract to WES indicated that the weevil *Euhrychiopsis lecontei* had no significant negative effect on five native milfoil species. The final report on this project was received from WES in January, 1996 (Sheldon 1996).

WES has attempted to isolate pathogenic fungi from milfoil collected in Minnesota and other northern states. Shearer (1996) reported that the endemic organisms isolated from milfoil during this study did not appear to have potential to control Eurasian watermilfoil. This lack of potential as biocontrol agents was evidenced by the low degrees of virulence demonstrated by the isolated organisms.

Lastly, WES has conducted studies designed to generate predictions of the possible spread of milfoil in Minnesota and the susceptibility of different classes of lakes to dominance by this exotic. This effort will likely help predict the effectiveness of potential biological control agents and understanding where and why future declines of milfoil occur. The report on this study by WES is expected to be completed early in 1997.

The Exotic Species Program hopes very much that WES will continue cooperative research on management of Eurasian watermilfoil in Minnesota and the upper Midwest. This WES research is conducted by the Aquatic Plant Control Research Program, which is a unique and valuable resource because the staff possess great depth of expertise in the study and management of aquatic plants.

Evaluation of herbicides for control of Eurasian watermilfoil

Evaluation of fluridone herbicide

- Fluridone herbicide can eliminate Eurasian watermilfoil from lakes, but also reduces or eliminates native plants

Fluridone herbicide can be applied to whole bays or lakes in order to control Eurasian watermilfoil. Operational treatment of whole bays or lakes with herbicide is not allowed in Minnesota because this results in more destruction of vegetation than is necessary to give users access to lakes. Unnecessary destruction of vegetation in Minnesota waters is not permitted because plants provide many benefits to lake ecosystems.

The DNR might permit application of fluridone to whole lakes if the herbicide could ***selectively*** control milfoil, i.e., remove milfoil while causing little, if any, reductions in other plants. Elimination and subsequent reestablishment of plants other than milfoil is not considered selective control. The DNR is evaluating the potential to selectively control milfoil by applications to whole lakes of fluridone at low rates. Fluridone formulated as Sonar® Aqueous Suspension was applied to two Minnesota lakes during late May 1994. Concentrations of fluridone observed after application were slightly higher than the target concentration of ten ppb. Ten ppb is the lower limit of the range of concentrations recommended by the manufacturer of this herbicide for control of milfoil in lakes and reservoirs (see product label).

These applications of fluridone reduced milfoil so that it was not found in the treated lakes by the beginning of the first year after treatment (1995). At the end of the first year after treatment, milfoil was found in one treated lake, Parkers, where it had become widespread by the end of the second year after treatment (1996). In the other treated lake, Zumbra, milfoil had not yet been found by the end of the second year after treatment. These applications of fluridone reduced both the distribution and the number of species of submersed plants present during the year of treatment and during two growing seasons after application. These applications also caused shifts in the species composition of the plant communities.

In the first year after treatment, the clarity of the water as indicated by Secchi disk depth in Lake Zumbra was lower than levels observed in either the year before treatment or the year of treatment. This decrease in clarity appears to have been caused, at least in part, by an increase in abundance of planktonic algae. Secchi disk depth returned to pretreatment levels during the second year after treatment.

The appearance of milfoil in Parkers was unexpected because the application of fluridone to this lake produced concentrations of herbicide which should have eliminated the plant. This result suggests that there is not likely to be a specific, relatively low concentration of fluridone that will reliably and selectively eliminate milfoil.

Studies of the effects on fish communities in vegetation by fluridone were conducted by the University of Minnesota (Pothoven 1996) with funding from the Exotic Species Program and the University of Minnesota. This research did not detect any collapses of gamefish populations in the treated lakes. In Zumbra, researchers discovered some evidence that largemouth bass were more effective predators in 1994 after treatment than in 1993. Also in Zumbra, the number of fish species decreased in 1995 by comparison with 1993. Several species of shiners and darters which were not captured in Zumbra during 1995 were infrequently encountered in this lake during 1993 before treatment. These species depend on submersed aquatic plants to provide cover and avoid predation by other fish. It is important to note that indirect effects on fisheries of treatment with fluridone may not become evident for some time, perhaps five to ten years or more after treatment.

Studies of the effects on invertebrate communities of reduction in vegetation by fluridone were conducted by Winona State University (Delong and Mundahl 1996) with funding from the Exotic Species Program. These efforts were focused on invertebrates which either live on plants or are closely associated with them. As expected, numbers of invertebrates declined following elimination of plants by herbicide. The Exotic Species Program is considering whether to continue these studies to determine rate of recovery of invertebrate populations following re-establishment of plants, assuming the plants return.

The Exotic Species Program will meet before mid-February, 1997 with interested parties from a number of organizations to review the results of the evaluation of the potential to selectively control milfoil with fluridone. Recommendations on future use of this herbicide in Minnesota will be made by the end of February, 1997.

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

The continued 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 also received valuable assistance in management of Eurasian watermilfoil from staff of the DNR's Aquatic Plant Management Program in the sections of Fisheries and Ecological Services, particularly the Brainerd, Glenwood, and Metro offices.

In 1996, the Exotic Species Program coordinated management of milfoil with cooperators on 53 lakes. This coordination included review of results of surveys or inspections, and implementation of control where appropriate. Cooperators on lakes designated for high-intensity management usually agree to reimburse the DNR for a portion of the costs of management on these lakes. In 1996, the Exotic Species Program paid contractors for control of milfoil on nine high-intensity management lakes and expects to reimburse cooperators for work on at least 37 maintenance management lakes. Payments to contractors and reimbursements of cooperators in 1996 are estimated to be at least $125,000 (Table 12). Funds allocated for work on individual lakes in 1996, but not spent, will ***not*** be carried over and added to funds allocated for 1997. In previous years funds for work on individual lakes allocated but not spent in one year were carried over to the following year. This was done because the cost share grants were new and in a number of

cases, potential cooperators did not learn about the availability of the funds until late in the season when control was less likely to be effective than it would be if done early in the year. To insure that money was spent when it would be most effective, unspent cost share funds were carried over to the following year. Now the cost share grants have been in existence for three years and the program is well known, there is no longer a need to carry money from one year to the next.

The DNR also benefitted from participation by representatives of various outside organizations in an evaluation of the potential to use fluridone herbicide for selective control of Eurasian watermilfoil. These organizations included the Minnesota Sportfishing Congress, the Minnesota Lakes Association, the Minnesota Aquatic Management Society, and a number of local units of government.

Management of Eurasian watermilfoil in other states

During the fall of 1996, Eurasian watermilfoil was first discovered in North Dakota. Students from the Valley City State University found the exotic in the Sheyenne River, approximately 60 miles west of Moorhead, Minnesota. The North Dakota Game and Fish Department is considering how to deal with management of milfoil in that state.

During 1996, the Iowa legislature passed a law to prohibit the transport of Eurasian watermilfoil. The legislature also allocated $100,000 in 1996 to initiate a program to attempt to limit further spread of the exotic in that state. This program is located at the Iowa Lakes Community College in Estherville. It is a cooperative effort that includes participation by the Iowa Department of Natural Resources and a number of lake associations, which are located primarily in the Spirit-Okoboji and Clear lakes areas in the northern part of the state.

In Wisconsin, a cooperative study of the potential to manage Eurasian watermilfoil with weevils, *Euhrychiopsis lecontei*, is being conducted by the Biological Fishery Research Unit (BFRU) and the Wisconsin Department of Natural Resources (WDNR). The BFRU is part of the U.S. Geological Survey and is located at the University of Wisconsin at Stevens Point. In May, the coordinator of the Minnesota Eurasian Watermilfoil Program and Dr. Newman, University of Minnesota (see below) went to Madison to meet with staff from the BFRU and WDNR to discuss research on milfoil and weevils. During 1996, Wisconsin researchers found weevils in all twelve lakes that they sampled. This effort and other milfoil research projects conducted by the WDNR are being followed closely by the Exotic Species Program of the DNR.

In Michigan during 1996, the Department of Environmental Quality continued its evaluation of the potential to selectively control Eurasian watermilfoil with fluridone herbicide.

Future plans and needs of the Eurasian watermilfoil program:

The Eurasian Watermilfoil Program is now well established and has adequate funds. Priorities for the Eurasian Watermilfoil Program include:

- Keep the public informed about Eurasian watermilfoil and the problems that it can cause,
- Contain the plant's spread by targeting access inspection and enforcement efforts in areas of the state where infestations currently occur,
- Monitor the distribution of milfoil in the state with emphasis on verification of reports of new occurrences of milfoil,
- Control milfoil in Minnesota lakes, especially new populations in areas outside Minneapolis and St. Paul metropolitan area,
- Support research on the potential for biological control of milfoil, including support of the proposal submitted to the LCMR for continued funding, as well as research on the biology of this species,
- Make recommendations on future use of fluridone herbicide in Minnesota, and
- Revise the DNR's plan for management of milfoil.

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Management of Purple Loosestrife

1996 Highlights

- 130 high priority purple loosestrife infestations were treated with herbicide.
- No purple loosestrife was found at nine sites where purple loosestrife plants were treated with herbicides in 1995. This control success is limited to the small infestations that are treated soon after purple loosestrife invades an area.
- 12 sites that were treated in 1995 had a 75% reduction in quantity of herbicide needed to control these infestations in 1996. This is directly due to reductions in infestation size from previous treatments.
- 160,000 purple loosestrife leaf-eating beetles were released at 34 sites statewide.
- Over 95 percent of insect releases made for biological control of purple loosestrife between 1992 and 1995 have become established.
- The Department of Natural Resources (DNR) hosted a national workshop on biological control of purple loosestrife.

Background

Purple loosestrife *(Lythrum salicaria)* 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. 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 3).

In 1996, 39 new purple loosestrife infestations were identified in Minnesota. There are now 1,806 purple loosestrife infestations recorded in the statewide inventory (Table 13). Of those sites, the majority (70%) are lakes, rivers or wetlands. Inventory totals indicate that Minnesota presently has 38,000 acres that are infested with purple loosestrife. These infestations range in size from a few plants to thousands, and vary greatly in plant density.

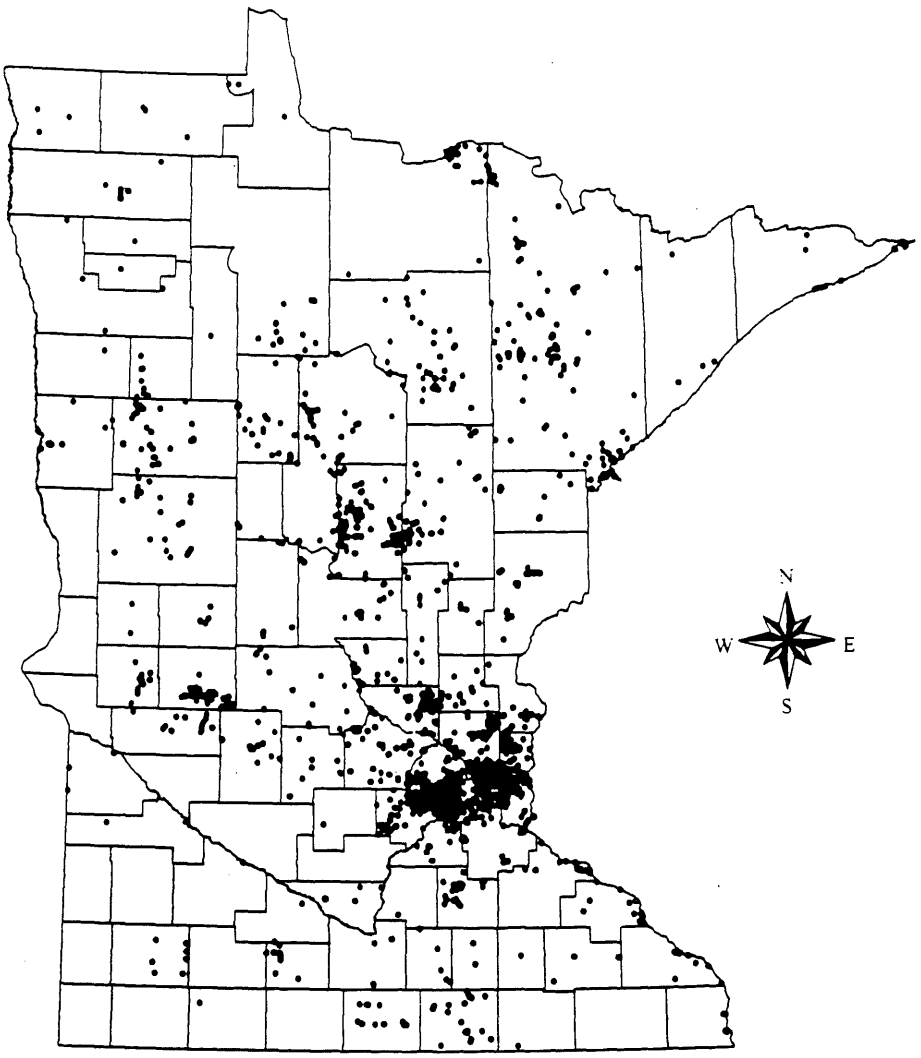


Figure 3. Purple loosestrife infestations in Minnesota as of December, 1996.

Table 13. Purple Loosestrife infestations recorded by the Minnesota Department of Natural Resources in 1995 and 1996.

Site Type	Total Sites - 1995	New Sites - 1996	Total Sites - 1996
Lake	540	8	548
River	139	11	150
Wetland	551	9	560
Roadsides and Ditches	391	8	399
Other[1]	146	3	149
Total	**1767**	**39**	**1806**

[1] Includes gardens and other misc. sites.

Progress in Management of Purple Loosestrife - 1996

Chemical control of purple loosestrife

Attempts by the DNR to control purple loosestrife have relied mainly on the use of herbicides. The most effective herbicide is 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. Although the use of 2,4-D has some advantages, it is more selective than Rodeo because it affects primarily broad-leaved or dicotyledonous plants, it is less effective than Rodeo. A third herbicide, Garlon 3A, or triclopyr, has been applied to purple loosestrife on a trial basis to test its effectiveness and selectivity. If Garlon 3A is registered for aquatic use in the U.S., it will be the herbicide of choice for loosestrife control. Garlon 3A has proven to be very effective and is more selective than Rodeo (i.e., it is less harmful to non-target plants). Garlon 3A is also less expensive than Rodeo.

Between 1990 and 1995, herbicides were applied to an average of 175 purple loosestrife sites per year (Table 14). 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. A similar amount of work was done in 1996.

Beginning in 1991, a prioritization plan was developed for selecting control sites in public waters and wetlands. This was done because there are insufficient resources to apply herbicides to all 1,767 known purple loosestrife sites in Minnesota. In addition, DNR personnel observed that herbicides 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 to the plant's ability to reestablish through recruitment of seedlings from the 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. 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 ($\geq$ 1000 plants) being treated (Table 14).

During the summer of 1996 the DNR or contractors visited 158 purple loosestrife stands for herbicide control work. At 23 sites workers found no loosestrife plants, nine of these sites had been treated in 1995. One site had too many loosestrife plants to treat. Three sites had loosestrife plants which were hand pulled. A total of 130 sites were treated with herbicides. Most of the sites treated by the DNR were very small, 57% had less than 100 plants (Table 14). These applications used 14 gallons of herbicide, took 1,396 worker hours and cost $45,227 (Table 15).

Biological control of purple loosestrife

Insects for biological control of purple loosestrife were first released at one 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 MN. This research was expanded in 1993 through funding appropriated by the Legislature as recommended by the Legislative Commission on Minnesota Resources. Four species of insects, two leaf-eating beetles, *Galerucella calmariensis* and *G. pusilla*; a root-boring weevil, *Hylobius transversovittatus;* and a flower-feeding weevil, *Nanophyes marmoratus*, are now being released as potential biological controls for loosestrife in Minnesota.

Table 14. Number of purple loosestrife infestations treated in 1996 by the Purple Loosestrife Program classified by infestation size.

Year	< 20 plants	20 - 99 plants	100-1000 plants	> 1000 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

Table 15. Summary of herbicide applications to purple loosestrife infestations in 1996 by the Purple Loosestrife Program, Minnesota Department of Natural Resources.

DNR Region	Number of sites treated with Rodeo	Number of sites treated with Garlon 3A	Hour of Labor	Total Cost
I - Northwest	32	0	304	$10,566
II - Northeast	37	0	291	$10,254
III - North Central	35	9	594	$16,236
IV - Southwest	11	0	153	$6,600
V - Southeast	6	0	54	$1,571
VI - Metro	0	0	0	$0
Total	**121**	**9**	**1396**	**$45,227**

Biocontrol insects released in between 1992 and 1995 have established at more than 90 percent of the sites. Insect populations increased significantly at a several locations and damage to loosestrife plants is pronounced in several areas. It is still too early to tell how effective the biocontrol agents will be. Early indications here and in other states and provinces, however, show promise.

During 1996, insects were reared in labs at the University of Minnesota and at a DNR field site near Brainerd for research and field releases during the summer of 1996. Most of the lab rearing and research efforts focused on the leaf-eating beetles (*Galerucella* spp.). The leaf-eating beetles were reared outside for the first time in Minnesota. This was done to reduce rearing efforts and produce hardier insects. Leaf-eating beetles were also provided to Leech Lake Indian Reservation, Mille Lacs Band, and the U.S. Fish and Wildlife Service (USFWS) in Winona, as pilot projects for small-scale outdoor rearing. Approximately 168,000 leaf-eating beetles were produced in 1996, with over 75% being reared outdoors, and about 157,000 were released on 34 separate sites statewide. As of December 1996, insects have been released in 77 sites around the state (see Figure 4).

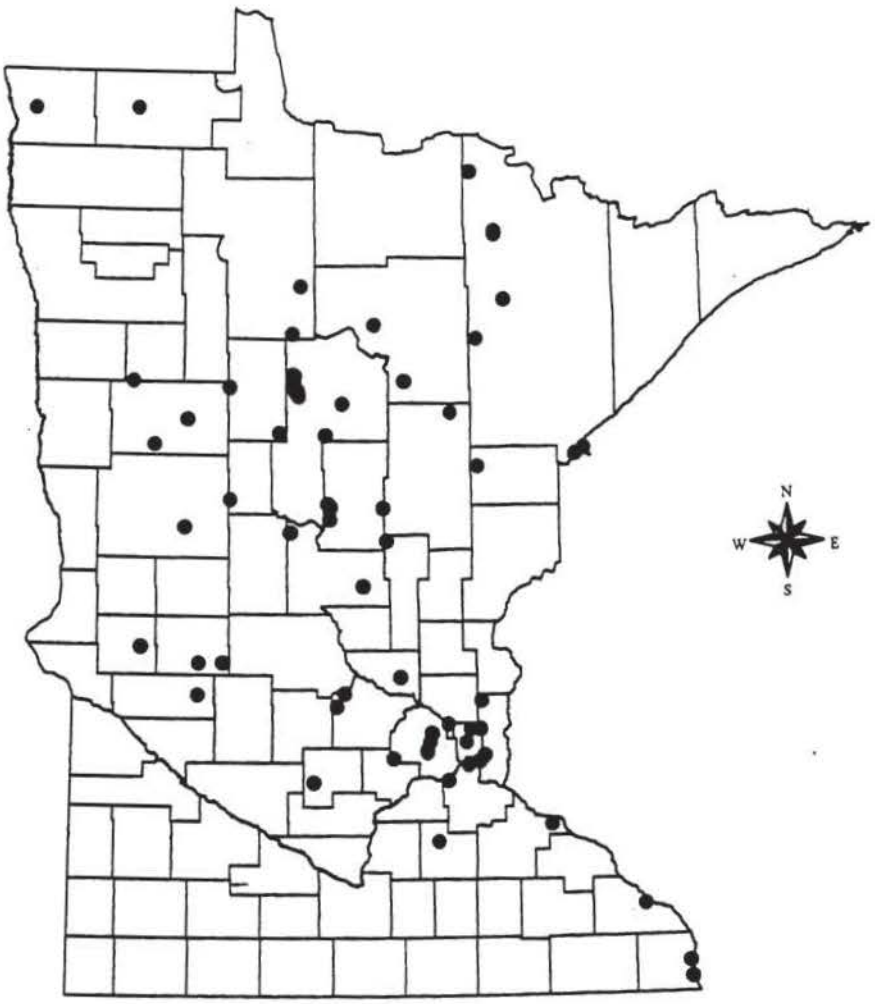


Figure 4. Leaf-eating beetle, *Galerucella* spp. releases in Minnesota as of December, 1996.

Because there are only a small number of root-boring weevils 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 are still small, the root-boring weevils survived the winter and are reproducing. In 1995, more root-boring weevils eggs were received from Cornell University for release into loosestrife infested Minnesota wetlands.

Rearing and distribution of the root-boring weevil continued in 1996. Cornell University provided 1500 root-boring weevil eggs during the summer. These eggs were inoculated into loosestrife plants in the field at three different locations. Because of the weevils slow growth, it will take many years to build up populations in Minnesota wetlands. Cornell University is developing new rearing methods for the weevils which may significantly speed up the production efforts. The new techniques will be implemented in Minnesota as soon as they are available.

Research

Insects as biological control agents

Research on rearing methods continued during 1996 to increase production of the leaf-eating beetles. New outdoor rearing methods were tested as several locations statewide. Prior to 1996, all insects were reared in the lab. Outdoor rearing was first tested by Cornell University in 1994. More insects were produced and insect fitness was increased. DNR and University of Minnesota research efforts found that outdoor rearing required less effort, was less costly and produced as many if not more leaf-eating beetles. Outdoor rearing efforts will be expanded significantly in 1997.

Monitoring efforts of insect release sites was expanded in 1996 with a new monitoring protocol developed by Cornell University. This protocol is being adopted nationwide to intensively monitor changes to the insect and loosestrife populations and changes to native plant populations. Monitoring in Minnesota will continue in 1997 and beyond.

The University of Minnesota is studying the effects of insect feeding on carbohydrate stores in the roots. It is predicted that insects defoliation of loosestrife will deplete carbohydrate stores in the roots thereby killing or stunting the plant. What is not known, is how many times the loosestrife plants will need to be defoliated before the carbohydrate stores are depleted. Early indications show that one defoliation will not kill the plant, but carbohydrate stores were reduced.

Fungal Pathogens as biological control agents

In 1991 and 1992, the DNR funded research to isolate fungal pathogens that can cause damage to purple loosestrife plants. This research is continuing with funding appropriated by the Legislature as recommended by the LCMR. Several pathogens have been isolated that show promise as fungal herbicides. However, field testing of the fungal pathogens in 1995 was unsuccessful at controlling purple loosestrife. A new pathogen was isolated and tested in 1996 with some success. Initial results showed that this new pathogen has the potential to kill loosestrife plants and will be tested more in 1997.

Management of purple loosestrife in other states

The DNR has received two federal grants to rear and distribute insects for purple loosestrife control nationwide. A total of $312,000 was received from two USFWS 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. To date, over 250,000 leaf-eating beetles and 30,000 root-boring weevil eggs were reared and distributed to 27 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.

A national workshop to teach resource managers how to implement a biological control program was held in January, 1996. This workshop was hosted by the DNR and the USFWS. Over 100 people participated from 22 States and five Federal agencies. This workshop discussed the federal grants for distributing insects, how to rear and release the biocontrol agents, and how to monitor changes in insect and plant populations once biocontrol insects are introduced.

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 (nine in 1996) 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 loosestrife infestations within wetlands statewide. Biological controls, if effective, will reduce the impact loosestrife has on wetland flora and fauna communities. DNR's goal is to reduce loosestrife populations in Minnesota by at least 70% within 15-20 years. Purple loosestrife likely will 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.

Participation of others in purple loosestrife control efforts

In 1996, the DNR worked with a variety of local governments and other organizations to control purple loosestrife in Minnesota (Table 16). Control information and technical assistance was provided to landowners and local units of government.

Table 16. List of cooperators 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	DNR provided biocontrol insects and expertise for rearing and distribution
Mille Lacs Band Ojibwe, Natural Resource Department	DNR provided biocontrol insects and expertise for rearing and distribution
USFWS, Winona MN	DNR provided biocontrol insects and expertise for rearing and distribution
Ramsey County	Cooperative agreement to allow Ramsey Co. to utilize state contract to hire commercial applicators. Start new effort for biocontrol.
McLeod County	Partner with DNR in biocontrol initiative on Lake Whitney
City of Sunfish Lake	DNR provided equipment and herbicide
Birch Lake Association, Ramsey Co.	DNR provided equipment and herbicide
L. Sand Lake Association, St. Louis Co.	DNR provided equipment and herbicide
City of Lakeville	DNR provided equipment and herbicide
St. Marys University, Winona MN	Provided DNR with GIS data on purple loosestrife infestations
Cornell University, Ithaca NY	Provided purple loosestrife biological control insects for release in Minnesota
MN Department of Agriculture	Partner with DNR in statewide biological control efforts including releasing and monitoring insects.

Future needs for managing purple loosestrife

- Continue research on biological controls of purple loosestrife. This includes the development of insect rearing and release strategies. Implementation strategies will be needed for actual distribution in the field and subsequent monitoring of the insects.
- Continue funding herbicide control efforts on small infestations of loosestrife.
- Increased coordination to control loosestrife on other state agency managed areas.
- Develop new in-state partners (e.g., County Ag. Inspectors) to expand scale of rearing efforts.

Management of Flowering Rush

1996 Highlights

- There were no new reports of flowering rush infestations in Minnesota in 1996.
- The Exotic Species Program continued control activities through a cooperative project with Becker and Wadena County Sentence to Service program.
- Bemidji State University researchers collected baseline information on flowering rush biology through a project funded by the Exotic Species Program.

Background

Flowering rush (*Butomus umbellatus*) is a Eurasian aquatic plant that has been introduced into Minnesota. It grows as a submersed plant in lakes and rivers and as an emergent plant along shorelines. It is a pioneering species and often invades areas where native vegetation is absent or sparse. The Exotic Species Program is concerned about this exotic species because:

1) it is an exotic plant that has overwintered and spread within several Minnesota water bodies,
2) it may compete with and crowd out native aquatic plants, and
3) dense growths of submersed flowering rush plants may interfere with recreational water use.

Flowering rush is currently sold as an ornamental garden or pond plant. The sale of this exotic is the most likely means of introduction into a new area. Once established, flowering rush spreads mainly by vegetative reproduction of the rhizome. Because of its limited reproductive potential and dispersal mechanisms, flowering rush does not spread as quickly as other harmful exotic plants, such as Eurasian watermilfoil and purple loosestrife. However, once it is established controlling it without harming native vegetation is difficult.

Distribution/Inventory

Flowering rush has been reported from ten Minnesota water bodies:

Becker County	Detroit Lakes	confirmed
	Muskrat Lake	confirmed
	Sallie Lake	confirmed
	Melissa Lake	confirmed
	Pelican River	confirmed
Itasca County	Twin Lakes	confirmed
Anoka County	Amelia Lake	historical report
	Bass Lake	historical report
	Reshanau Lake	historical report
Rice County	Cannon River	historical report

Progress in management of flowering rush - 1996

The Exotic Species Program continues to assess the risk that flowering rush may cause to native species and evaluate control options. Flowering rush often grows in stands with native vegetation, making it difficult to control this exotic without harming the native plants.

The Exotic Species Program coordinated a hand-cutting project of emergent flowering rush at sites in Detroit Lakes. Becker and Wadena County Sentence to Service (STS) crews hand cut marked areas of emergent flowering rush two to three times during the summers of 1995 and 1996. This method appears effective at seasonally controlling the abundance of flowering rush. In 1997 the DNR will assess the longer term effects of repeated cutting on flowering rush and native species within the sites.

The Pelican River Watershed District (PRWD) manages submersed areas of flowering rush and native plants by mechanically harvesting. The harvesting program is regulated through DNR's Section of Fisheries. The PRWD also provided shoreline pick up of flowering rush plants cut by the STS crews.

DNR Exotic Species Program staff hand dug and removed flowering rush in Melissa Lake in 1996. The DNR will monitor this site in 1997 and determine if hand removal of roots and shoots is effective in controlling small isolated areas of flowering rush.

Bemidji State researchers are investigating the biology of flowering rush under contract with the DNR. Their studies include an evaluation of the viability of flowering rush rhizomes and seeds and the chromosome composition of different populations of flowering rush. This information will be useful in determining how flowering rush spreads and may provide insight on control options.

Future needs for flowering rush management

- The DNR should continue public awareness about the value of native vegetation and potential problems of introducing exotics. New state regulations make it illegal to buy or sell flowering rush in Minnesota. However, this exotic is still described in horticultural books and magazines and may be inadvertently sold in the state.
- Monitor all reported flowering rush sites and investigate any new reports.
- Continue to conduct and/or evaluate current control projects and investigate alternative methods.
- Evaluate research reports from Bemidji State and use results to determine future research needs.

Management of Curly-Leaf Pondweed

1996 Highlights

- A private consultant has been hired to review the available literature on curly-leaf pondweed control. This review will be completed in March of 1997.
- Legislation was drafted, with help from the DNR Exotic Species Program, which makes it illegal to transport any aquatic plant on a boat or trailer. This legislation, which was passed in 1996, will help slow the movement of curly-leaf pondweed.
- Public information about curly-leaf pondweed was provided through literature, public presentations, and watercraft inspections.
- Technical assistance (in cooperation with DNR Fisheries staff) was provided to various organizations interested in curly-leaf pondweed control.

Background

Curly-leaf pondweed *(Potamogeton crispus)* is an exotic 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 unique life cycle adaptations which give 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 usually senesces by early July, but it first forms vegetative propagules called turions (hardened stem tips). These turions disperse by water movement throughout a water body. Turions lay dormant during the summer when native plants are growing, and germinate in the fall when most native vegetation has senesced. Thus curly-leaf pondweed is able to use turions to invade new areas of a water body.

Large populations of curly-leaf pondweed can alter the nutrient dynamics of water bodies. As curly-leaf plants senesce in the summer, large amounts of vegetation falls to the lake bottom and decompose. This decomposition can increase internal nutrient loading in a water body (Bolduan et. al. 1994), which in turn may cause an increase in algal growth. Curly-leaf pondweed can be a particular problem in shallow, fertile lakes such as occur in southern and central Minnesota. Lake associations and DNR fisheries staff have been managing curly-leaf problems in Minnesota lakes for many years. They have expressed interest in improving current management approaches.

In 1995, the DNR Exotic Species Program estimated the general distribution of curly-leaf pondweed in Minnesota. It has been reported in 65 of the 87 Minnesota counties. The DNR evaluated the potential for curly-leaf eradication and concluded that, because curly-leaf pondweed produces turions which can stay in lake sediments for years (like a seed bank), eradication of curly-leaf pondweed from a water body is unlikely given current control technology.

Progress in Management of Curly-leaf pondweed in 1996

- DNR Exotic Species Program staff have talked with several lake associations about their options for curly-leaf pondweed control.

- DNR Exotic Species Program staff, along with DNR fisheries staff, reviewed a proposal to control 177 acres of curly-leaf pondweed in Lake Marion, in Dakota County. This project is being proposed by Barr Engineering for the City of Lakeville. The main objective in this curly-leaf project is to reduce internal phosphorus loading in the lake by reducing the amount of curly-leaf which decomposes in the central basin. Engineers at Barr believe that the mid-summer die off of curly-leaf depletes oxygen at the sediment surface, and thus leads to a release of phosphorus into the lake from the anoxic sediments.

- DNR Exotic Species Program staff provided technical assistance to DNR fisheries staff on how to control a small curly-leaf pondweed patch in Sleepy Eye Lake in Brown County. Because of a renovative fisheries treatment, Sleepy Eye Lake has experienced a large increase in water clarity. In the past poor water clarity has resulted in almost no submersed aquatic plants growing in Sleepy Eye Lake. Fisheries staff are trying to keep the exotic curly-leaf out of the lake so that native aquatic plants can re-establish.

Current Distribution of curly-leaf pondweed in Minnesota

The process used to determine the distribution of curly-leaf pondweed is described in the 1995 annual report (Exotic Species Programs 1995 p. 64). Figure 5 shows every county in Minnesota where there is at least one water body with curly-leaf pondweed recorded in DNR records. Although most of the counties in the state have at least one record of curly-leaf, there are still many lakes within the state where this exotic plant has not yet been found. Lake and St. Louis counties, for example, have many lakes which have no recorded curly-leaf pondweed populations.

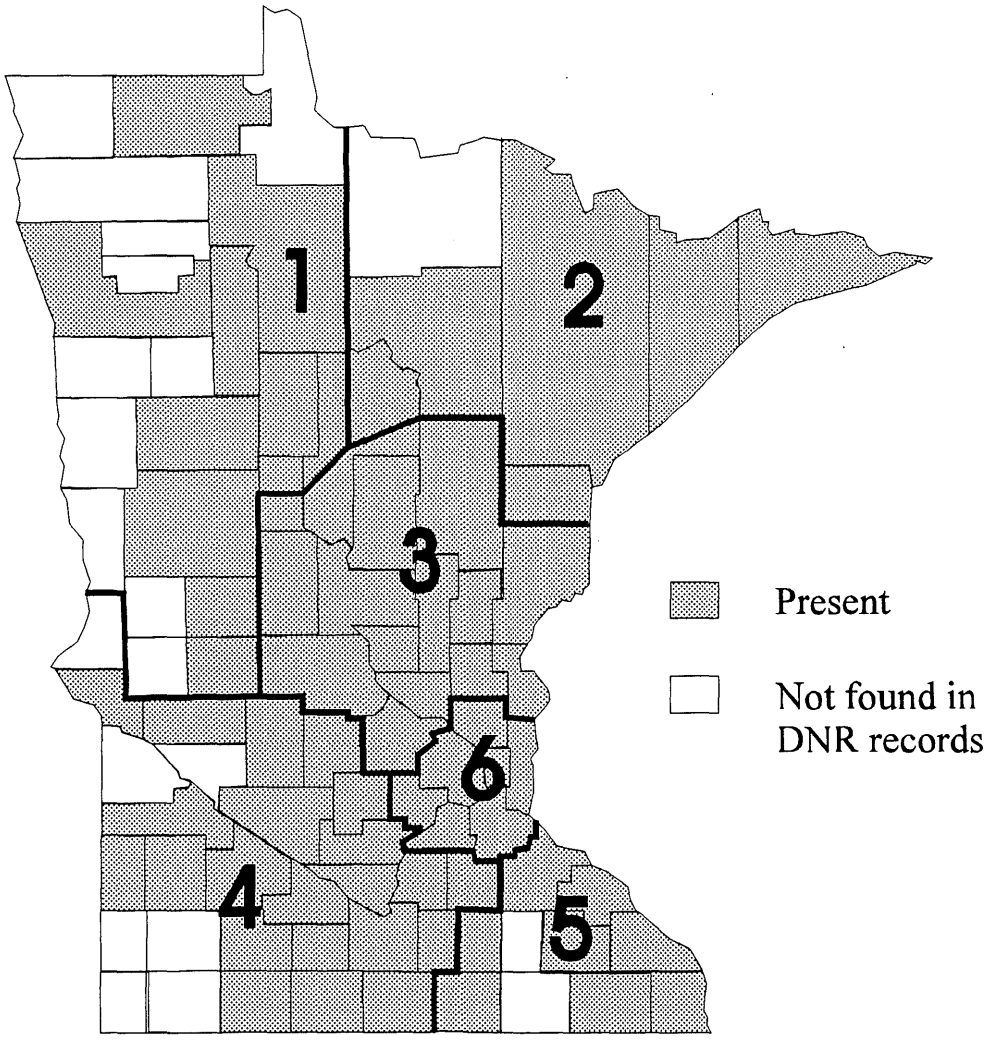
Research on curly-leaf pondweed

The DNR Exotic Species Program has hired a consultant to review the available literature, both peer - reviewed and government publications, on curly-leaf pondweed control. The emphasis of this review is the effectiveness of control methods on long term abundance of curly-leaf populations, and how the timing of control measures effects the results. This review will be done in March of 1997.

As described in the 1995 annual report (Exotic Species Programs 1995 p. 66), the firm of Blue Water Science is conducting research to determine if a properly timed intensive mechanical harvesting effort can result in a long-lasting reduction of curly-leaf pondweed. This effort in French Lake, in Rice County involves three years of mechanical harvesting, which began in May of 1996. Approximately 100 lake shore residents volunteered time for the cutting project this past summer. McComas and Stuckert of Blue Water Science believe that curly-leaf regrowth has been reduced in cut areas based on plant surveys during the summer of 1996, and previous observations. They intend to continue the harvesting for an additional two years (McComas and Stuckert, 1996). Exotic Species Program staff, along with DNR fisheries staff, monitored the effectiveness of the 1996 cutting in French Lake. We observed curly-leaf being harvested in the north end of the lake. We did not see any native plants in the areas which were harvested.

The DNR Exotic Species Program staff have reviewed three other proposals to reduce curly-leaf pondweed abundance by cutting the plant early in the summer. These projects are similar to the French Lake project, and were also proposed by Blue Water Science.

Figure 5. Counties in Minnesota with *Potamogeton crispus* (curly-leaf pondweed), numbers refer to DNR regions.



Control of curly-leaf pondweed

Curly-leaf pondweed is a monocot, biologically very similar to numerous valuable and common native aquatic plants, such as all of the native *Potamogetons* (for example sago pondweed), *Vallisneria americana* (wild celery), and duckweeds *(Lemnaceae)*. Generally, selective chemical control of curly-leaf pondweed is not possible (i.e., killing curly-leaf without harming adjacent native vegetation) unless it is the only aquatic plant species growing in a treated area. Curly-leaf pondweed can be controlled with both herbicides and by mechanical harvesting. The herbicides used are of the non-selective, contact type, usually diquat or endothall formulations such as Aquathol or Hydrothol 191. When a water body is treated with herbicides, it is not possible to eradicate the curly-leaf pondweed turions. Even if all of a summer's curly-leaf pondweed crop was killed before it produced turions, turions would be present from previous years.

Ninety-nine aquatic plant control permits issued by the DNR in 1995 were used to control curly-leaf pondweed. Under those permits herbicide was applied to 590 acres and 340 acres were mechanically harvested. Most of permits to control curly-leaf pondweed used in 1995 were in region 6 (54%), with an additional 28% used in region 3, and 13% used in region 4 (Figure 5).

This information comes from aquatic plant management permittee reports and is not yet available for 1996.

Future needs for curly-leaf management

- Assess the extent of ecological and recreational problems caused by curly-leaf pondweed in Minnesota.
- Continue public awareness efforts through our watercraft inspection program, literature, and public speaking engagements.
- Prepare a report on the current state of curly-leaf pondweed in Minnesota and existing management technology, and summarize this information in a fact sheet.
- 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 the possibility of cooperative research with Hennepin Parks and the Army Corps of Engineers, Aquatic Plant Control Program.

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Management of Zebra Mussels

1996 Highlights

- Single zebra mussels were found individually attached to three native mussels moved in a translocation project at the proposed Stillwater bridge site in the St. Croix River.
- Divers discovered three boats with attached zebra mussels in the St. Croix River and Conservation Officers ordered the boats removed and cleaned.
- No infestations of zebra mussel were recorded from inland waters in Minnesota.
- Watercraft inspections and public awareness efforts continued and increased in areas near zebra mussel infested waters (see Education & Inspection).
- The Department of Natural Resources (DNR) continued to work with the National Park Service (NPS) and U.S. Fish & Wildlife Service (USFWS) on the St. Croix River Zebra Mussel Plan.

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. Attachment to recreational boats can cause damage to watercraft or motors, as well as serving to move mussels to other waters. 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. Despite having been present in North America for less than a decade, it has established populations throughout most of the eastern United States and its eventual distribution is projected to include most of the U.S. and southern Canada. The following report summarizes activities in Minnesota for 1996.

Progress on management of zebra mussels - 1996

Progress was made in the following areas that were identified as future needs for 1996:

- Researchers documented attachment of zebra mussels onto aquatic macrophytes in Lake Pepin.
- Legislation was passed preventing the transport of all aquatic macrophytes in 1996 (M.S. 84D.09, see Appendix A). This will assist in preventing the transport of attached zebra mussels.
- The Exotic Species Program obtained GIS software and training and will continue to work on a distributional database for zebra mussels.

Current distribution/inventory of zebra mussels

Zebra mussel population levels in the Mississippi River continued to increase and native mussels in Lake Pepin and elsewhere in the river show increases in infestation by zebra mussels. The DNR and the Army Corps of Engineers are conducting a study looking at zebra mussel infestation and impacts on native unionids. Zebra mussels have not yet been documented above Lock and Dam 1 on the Mississippi River (Figure 6). Zebra mussels continue to be found in the Duluth Harbor, but no evidence has been found to suggest that these mussels are reproducing. Single zebra mussels were collected attached to three native unionids moved in the translocation project at the proposed Stillwater Bridge site in the St. Croix River. These three were found widely scattered and do not indicate that the St. Croix River is infested with reproducing zebra mussel populations. 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 for monitoring activities. The DNR also contracted with commercial divers to inspect recreational overwintered boats and commercial barges in the St. Croix River. The DNR also required three boats found during dive inspections with attached zebra mussels in the St. Croix River to be removed, cleaned and reinspected as required under current Minnesota law.

Control of zebra mussels

There was no control of zebra mussels within natural ecosystems conducted in 1996 and we do not anticipate undertaking control activities at any time in the near future. There are still no environmentally safe control methods available for 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 remains 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 Inspection sections).

Research on zebra mussels

The DNR continued research to document increasing levels of zebra mussel infestation on native unionids in Lake Pepin on the Mississippi River. DNR staff also attended the Sixth International Zebra Mussel Research Conference to gather current information on research being conducted in the United States and Canada. DNR Biologists also collected and analyzed plankton tows from Lake Pepin to examine veliger densities in the Mississippi River. Preliminary results indicate very high densities of veligers in the southern end of Lake Pepin from early July through mid-September. While this period represents the highest risk for zebra mussel attachment, veligers were found in the lake as early as June and continue to be present in low numbers through early October.

Management of zebra mussels in other states

Management efforts in other states are very similar to efforts in Minnesota. With no control options available, management focuses mainly on public awareness and regulations to prevent or slow the spread of the zebra mussel. Approximately 17 states have laws which prohibit the importation of zebra mussels, while four additional states have general prohibitions on the importation of exotic species. The phrase "management of zebra mussels" must be viewed realistically. Because this organism can withstand a lack of water or oxygen 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.

Figure 6. Confirmed Zebra Mussel Sightings as of December, 1996.
(Source: U.S. Geological Survey - Biological Resources Division)

Effectiveness

No inland lakes in Minnesota are known to be infested with zebra mussels. 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 rate of movement of zebra mussels by trailered watercraft.

Participation with other groups

An interagency workgroup for the St. Croix River Zebra Mussel Response Plan continues to meet and coordinate efforts to try and prevent the zebra mussel from spreading into the St. Croix River. Wisconsin enacted a law similar to that in Minnesota prohibiting boats from having attached zebra mussels in the St. Croix River, making enforcement similar for the entire boating community of the St. Croix River. The DNR required boat owners on the St. Croix River to remove and clean their boats when zebra mussels were found attached during routine monitoring dives.

Public awareness and education efforts have benefitted from cooperation from the many groups involved in the zebra mussel issue: federal agencies (NPS), state agencies (DNR), Minnesota Sea Grant Extension, and private industry (Northern States Power). These efforts are covered more fully in the Education section.

Minnesota Sea Grant instituted a Volunteer Citizen Monitoring effort to help with the early detection of zebra mussels and other harmful invaders in inland waters. Currently, 30 volunteers participate in Minnesota by checking docks, boat hulls, and other hard surfaces for attached zebra mussels. This program, in collaboration with Wisconsin and Michigan Sea Grant programs, provides an early warning mechanism for management and enforcement agencies concerned with the spread of exotics throughout the upper Midwest.

Future needs for management of zebra mussels

- Continue veliger sampling in Lake Pepin and attempt to document the occurrence and density of veligers from areas nearer to the Twin Cities in the Mississippi River.
- Implement education, inspection, and enforcement measures to prevent the movement of aquatic vegetation from zebra mussel infested waters.
- Monitor findings of international research efforts including the 1997 International Zebra Mussel Conference.

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 widely distributed in Minnesota. The rusty crayfish lives in permanent water bodies and grows 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. While its activities may also reduce diversity and abundance of native vegetation when rusty crayfish occurs at high densities, this reduction has also been seen 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, other fish such as walleye and bass in some lakes were reported to feed heavily on rusty crayfish.

Progress in management of rusty crayfish - 1996

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 management activities within the state. Rusty crayfish were designated as prohibited exotic species in rules adopted in 1996. Minnesota Rules prohibit the sale of crayfish as bait, but allows their use for bait in the body of water where they are captured. Individuals can take and possess up to 25 pounds of crayfish for personal use. DNR Fisheries also requires a permit for importing live crayfish or eggs, transfer between water bodies or commercial harvest. A brief summary paper on the ecology and biology of this crayfish was drafted by the DNR and is in review. This paper will be available to interested resource professionals when it is completed.

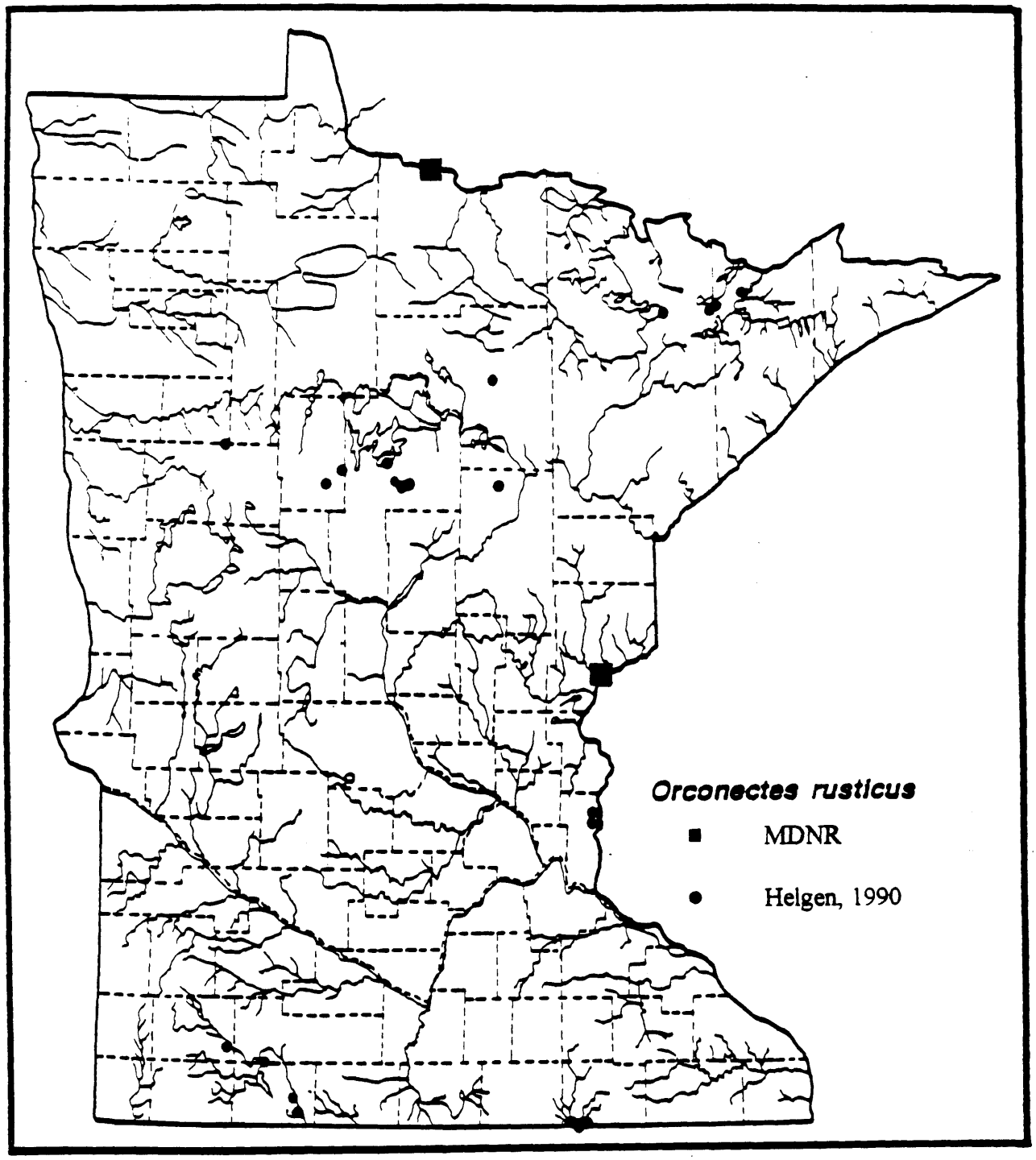
Current distribution of rusty crayfish

In 1990, the rusty crayfish was reported from 16 water bodies in 12 counties scattered widely throughout the state from the northeast to the southwest (see Figure 7). Additional specimens collected by the DNR place it in two more waters, both border rivers (St. Croix River in Pine County and Rainy River in Koochiching County). Judging from this widespread distribution, rusty crayfish are likely present in more Minnesota waters.

Control of rusty crayfish

There are no environmentally safe control methods available for the rusty crayfish that can be used in natural systems. Suggestions have been made to trap and remove these crayfish. However, trapping removes mainly large male rusty crayfish. This has no effect on population density. A study of trapping in small ponds by the U. S. Fish and Wildlife Service (USFWS) 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 setting, trapping is not likely to succeed in reducing the population or problem.

Figure 7. Rusty crayfish distribution in Minnesota (Reproduced from Helgen, 1990, with DNR collections added).



Research on rusty crayfish

The Exotic Species Program is not currently conducting research on rusty crayfish. Researchers in Wisconsin have conducted studies on biology, ecology and impacts in northern Wisconsin lakes.

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 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. Recent 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 of the lake, and a thriving fisheries is present.

Future needs for management of rusty crayfish

- Survey crayfish throughout Minnesota waters to better establish extent of rusty crayfish distribution.
- Review the current classification of the rusty crayfish. While currently listed as a 'prohibited' exotic species, other current state regulations and information on impacts by native crayfish may warrant the reclassification to 'regulated' status.

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Management of Ruffe

1996 Highlights

- No ruffe have been discovered in inland waters of Minnesota.
- Ruffe were listed as prohibited exotic species in permanent rules adopted by the Department of Natural Resources (DNR) (see Appendix B).
- A draft Nonindigenous Fish Response Plan has been developed for the state.

Background

The ruffe (*Gymnocephalus cernuus*) a Eurasian fish of the perch family, was unintentionally 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 - 1996

Many of the activities conducted by the DNR and other cooperating agencies in past years to prevent the spread of ruffe were continued in 1996. Information about the ruffe has been included in brochures, billboards, and 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. "Ruffe Watch" identification cards for anglers were prepared by MN Sea Grant in cooperation with the Great Lakes Sea Grant Network, the USFWS, and several state resource agencies. The Exotic Species Program and DNR fisheries biologists have drafted a management plan for ruffe, round goby and other exotic species of fish. The draft plan will be sent out for review by organizations such as the Minnesota Sea Grant, University of Minnesota, and the USFWS. Sixty preserved specimens of ruffe were supplied to the Minnesota DNR fisheries offices compliments of Minnesota Sea Grant and USGS-Biological Resources Division. The specimens will help DNR staff identify ruffe.

A federal ruffe control committee that was established in 1992, again revised a federal Ruffe Control Program in 1996 and is seeking additional public comment on the program.

Current distribution and inventory of ruffe

The USGS-BRD, Lake Superior Biological Station (previously the National Biological Service) has taken the lead role in ruffe population investigations in the Great Lakes and their tributaries. According to their surveys, the population of ruffe in the St. Louis River estuary declined slightly in 1996 and is currently estimated at 6.2 million fish.

The USFWS Fishery Resources Offices will continue 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. They have been found in Lake Superior as far east as Ontonagan, Michigan, a reproducing population was discovered in Thunder Bay, Ontario in 1994, and ruffe were discovered in Lake Huron for the first time in 1995 (Figure 8).

Figure 8. Confirmed Ruffe Sightings as of December 1996.
(Source: U.S. Geological Survey - Biological Resources Division)

During routine fish population assessment netting, DNR's Section of Fisheries sets nets in inshore areas of Lake Superior. The DNR is conducting no 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. No ruffe were confirmed in Minnesota inland waters in 1996.

Control of ruffe

The Minnesota and Wisconsin DNR have attempted to control ruffe in the Duluth area of Lake Superior and the St. Louis River since 1988. Several tactics were considered including predator control, chemical treatment of the lower St. Louis River system, and stocking sterile male ruffe. Predator control was chosen as the quick response tactic that might provide a check on the ruffe expansion. The goal of restrictive angling regulations and stocking of predator fish was to increase predation on ruffe by native fish. This tactic has not checked the ruffe population size or ruffe expansion.

In response to the discovery of ruffe in Lake Huron, and after consultation with the Council of Lake Committees of the Great Lakes Fishery Commission in November 1995 and a July 1996 meeting of the Ruffe control Committee, the Federal Ruffe Control Program was revised and submitted to the federal ANS Task Force. The goal and objectives in the current draft are:

Revised Goal: The goal of the ruffe control program is: to prevent or delay the further spread of ruffe through the Great Lakes and prevent their spread to other inland lakes and watersheds.

Revised Objectives: (not in priority order)

- Population reduction: Eliminate or reduce reproducing ruffe populations, using appropriate technologies where feasible.
- Ballast water management: Minimize the transport of ruffe from western Lake Superior through ballast water management, and support the development of technologies to prevent transport.
- Population investigation: Continue and expand investigations of ruffe populations to evaluate the impact on affected fish communities and to provide information necessary to plan, implement, and evaluate control activities.
- Surveillance: Conduct surveillance sampling in likely locations to find newly established populations of ruffe, and designate a single office to compile collections of ruffe.
- Fish Community Management: Recommend fish management practices that will improve resilience of fish communities against invasion or dominance by ruffe.
- Education: Develop and promote information and education programs to identify ruffe so that they will not be transported alive and so that they will be killed and reported if taken.
- Bait fish management: Assist jurisdictions in developing model language for regulation of bait harvest and possession.

- Chicago Sanitary and Ship Canal: Consider options to prevent the movement of ruffe from the Great Lakes to the Mississippi watershed via the Chicago, Des Plaines, and Illinois Rivers.

Research on ruffe

The USFWS and the U.S. Geological Survey, Biological Resources Division (USGS-BRD) are conducting research on ruffe. Their current research topics include: monitoring ruffe in the St. Louis River estuary, monitoring areas of future expansion, monitoring native populations after ruffe invade, and predator food habits on ruffe.

Minnesota Sea Grant received $2 million in funding from the National Sea Grant Program to be used on ruffe research and education efforts. They funded research projects focused on describing the impacts of ruffe and their colonization and reproduction patterns in the Great Lakes.

An International Symposium on Biology and Management of Ruffe is planned for March 21-23, 1997 in Ann Arbor, Michigan. It will be jointly sponsored by Minnesota and Michigan Sea Grant programs. The symposium will feature Eurasian and North American ruffe experts. The symposium is an attempt to establish the current state of knowledge about ruffe and identify research needs to stimulate further research on the control/management of ruffe in North American waters, and lead to cost effective management decisions.

Minnesota Sea Grant's Exotic Species Information Center has developed a searchable "Ruffe Database" located on Minnesota Sea Grant's Web Site (http://www.d.umn.edu/~seagr/). Over 75 research references can be searched by author, title, or year.

Effectiveness of ruffe management

The state's predator stocking and restrictive angler regulations appear to have had little effect in slowing the expansion of the ruffe. Those activities were the only control strategies initially available. Regulations, inspections, and other and 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 for nonindigenous fish introductions to 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 entity, or the Indian tribes have 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. Michigan is considering, but has not established management options for the ruffe population discovered where Thunder Bay River enters Lake Huron.

Participation of others in ruffe control efforts

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.

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 efforts to address the future potential for ruffe to enter the Mississippi River via outlets from Lake Michigan.
- Invest in the research of environmentally sound control methods.
- Support continued biological assessment efforts by the DNR Section of Fisheries, 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.
- Circulate and finalize Minnesota's Nonindigenous Fish Plan that includes ruffe.

References Cited

Ruffe Control Committee. November 1996. Ruffe Control Program. Submitted to the Aquatic Nuisance Species Task Force by the Ruffe Control Committee, Thomas R. Busiahn, Chairman, USFWS, Ashland WI.

Management of Round Goby

1996 Highlights

- Illinois Natural History Survey prepared a document "The Round Goby (*Neogobius melanostromus*): A Review of European and North American Literature". The document also included notes from a Round Goby Conference held in Chicago in February 1996.

- Round goby is designated a prohibited exotic species in the permanent rules adopted by the DNR in 1996 (see Appendix B).

- A draft Nonindigenous Fish Response Plan which will guide future round goby management efforts has been developed for the state.

- The U.S. Fish and Wildlife Service (USFWS) surveyed the Chicago waterways in the fall of 1996 to determine the distribution of round gobies in the waterways. This was a preliminary step to assessing the potential for implementing emergency efforts to keep the round goby from entering the Mississippi River from the Chicago waterways.

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 (Jude et. al. 1992). 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 (Marsen, et. al. 1996). Populations of other species such as logperch and lake sturgeon may be harmed as well. If round gobies enter the Mississippi River basin, there is concern about their impacts on darters, several of which are federally listed threatened and endangered species (Busiahn personal communication). Because round gobies eat zebra mussels, there is also concern about the potential for round gobies pass contaminates from zebra mussels to game fish such as smallmouth bass.

Progress in management of round goby - 1996

The understanding of round goby biology and potential impacts was furthered by the Round Goby Conference held in Chicago in February. An excellent review of literature has been compiled (Marsden, et. al. 1996) and will soon be available.

The round goby was designated a prohibited exotic species in the Department's permanent rules (see Appendix B). By placing round goby in this regulated classification, transportation of the species will be prohibited on public roads (under Minnesota Statutes 84D.05 and 84D.13 in Appendix A), and the risk that it will be dispersed to inland waters of the state can be reduced.

Round goby identification cards 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, or when, round gobies are discovered in inland waters they will be reported to the DNR.

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, the Lake Erie basin, Lake Michigan basin, the Chicago waterways, and now to the Lake Superior watershed (see Figure 9). The first two specimens of the round goby were discovered in the Duluth-Superior harbor (St. Louis River estuary) during 1995 and another was found in 1996. Round goby have not been identified in any inland waters in the state. The presence of round gobes in Lake Michigan and the Chicago waterways poses risk of introduction of round gobies into the Mississippi River watershed through the connected waters. A survey conducted by the USFWS in fall of 1996 found gobies located in the Little Calumet River portion of the Chicago waterways, within 12 river miles downstream of Lake Michigan.

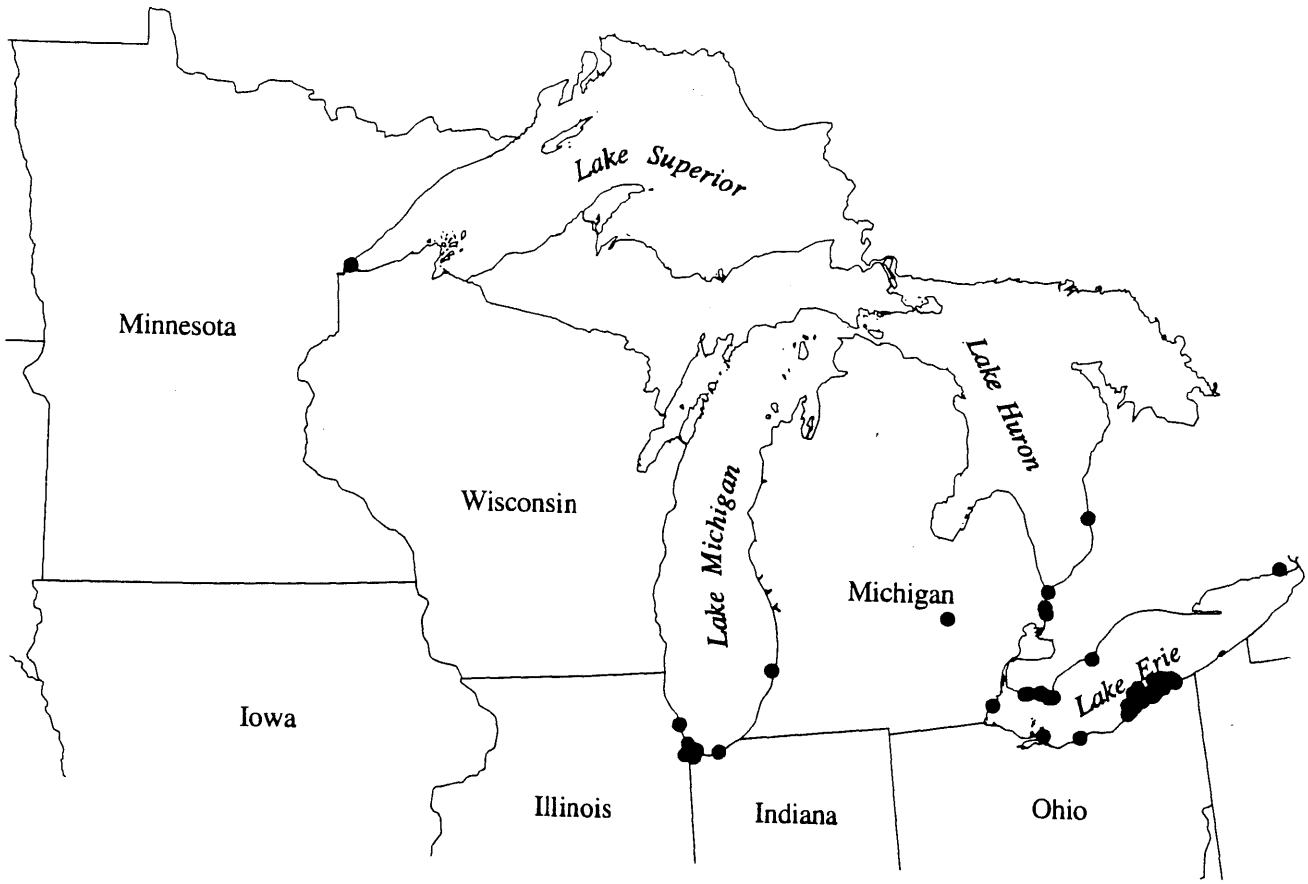

Figure 9. Confirmed round goby sightings as of December 1996.
(Source: U.S. Geological Survey - Biological Resources Division)

Research on round goby

Several research efforts regarding round goby began in the Great Lakes region before gobies were found in Minnesota. The primary research work has been done at the University of Michigan (Jude 1992 and 1995) and Illinois Natural History Survey. A Round Goby Conference was be held in Chicago on February 21-22, 1996 to review the latest information on the biology, spread, population dynamics, and impacts of the round goby. Illinois Natural History Survey prepared a document "The Round Goby (*Neogobius melanostromus*): A Review of European and North American Literature". The document also included notes from the conference and research priorities established during a roundtable discussion at the conference.

Participation of others

Two other agencies have played a role in the discovery of round goby and subsequent education efforts to alert the public of the round goby's presence in the state. The USGS-Biological Resources Division discovered the species during its work in the Duluth area in 1995. Minnesota Sea Grant has been developing informational materials such as an identification card and issued press releases about the discovery in 1995.

Within the Great Lakes region, Illinois Natural History Survey and Illinois/Indiana Sea Grant have been active in conducting research and preparing informational materials. Illinois/Indiana Sea Grant developed a round goby fact sheet titled *Round Gobies Invade North America*. The fact sheet is being distributed throughout the Great Lakes region.

At the national level, the round goby has not yet been declared an aquatic nuisance species and a control program has not been initiated. The USFWS is preparing a risk assessment on the round goby as a preliminary step to drafting a long term management plan for management of the goby. In November 1996, the national Aquatic Nuisance Species (ANS) Task Force assigned the Army Corp of Engineers, the USFWS, and others to a committee to review what possible short term actions could be taken to keep round gobies from moving down the Chicago waterways into the Mississippi River watershed.

Future needs for round goby management

State

- Distribute round goby identification cards and fact sheets as part of the ongoing exotic species public awareness activities in the state.
- Circulate and finalize Minnesota's Nonindigenous Fish Plan that includes round goby.

Regional/National

- Determine management actions that can be taken in the Chicago waterways to limit round goby spread.
- Invest in the research of environmentally sound control methods and other priorities established at the 1996 Round Goby Conference.

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Management of Eurasian Swine

1996 Highlights

- In 1996, there were no changes to the restricted species statutes that pertain to Eurasian swine. Eurasian swine herds in the state are prohibited in Minnesota, except for the six existing registered herds that were grandfathered by legislation passed in 1993.

Background

Eurasian swine (*Sus scofa* 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 Minnesota Department of Agriculture (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.

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 restricted species 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.

Current distribution of Eurasian swine

No wild populations of Eurasian swine are known to exist in the state. There are six known 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. Simple 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 scofa domesticus*).

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

- Identify non-registered herds.
- Inspect facilities holding registered herds and issue permits when appropriate.
- Develop methods to differentiate between domestic and Eurasian swine herds.

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Appendix A - Minnesota Statutes Regarding Exotic Species

CONTENTS

MINNESOTA STATUTES - HARMFUL EXOTIC SPECIES

(Note: Minnesota Statutes, chapter 84D becomes effective May 1, 1996 and replaces several statutes that pertained to Eurasian water milfoil, ecologically harmful exotic species, and purple loosestrife.)

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 nonwoody plant, either a submerged, floating leafed, floating, or emergent plant that naturally grows in water or hydric soils.

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 watermilfoil.** "Eurasian watermilfoil" 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. **Limited infestation of Eurasian watermilfoil.** "Limited infestation of Eurasian watermilfoil" means a body of water designated by the commissioner under sections 84D.03, subdivision 2, and 84D.12.

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 watermilfoil 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 watermilfoil. These programs must include: (1) compiling inventories and monitoring the growth of purple loosestrife and Eurasian watermilfoil 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 watermilfoil 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, between May 1 and October 15 for a minimum of 20,000 hours, watercraft and associated equipment, including weed harvesters, that leave or are removed from infested waters.

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; LIMITED INFESTATIONS OF EURASIAN WATERMILFOIL.

Subdivision 1. **Infested waters.** 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.

Subd. 2. **Limited infestations of Eurasian watermilfoil.**

(a) The commissioner shall designate a water of the state as a limited infestation of Eurasian watermilfoil if:

(1) the commissioner determines that Eurasian watermilfoil occupies less than 20 percent of the littoral area of the water, up to a maximum of ten acres;

(2) mechanical harvesting is not used to manage Eurasian watermilfoil in the water; and

(3) Eurasian watermilfoil control is planned for the water.

(b) The commissioner shall mark limited infestations of Eurasian watermilfoil in accordance with rules adopted by the commissioner under section 84D.12.

© Except as provided in rules adopted under section 84D.12, a person may not enter a marked area of a limited infestation of Eurasian watermilfoil.

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 or ornamental purposes;

(5) when harvested for personal 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.

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. 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. 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 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;

(3) governing notification under section 84D.08; and

(4) designating, and governing the marking and use of, limited infestations of Eurasian watermilfoil.

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;
(4) limited infestations of Eurasian watermilfoil; and
(5) 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 watermilfoil limited infestation; or
(4) intentionally damages, moves, removes, or sinks a buoy marking, as prescribed by rule, Eurasian watermilfoil.

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 watermilfoil 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 watermilfoil, $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, limited infestations of Eurasian watermilfoil, 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 © 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 watermilfoil 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 188.88 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, EXOTIC 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 an 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.*

M.S. 17.497 EXOTIC SPECIES IMPORTATION; RULES.

The commissioner of natural resources shall establish rules, in consultation with the commissioner of agriculture and the aquaculture advisory committee, for approving or rejecting importation of "exotic" or genetically altered aquatic species to protect the integrity of the natural ecosystem and provide aquatic farmers with information that may affect business decisions.

History: *1991 c 309 s 9.*

Appendix B - Minnesota Rules Regarding Harmful Exotic Species

CONTENTS

WATERWAY MARKERS

M.R. Chapter 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 - HARMFUL EXOTIC SPECIES

(Effective April 29, 1996)

M.R. 6216.0100 PURPOSE.

The purpose of parts 6216.0100 to 6216.0600 is to prevent the spread of harmful exotic species, and prohibited exotic aquatic plants and wild animals, into and within the state as authorized by Minnesota Statutes, sections 17.457, 18.317, and 84.967 to 84.9692 [Note: New rulemaking authority is in Minnesota Statutes, sections 84D.12].

M.R. 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, sections 17.457, 17.4984, 174985, 18.317, 84.967 to 84.9692, and 97A.015, unless otherwise noted in this part.

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. 4. **Infested waters.** "Infested waters" means water and water bodies identified by the commissioner as having populations of select harmful exotic species such as zebra mussel, Eurasian watermilfoil, ruffe, spiny waterflea, or white perch.

Subp. 5. **Littoral area.** "Littoral area" means those areas of a water body 15 feet or less in depth.

M.R. 6216.0250 PROHIBITED EXOTIC SPECIES.

Subpart 1. **Designation.** The species in subparts 2 to 5 are prohibited exotic species because they pose a substantial threat to native species in the state.

Subpart. 2. **Aquatic Plants.**

A. Eurasian watermilfoil (*Myriophyllum spicatum*);
B. hydrilla (*Hydrilla verticillata*);
C. European frog-bit *(Hydrocharis morsus-ranae*);
D. flowering rush (*Butomus umbellatus*)
E. any variety, hybrid, or cultivar of purple loosestrife (*Lythrum salicaria, Lythrum virgatum*, or combinations thereof); and
F. water chestnut (*Trapa natans*).

Subp. 3. **Fish.**

A. grass carp (*Ctenopharyngodon idella*);
B. rudd (*Scardinius erythrophthalmus*);
C. round goby (*Neogobius melanostomus*);
D. ruffe (*Gymnocephalus cernuus*);
E. sea lamprey (*Petromyzon marinus*); and
F. white perch (*Morone americana*).

Subp. 4. **Invertebrates.**

A. rusty crayfish (*Orconectes rusticus*); and
B. zebra mussel species (all species of the genus *Dreissena*).

Subp. 5. **Mammals.**

A. Asian raccoon dog, also known as finnraccoon (*Nyctereutes procyonoides*);
B. European rabbit (*Oryctolagus cuniculus*); and
C. any strain of nutria (*Mycocastor coypu*).

M.R. 6216.0300 IDENTIFICATION, NOTICE, AND MARKING OF INFESTED WATERS AND LIMITED INFESTATIONS OF EURASIAN WATERMILFOIL.

Subpart 1. **Identification of infested waters and notice.** The commissioner shall identify infested waters. The commissioner shall publish the names of identified water bodies in the State Register before May 1 of each year and provide notice though other available means where practical. The department shall post signs describing such infestation at all public accesses to identified water bodies. At any time the commissioner may identify additional water bodies or identify those water bodies which no longer are infested waters.

Subpart 2. **Identification of limited infestations of Eurasian watermilfoil and notice.** The commissioner shall identify water bodies having limited infestations of Eurasian watermilfoil as defined in Minnesota Statutes, section 84.967, subdivision 3. The commissioner shall publish the names of identified water bodies in the State Register before May 1 of each year and provide notice though other available means where practical. The department shall post signs describing the infestation at all public accesses to identified water bodies. At any time the commissioner may identify additional water bodies or identify those water bodies which no longer have limited infestations.

Subp. 3. **Delineation and markers for limited infestations of Eurasian watermilfoil.** Areas of infestation of Eurasian watermilfoil where control is planned in water bodies identified as having limited infestations shall be marked by the commissioner, or other persons authorized by the commissioner, using buoys or signs as specified in part 6110.1500, subpart 7. A minimum of three buoys or signs must be used to delineate an infested area, and placed at intervals of not more than 300 feet apart. In addition, at least two buoys or signs shall be placed at or near the shoreline to delineate an infested area if adjacent to shore. Buoys or signs shall be removed after control actions are completed.

M.R. 6216.0400 RESTRICTED ACTIVITIES ON INFESTED WATERS AND WATERS WITH LIMITED INFESTATIONS OF EURASIAN WATERMILFOIL.

Subp. 1. **Prohibition of taking bait from infested waters.** The taking of wild animals from infested waters for bait purposes is prohibited.

Subp. 2. **Prohibition of sport gill netting for whitefish and ciscoe in infested waters.** If the commissioner identifies waters that are open to sport gill netting for whitefish and ciscoe in infested waters, the commissioner may close the gill netting season for the identified water body or require that gill nets used in the infested waters not be used

in other water bodies. The commissioner shall publish the names of identified 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 identified water bodies.

Subp. 3. **Commercial fishing restrictions in infested waters.** Nets, traps, buoys, anchors, stakes, and lines used for commercial fishing 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 from infested waters and before resetting those nets in noninfested waters.

Subp. 4. **Prohibition on entry into delineated areas marked for limited infestation of Eurasian watermilfoil.**

A. Entry by boaters, anglers, or other water users and their equipment into marked areas of a water body where limited infestations of Eurasian watermilfoil have been delineated in accordance with part 6216.0300 is prohibited, except in emergency situations where property or human life is endangered.

B. Enforcement, emergency, resource management, and other government personnel or their agents may enter into waters where limited infestations of Eurasian watermilfoil have been delineated in accordance with part 6216.0300 when performing official duties. Owners or lessees of land adjacent to delineated areas who do not have water access to their land other than through the delineated area may use the shortest and most direct route through the delineated area for such access.

M.R. 6216.0500 TRANSPORTATION AND APPROPRIATION OF WATER FROM INFESTED WATERS.

Subpart 1. **Transporting water and live fish from infested waters.** Water from infested waters may not be used to transport fish. Live fish taken under a commercial fishing license may be transported from infested waters to other waters or holding facilities from May 1 through 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 fish from infested waters.** Water used to transport live fish 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 identified as having populations of zebra mussel or spiny water flea including, but not limited to, Minnesota waters of the Mississippi River downstream of St. Anthony Falls; Minnesota waters of Lake Superior including waters of the St. Louis River downstream of the mouth of the Cloquet River; waters of the Minnesota River downstream of Shakopee; Island Lake Reservoir in St. Louis County; and the Cloquet River downstream from Island Lake Reservoir, must drain bait containers, other boating-related equipment holding water, 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 identified 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 exotic species may be used for aquatic farm or private hatcheries under license by the department. 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 the 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 exotic species.

D. Fish raised in artificial water basins that have populations of populations of prohibited exotic species, or in any facility using infested water as a source, must be sold directly to a wholesale buyer for processing, or for stocking in other waters containing populations of prohibited exotic species, provided it contains the same prohibited exotic species as the source waters.

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.

M.R. 6216.0600 VIOLATIONS; CONFISCATIONS.

Unless a different penalty is prescribed, a violation of parts 6216.0100 through 6216.0500 is a misdemeanor as set forth in Minnesota Statutes, sections 18.317 and 84.9691. Where a violation has occurred, the department may confiscate the exotic species immediately upon discovery wherever found and, at the departments' discretion, destroy it. Where infested water is being appropriated, or diverted or transported without a permit, or otherwise contrary to the provisions of parts 6216.100 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.

Appendix C - Infested Waters in Minnesota

Waters infested with Eurasian watermilfoil

The following water bodies are infested with Eurasian watermilfoil (*Myriophyllum spicatum*).

County	Water body
Anoka:	Cenaiko, Crooked, Otter, Unnamed (in Springbrook Nature Center)
Carver:	Ann, Auburn, Bavaria, Lotus, Minnewashta, Pierson, Riley, Schutz, Stone, Virginia, Waconia, Zumbra
Chisago:	Green Lake, Rush
Crow Wing:	Bay
Dakota:	Crystal, Lac Lavon, Twin Lakes
Douglas:	Oscar
Hennepin:	Arrowhead, Brownie, Bryant, Bush, Calhoun, Cedar, Christmas, Dutch, Eagle, Fish, Forest, Harriet, Hiawatha, Independence, Lake-of-Isles, Libbs, Little Long, Long, Medicine, Minnehaha Cr., Minnetonka, Niccum's Pond, Nokomis, Parker's, Rebecca, Round, Sarah, Schmidt, Swan, Whitetail, Wirth
Kanabec:	Knife
Olmsted:	George
Pope:	Gilchrist
Ramsey:	Bald Eagle, Gervais, Island, Keller, Silver, Sucker, Vadnais, Wabasso
Scott:	Lower Prior
Todd:	Sauk Lake
Washington:	White Bear, St. Croix R.
Wright:	Augusta, Beebe, Clearwater, Little Waverly, Pulaski, Rock, Sugar, Waverly
Multiple:	Mississippi River: downstream of St. Anthony Falls

Waters infested with round goby

The following water bodies are infested with round goby (*Neogobius melanostromus*).

County	Water body
Multiple:	Lake Superior, St. Louis River: downstream of the Fond du Lac dam

Waters infested with ruffe

The following water bodies are infested with ruffe (*Gymnocephalus cernuus*).

County	Water body
Multiple:	Lake Superior, St. Louis River: downstream of the Fond du Lac dam

Waters infested with spiny water flea

The following water bodies are infested with spiny waterflea (*Bythotrephes cederstroemi*).

County	Water body
St. Louis:	Fish Lake, Island Lake
Multiple:	Lake Superior, Cloquet River from Island Lake to the St. Louis River, St. Louis River: downstream of the Cloquet River

Waters infested with white perch

The following water bodies are infested with white perch (*Morone americana*).

County	Water body
Multiple:	Lake Superior, St. Louis River: downstream of the Fond du Lac dam

Waters infested with zebra mussels

The following water bodies are infested with zebra mussel (*Dreissena sp.*).

County	Water body
Multiple:	Lake Superior, Minnesota River: downstream of Shakopee, Mississippi River: downstream of St. Anthony Falls, St. Louis River: downstream of the Fond du Lac dam