Ecologically Harmful Exotic Aquatic Plant and Wild Animal Species in Minnesota

Annual Report 1995

for the year ended December 31

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Submitted to
Environment and Natural Resources Committees
of the Minnesota House and Senate

This report should be cited as follows:
Exotic Species Programs. 1995. Ecologically Harmful Exotic Aquatic Plant and Wild Animal Species in Minnesota: Annual Report for 1995. Minnesota Department of Natural Resources, St. Paul, MN.

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1995 Annual Report Highlights

- The comprehensive program to maintain Minnesotans' awareness of exotic species and the problems they cause was continued. Key components of the effort included:

  1) A new sign to reduce the spread of exotic species was designed and distributed for posting at public water accesses;
  2) Boat registration mailings included printed information about exotic species;
  3) A new exhibit at the state fair focused on exotic species and prevention of their spread;
  4) A video on exotic species was cooperatively produced with the Bell Museum for grade school use; and
  5) Radio spots, TV spots, and billboards were targeted at boat owners who trailer their watercraft.

- Operators of 43,000 watercraft were interviewed by and worked cooperatively with watercraft inspection staff to check their equipment for exotic species. Inspections were conducted at public water accesses on lakes and rivers infested with Eurasian watermilfoil, zebra mussels, spiny water flea, and ruffe. An access inspection decal was introduced to speed the inspection process and to reinforce recommended cleaning methods.

- Eurasian watermilfoil is now found in 74 of Minnesota's lakes and rivers but no new lakes with the exotic plant were identified outside of the seven county Metro area. The Exotic Species Program cooperated with local units of government and lake associations to control Eurasian watermilfoil in more than 40 lakes.

- Efforts to control purple loosestrife using an integrated pest approach were intensified. Herbicides spraying continued but biological control efforts were expanded to forty-five new sites and four insect species have now successfully over-wintered and reproduced in Minnesota.

- The only new aquatic exotic species discovered in Minnesota was a fish, the round goby (*Neogobius melanstomus*), found in the St. Louis River estuary.

- Zebra mussels and ruffe do not appear to have spread to any inland lakes or rivers in Minnesota based on survey results.

- No citations were issued for the illegal transportation of Eurasian watermilfoil on Minnesota roads. Current law makes enforcement of the prohibition on the transport of Eurasian watermilfoil impossible, because it is difficult to distinguish the exotic plants from native milfoil species. Legislation has been proposed for the 1996 Legislative session to allow effective enforcement action.

Executive Summary

This report described the progress made during 1995 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 ecologically harmful exotic aquatic plant and wild animal species. These species that may harm communities of native plants and animals; they also can limit water recreation and increase operating costs for industry. In 1987, the DNR was assigned the responsibility to address problems caused by purple loosestrife. In subsequent years, the DNR's responsibilities were expanded to include Eurasian watermilfoil, zebra mussel, flowering rush, and ruffe. The establishment of the Exotic Species Program in 1991 further broadened program responsibilities and included a specific component on prevention.

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. A breakdown of FY95 expenditures by major category, as well as planned expenditures in FY96, is shown in Table 1. Expenditures in FY95 were more than the $1,112,000 appropriated from the water recreation account (some FY94 funds were rolled forward into FY95) and substantially more than in FY94. This increase reflects a variety of program changes. For example, the increase in watercraft inspection effort from 10,000 hours in 1993 to 20,000 hours in 1994 substantially increased inspection expenditures in FY95. Likewise, initiation of a program in 1994 to reimburse local units of government and lake associations for Eurasian watermilfoil management expenses shifted control expenditures into FY95.

Table 1. Water recreation account spending by the exotic species program in fiscal year 1994 (FY94) and fiscal year 1995 (FY95) and projected spending in fiscal year 1996 (FY96).

	FY94	FY95	FY96
Administration	88,640	100,800	106,400
Program Support	73,210	118,500	97,100
Public Awareness	115,430	210,800	155,000
Control/Eradication	216,840	355,600	340,200
Inspections/Enforcement	187,310	300,200	287,900
Research	119,230	195,200	149,800
Totals	**$ 800,600**	**1,281,100**	**$ 1,136,400**

*The 1995 Legislature adopted statutory language which extends the $5 surcharge indefinitely.

Exotic Species Program funding continues to be focused on:

- containing ecologically harmful species to sites where they presently occur in Minnesota (public awareness and inspection/enforcement spending);
- reducing their impact on Minnesota ecosystems (control/eradication spending); and
- supporting the improvement of control methods (research spending).

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.

The effectiveness of management activities was evaluated in 1995 using public surveys, boat inspections, and field surveys of infested areas. Survey results showed a lower level of awareness about exotic species by the boating public (79% of respondents in 1995 indicated awareness of exotic species laws vs 92% in 1994). The Exotic Species Program attributes this lower level of awareness to less media attention to exotic species issues and fewer road checks. In an attempt to maintain high levels of public awareness and to increase it in targeted groups, public awareness activities were increased in 1995. Radio time, television, 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.

Awareness of exotic species and the problems they cause, however, is not a guarantee that the boating public is adequately cleaning their watercraft and that the threat of inadvertent spread has been eliminated. In 1995, watercraft inspections efforts were modified to improve the effectiveness of containment efforts. Inspection effort was shifted to increase the amount of coverage at high-use accesses during high-activity periods. In addition, inspection decals were introduced. These decals, which are voluntarily applied to the winch post of trailers, allowed watercraft inspectors to identify boaters who had already heard the inspection message. As a result of these changes and warmer weather during 1995, almost 43,000 boat inspections (a 27% increase over 1994) were conducted during the 21,400 hours of inspection effort.

Little enforcement of exotic species laws was accomplished in 1995. A statute change passed by the 1995 Legislature, which singled out Eurasian watermilfoil (and not any of the other look-alike native milfoil species) as the only species which was illegal to transport, significantly hampered enforcement efforts. The DNR is not confident that Eurasian watermilfoil can be positively identified in the field which effectively eliminated the DNR's ability to prosecute illegal transport of this exotic. Regulatory changes, to restrict the transport of most aquatic plants and to regulate the movement of water and aquatic organisms from infested waters, are essential. If Minnesota's efforts to contain exotic species are to succeed, a comprehensive program needs to be in place that addresses all activities that may inadvertently spread these non-native plants and animals. Proposed revisions to the exotic species statutes and rules under development by the Department will address those issues.

Field surveys in 1995 found low rates of spread of the exotic species managed by the Exotic Species Program. Infestations of Eurasian watermilfoil were confirmed in seven new lakes in

1995, all in the Metro area, and no new infestations were found in outstate Minnesota. There was also no evidence that zebra mussels or ruffe moved into Minnesota's inland lakes within the last year. However, in 1995, zebra mussels were found on a greater number of boats removed from the Mississippi River at the end of the boating season. This increase is consistent with reports received by the DNR that the abundance of zebra mussels is increasing, particularly in the lower end of Lake Pepin. Zebra mussels were again documented on boats in the St. Croix and, for the first time, on a boat in an inland lake (White Bear Lake). In all cases, the infested boats had recently been moved from the Mississippi River to uninfested waters. Reproducing populations of zebra mussels have not been found in the St. Croix, but there is an imminent risk of spread from boats leaving the Mississippi River.

The Exotic Species Program, alone or in cooperation with local groups, undertook a wide variety of control actions in 1995. Eurasian watermilfoil control efforts were conducted on more than 40 lakes, 165 sites were sprayed to eradicate purple loosestrife, and flowering rush control activities were continued in the Detroit Lakes area. Surveys will be conducted in 1996 to determine the effectiveness of control efforts.

Field surveys of sites where control activities were conducted in 1994 (or earlier) showed varied control success. Control efforts with herbicides are reducing some populations of Eurasian watermilfoil and purple loosestrife, (particularly small populations that have not been established for long periods) and the Exotic Species Program continues to modify control approaches to improve their success. Research efforts to develop and implement better control approaches, 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 new biological-control method for managing purple loosestrife is being tested at numerous sites throughout the state (45 new sites were established in 1995). 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 1995 aimed at developing a biological control approach for Eurasian watermilfoil.

Numerous groups participated in 1995 with the DNR in exotic species management activities. Local government units often provide cooperative funding for control efforts as did the 1854 Treaty Authority. In 1995, these groups assisted with control of Eurasian watermilfoil, purple loosestrife, and flowering rush. The Exotic Species Program Coordinator's role as chair of the Great Lakes Panel on aquatic nuisance species provided many contacts for cooperative efforts. 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 Universities 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.

In comparison to other states, Minnesota continues to have one of the most far-reaching and aggressive approaches to managing exotic species. The rapid spread of zebra mussels in the nation, the continued expansion of Eurasian watermilfoil in other states, as well as the developing biological control approach for purple loosestrife has prompted many state and federal agencies to

look to Minnesota for guidance. Exotic Species Program staff are cooperating with state, regional, and federal agencies to improve and enhance collective management efforts. Research, public awareness, and control efforts are being enhanced through these cooperative interactions.

Future Needs

Numerous management needs have been identified for 1996; 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 ecologically harmful exotic is currently restricted to the rivers in southeastern Minnesota with commercial barge traffic, but there is high potential for zebra mussels to spread to inland waters -- the appearance of this exotic on a boat in White Bear Lake clearly illustrates this risk. There is also a clear need to develop prevention strategies to restrict the introduction of additional exotic species into Minnesota that could cause ecological or economic harm if they become established. 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. To prepare for the potential discovery of exotic fish in inland waters, a management plan for exotic fish needs to be developed.

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 1, the DNR is required to prepare a report for the legislature which summarizes the status of management efforts for ecologically harmful exotic species (see M.S. 84.968 in Appendix A). According to statute, this report must include:

(1) detailed information on expenditures for administration, education, eradication, inspections, and research;

(2) an analysis of the effectiveness of management activities conducted in the state, including chemical eradication, 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 by species; and

(6) an estimate of future management needs.

Additional sections on distribution of species, have been added to this report to provide a thorough account of Exotic Species Program activities and background information on select ecologically harmful exotic species which may be the focus of future management efforts.

Overview of Minnesota Exotic Species Program

History of the Exotic Species Program in Minnesota

Although ecologically harmful exotic species have been present in Minnesota for many years (e.g. common carp and sea lamprey), the 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 such a program. In 1989, DNR was officially assigned an additional coordinating role for Eurasian watermilfoil (EWM) control (see M.S. 103G.617 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", 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, flowering rush, and ruffe, as well as harmful species that have the potential to move into Minnesota.

The primary purpose of the Exotic Species Program is to minimize harmful effects of exotic species on the state's lakes, rivers, wetlands, and other ecosystems. However, there are additional reasons to control harmful exotic species; they can limit water use and recreation, increase operating costs for industrial and municipal water users, and eliminate certain commercial enterprises.

Program staff

Responsibilities for overall coordination of the DNR's program are assigned to an Exotic Species Coordinator located in 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 (282-2509)
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, many other individuals from the Division of Fish and Wildlife contribute by providing biological expertise, assisting with control, 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. Their activities are outlined in this report in the Enforcement chapter.

Minnesota Conservation Corps (MCC) In 1995, 26 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 when their help is needed. 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.

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, 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 1995, purple loosestrife research was conducted under contract with the University of Minnesota and Cornell University. Biological control research for Eurasian watermilfoil is done under contract with the University of Minnesota. This research is described in greater detail in the individual management chapters. Control of purple loosestrife and Eurasian watermilfoil are usually carried out by licensed herbicide applicators under state contract. Local lake associations, conservation districts, or local governments share the cost of the contract work for most control of Eurasian watermilfoil.

Federal and Regional Coordination

The DNR Exotic Species Program staff all participate in regional or federal activities regarding harmful exotic species. MNDNR Exotic Species Program Coordinator, Jay Rendall, is the current Minnesota representative to the Great Lakes Panel on aquatic nuisance species and was its Chair in 1995. Participating on this panel, established by the federal nonindigneous Aquatic Nuisance Prevention and Control Act of 1990, helps keep Minnesota informed of regional and federal efforts regarding harmful exotic species and also provides a voice for Minnesota interests as regional and federal policies 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.

Regulations

1995 Highlights

- The current law which prohibits the transport of Eurasian watermilfoil is unenforceable because it applies only to this one milfoil species which cannot always be distinguished from native species with certainty.

- The Department of Natural Resources (DNR) proposed new rules to prevent the spread of harmful exotic species and published them in the State Register.

Background

State

Ecologically harmful exotic species were essentially unregulated in Minnesota until 1987, when laws pertaining to purple loosestrife were first passed. As additional ecologically 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 are located in several different chapters of the statutes (Minn. Stat. Chapters 18, 84, 86B, 103G).

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 - 1995

Several items identified as future needs in the 1994 Annual report were addressed in 1995. These items are describe below:

- The DNR sought changes to state statute to prohibit transport of all water milfoil species instead of the two water milfoil species, Eurasian and northern, prohibited in 1994 law. Although these changes were passed in the Environment committees of the House and Senate, this requested change was not adopted by the full 1995 Legislature. Instead, the statute was amended in conference committee (First Special Session, chapter 1, section 2) to prohibit only the transport of Eurasian watermilfoil and allow the transport of native water milfoil species (see M. S. 18.317 - Appendix A).

- Changes in statute were made to allow the DNR to issue permits regulating the propagation, possession, taking, or transportation of undesirable exotic species for disposal, research, education, or control purposes.

- The definition of zebra mussels was changed in state statute to include any species in the genus *Dreissena*, thereby including the quagga mussel that has been found in midwestern waters.

- The DNR supports reauthorization of federal public law 101-646 titled the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (the act). The DNR, in conjunction with other members of the Great Lakes Panel on Aquatic Nuisance Species, opposed a potential repeal of the act by Congress in 1995. The repeal provision was eventually removed from the federal Legislation of concern. Reauthorization of the federal act is still pending.

- Proposed rules have been drafted and a notice of intent to adopt the rules without a public hearing has been published in the *State Register* on December 26, 1995 (see Appendix C). The DNR intends to adopt the rules in March 1996.

Other changes were made to state statutes in 1995 to eliminate gaps in the regulation's coverage and improve implementation of program activities, simplify civil penalties, and correct technical problems. They were as follows:

- The definition of "watercraft" was changed in the exotic species regulations so that duckboats are now included;

- The definition of "undesirable exotic species" was established as ecologically harmful exotic species that have been determined by the commissioner of natural resources to pose a substantial threat to native species in the state;

- The statutes were modified to allow limited infestations of Eurasian watermilfoil to be marked only where control is planned rather than requiring marking in all areas of a limited infestation;

- Civil penalties were reduced for violations of specific prohibitions on transportation and placement of undesirable exotic species, but the penalty for launching a watercraft with Eurasian water milfoil was increased from $150 to $200;

- The wording was changed in the statute which lists civil penalties [M.S. 84.9692, Subd. 2, (3)] from "launching or attempting to launch a watercraft..." to "attempting to place or placing a watercraft, trailer, or plant harvesting equipment with visible zebra mussels attached into waters of the state..."

- Statutes were modified to clarify that mute swans <u>are not</u> "migratory waterfowl" and <u>are</u> "unprotected birds" thus allowing the department to control free-flying mute swans in the future.

Future Needs For Regulations

State

- Recodify the state statutes regarding ecologically harmful exotic species into a new chapter to improve the clarity, relationships of the parts, and understanding of the laws.
- Replace the current milfoil transportation laws with a prohibition on the transportation of all aquatic macrophytes (with some appropriate exceptions) on public roads. This change would establish an enforceable law that would 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.
- Seek new statutory authority to regulate exotic species of wild animals and aquatic plants that are intended for introduction.
- List appropriate exotic species in "undesirable" or other regulated categories through the rulemaking process.
- Establish the permit process for regulated exotic species through the rulemaking process.

Federal

- Support efforts to reauthorize and improve federal public law 101-646 titled the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990.
- Expand the Coast Guard's authority to regulate discharge of ballast water in Great Lakes waters to authority in all U.S. waters to reduce the introduction of exotic organisms into the country.
- Support efforts to improve the federal noxious weed law to allow faster listing of noxious species, regulate interstate transportation of federal noxious weeds, and change the criteria for defining federal noxious weeds (Schmitz 1990).

References Cited

Schmitz, Don C. 1990. The Invasion of Exotic Aquatic and Wetland Plants in Florida: History and Efforts to Prevent New Introductions. *Aquatics* 12(2): 6-12.

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. The 1995 Legislature adopted statutory language which extends the $5 surcharge indefinitely. Funding for Department of Natural Resources efforts to control exotic species was first appropriated in 1988 and, between 1989 and 1994, increased to meet the growing problems these species posed. A summary of appropriations to the program for fiscal years 1990 through 1996 is provided in Table 2 along with projections for 1997.

To provide a detailed list of program expenditures, by activity, for calendar year 1995 is not practical. This period covers parts of two states fiscal years, FY95 and FY96 (which begin on July 1 and end on June 30), and there is no easy way to account for calendar year 1995 expenditures. Instead, we report both expenditures incurred in FY95 and those planned in FY96 (Table 3 and 4). The following assumptions and definitions were used to report on expenditures.

Administration

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

Program support

State program coordination includes preparation of state plans and reports, legislative 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 includes 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. In addition, twenty thousand dollars of direct support for activities conducted by the Great Lakes Panel on Aquatic Nuisance Species was provided in 1995.

Equipment expenses represent the purchases of equipment such as boats, trailers, and computers.

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, Eradication, 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 1995 (FY95)
Expenditures on exotic species activities during FY95 (July 1, 1994 - June 30, 1995) totalled $1,490,100 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. Expenditures from other accounts, e.g., the Game and Fish Account and the General Fund, reflect staff, who are not hired as exotic species specialists but who work on exotic species issues as part of other department positions. Exotic species research projects funded by the legislature, as recommended by the Legislative Commission on Minnesota Resources are also shown.

The $1,281,100 of Water Recreation Account surcharge expenditures by the Exotic Species Program during FY95 was more than the $1,122,000 appropriated (Table 3). Additional funds were available because FY94 expenditures were less than appropriations and the unspent funds rolled forward into FY95. Fifty-two thousand dollars ($52,000) of the FY95 appropriation were not spent and were returned to the Water Recreation Account.

FY95 expenditures were higher than those reported in FY94 in all program categories (Table 1), with the largest increases in the public awareness, control/eradication, and inspections/ containment areas. These increases were expected and described in the 1994 Annual Exotic Species Report. The Exotic Species Program is increasing public awareness expenditures in an effort to try to offset an apparent decline in news coverage focused on exotic species. In addition, in FY95, a new sign was produced for all public water accesses in the state (see Public Awareness Chapter). Expenditures on control and eradication increased primarily because of a shift in the management strategy for Eurasian watermilfoil. For lakes in the maintenance management category (see Eurasian Watermilfoil Chapter), the DNR now provides reimbursement to local organizations to offset their expenditures on management of milfoil. The adoption of this new program shifted control expenditures from FY94 to FY95. Finally, an increase in inspection and enforcement-related expenditures was anticipated because FY95 was the first full year when 20,000 hours of access inspection activity was mandated by statute (see Watercraft Inspection Chapter).

Program support and research costs increased to a lesser extent in FY95. A major component of the increase in program support costs ($20,000) was funding granted to the Great Lakes Panel on Aquatic Nuisance Species. The Exotics Species Program believes that supporting the Great Lakes Panel is a wise investment because a strong, well-coordinated, regional program will reduce the introduction of new exotic species to Minnesota and the panel will conduct activities such as an inventory and evaluation of informational materials about aquatic nuisance species, that will be of benefit to the state. The Exotic Species Program also expanded our research efforts in FY95 and provided limited funding to projects directed at the ruffe ($5000) and zebra mussel ($22,000).

Fiscal Year 1996 (FY96)

Since fiscal year 1996 was only partially completed when this report was completed, planned expenditures, not actual expenditures to date, are reported. Appropriations from the Water Recreation Account, $1,136,400, to the Exotic Species Program were higher in FY96 than in FY95 because of the year-to-year variation in watercraft license sales but represent fewer dollars than were actually spent in FY95 (see above). Anticipated spending by category is shown in Table 4. Costs in the program support and zebra mussel management areas will grow in FY96 due to shifts in program staffing. The Exotic Species Coordinator will work full-time on exotic species related activities in FY96 (up from roughly 60% in previous years), which will increase program support costs. In addition, the DNR chemistry laboratory has closed and the Exotic Species Program will now buy chemistry support services from the Department of Agriculture. Beginning in FY96, the water recreation account (not the Game and Fish account) will be used to fund staff time spent on zebra-mussel related issues. The gradual decrease in Game and Fish Fund expenditures that support exotic species program activities represents an active effort to shift all exotic species related program costs to the Water Recreation Account.

Table 2. Appropriations for DNR Exotic Species Programs, fiscal years 1990-1997.

	FY 1990	FY 1991	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997
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
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 for research	$75,000 from Minnesota Environment and Natural Resources Trust Fund for research for research
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)	$1,098,000 from Water Recreation Account ($5 watercraft surcharge)

Table 3. Exotic species related expenditures in fiscal year 1995.

	Water Recreation Account	Game and Fish Fund	General Fund/Other	Env. and Natural Resources Trust Fund
Administrative/Operations				
Rent	22,700			
Phones / postage / Misc.	10,110			
Staff Administrative Activities	9,010			
Staff Personal leave (Vacation, Holiday, Sick)	25,060			
Clerical	33,900			
Program Support				
State program coordination	62,780	5,940	250	
Support regional / federal activities	30,570			
Equipment	25,150			
Public Awareness				
Communications plan, workshops, presentations, radio spots, billboards	210,780	170	765	
Control, Eradication, and Inventory				
Eurasian watermilfoil	186,550	20		
Purple loosestrife control	143,990	690	10,000	
Zebra mussel	12,840	10,480		
Flowering Rush	8,420			
General	3,840			
Inspections/Containment				
MCC - access inspections	233,730			
Enforcement - road checks	66,460			
Research				
Purple loosestrife	36,230			75,000[4]
Eurasian watermilfoil	131,990	1,540	1,120	103,000[4]
Zebra mussels	22,000			
Ruffe	5,000			
Totals	1,281,100[1]	18,840[2]	12,135[3]	178,000

[1] Is more than $1,112,000 appropriated in FY95 because some FY94 funds were shifted to FY95.
[2] Two staff positions which contribute to exotic activities (staff supervisor and invertebrate biologist) are supported by the Game and Fish Fund.
[3] One position which contributes to exotic activities (Ecological Services Unit Head) was funded by the General Fund in FY95 Public awareness, control, and research efforts were supported by cooperative funding provided by outside organizations and in-kind service provided by DNR's Chemistry Laboratory.
[4] Appropriated funds were not all spent in FY95 because project end date was extended to December 31, 1995.

Table 4. Planned exotic species related expenditures for fiscal year 1996.

	Water Recreation Account	Game and Fish Fund	General Fund/Other	Env. and Natural Resources Trust Fund
Administrative/Operations				
Rent	20,600			
Phones / postage	11,000			
Staff Administrative Activities	10,200			
Staff Personal Leave	30,500			
Clerical	34,100			
Program Support				
State program coordination	72,900	5,900	12,000	
Support regional / federal activities	19,700			
Equipment	4,500			
Public Awareness				
Communications plan, workshops, presentations, radio spots, billboards	155,000			
Control, Eradication, and Inventory				
Eurasian watermilfoil	228,000			
Purple loosestrife control	87,700	1,000		
Flowering Rush	5,000			
Zebra mussel	19,500			
Inspections/Containment				
MCC - access inspection	226,100			
Enforcement - road checks	61,800			
Research				
Purple loosestrife	41,600			75,000
Eurasian watermilfoil	86,500	1,500	1,000	75,000
Flowering Rush	10,700			
Zebra mussel	5,000			
General	6,000			
Totals	1,136,400	8,400	13,000	150,000

Education / Public Awareness Activities

1995 Highlights

- The Department of Natural Resources (DNR) funded the production of a new "Aquatic Exotics" video for Junior High and elementary school age children. The video is part of a multi agency traveling trunk project.

- A new sign was designed and distributed for posting at water accesses (see Fig. 1). They will be placed at exits to all Department of Natural Resources public water accesses and will be provided at no charge to other access owners in the state.

- Information about aquatic exotics was printed on boat registration mailings.

- Minnesota Sea Grant's Exotic Species Information Center distributed printed materials, training manuals, videotapes, and slides on exotic species in response to over 500 informational and technical requests.

- Information about zebra mussels and Eurasian watermilfoil was included on the cover of the DNR's Waterfowl Hunting Regulations Supplement to raise awareness of the potential to transport those species on boating and hunting equipment.

Figure 1. Sign designed in 1995 for placement at exits from public water accesses in the state.

Background

Over the past several years, substantial efforts have been made by the DNR to increase public awareness and understanding of harmful exotic species. The Exotic Species Program's communication efforts related to aquatic exotic species were 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 Minnesota Sea Grant 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, and others must do to reduce the spread of these exotics; and

4) summarize control approaches.

Progress in public awareness - 1995

Key components of the Exotic Species Program's 1995 communication efforts included:

- signs posted at public water accesses;
- information was included in the fishing and boating regulations;
- radio advertisements, promoting "Clean boats, Clean waters", were run during Fishing Opener, Memorial Day, Fourth of July, and Labor Day weekends;
- billboards were posted and maintained on key travel routes away from infested waters;
- the On the Waterfront newsletter was written and published regularly in the Focus 10,000 magazine;
- displays were developed and staffed for sport shows and the Minnesota State Fair;
- press releases prepared and distributed throughout the year;
- radio public service announcements were prepared and distributed to all Minnesota stations;
- brochures about aquatic exotic species were distributed to all watercraft registration sites for distribution to watercraft owners; and
- television spots about Eurasian watermilfoil were aired in the Twin Cities Metro area;

Radio was used to reach boaters and anglers in several ways. Paid advertising was placed on larger Twin Cities stations including WCCO-AM, KQRS-FM, KFAN-AM, WKLX-FM, KQQL-FM, and KTCZ-FM. These stations were selected for their listener profile which matched the desired demographics of boater owners. Several out-state stations are also used in 1995. Similar ads were run on radio 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.

A television advertisement about the spread of Eurasian watermilfoil was aired on the three major network channels (KARE, KSTP, WCCO) in the Twin Cities market just prior to the Fourth of July travel period.

Seventeen billboards were posted along major highways leading from infested waters and into popular vacation areas. Six billboard locations were in the Twin Cities metro area, three near Duluth, one west of Rogers and one west of Sauk Rapids.

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. A new feature of the redesigned State Fair exhibit was a boat and trailer which highlighted areas where exotic species often attach. Information and exotics publications were also distributed at the Minneapolis Boat Show.

Various other presentations were conducted for university classes, high schools, teacher workshops, and lake associations.

Effectiveness of public awareness efforts

In 1994, Minnesota Sea Grant conducted a survey of boaters in Minnesota, Wisconsin, and Ohio to evaluate and compare the differences of 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."***

Additional survey information important for the exotic species program will be gathered during the summer of 1996, when a major boating survey will be done by the DNR. Information from these surveys will be used to guide development of annual public awareness efforts and maximize their effectiveness.

However, the best measure of effectiveness is the rate of spread of these exotics. For Eurasian watermilfoil, the rate of new infestations (excluding those in connected waters) has declined significantly since 1990, which indicates that the public awareness efforts in conjunction with the other aspects of the program are having the desired impact.

Participation of others in public awareness activities

Other agencies have been involved with public awareness activities in the state for several years. Billboards posted in the summer of 1995 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 was distributed by the National Park Service, MN Sea Grant, the U.S. Fish and Wildlife Service, and the U.S. Army Corps of Engineers, as well as numerous Midwestern states and Provinces.

The University of Minnesota Sea Grant program established an Exotic Species Information Center (Center) in 1991. The Center provides educational and technical information about harmful aquatic exotic species to government and international agencies, industries, small businesses, educators and students, media, and the general public. The Center collaborates with the DNR's Exotic Species Program to provide develop informational materials and distribute information on exotic species statewide. Activities of the Center are funded through appropriations to the National Oceanic and Atmospheric Administration.

The Center's 1995 education and public awareness activities in Minnesota included:

- distributing printed materials, training manuals, videotapes, and slides on exotic species in response to over 500 informational and technical requests;
- issuing news releases, wrote numerous newsletter articles, and published and distributed brochures, fact sheets, cards and other educational materials to promote public awareness on exotic species issues statewide, regionally and nationally, developed programming to train extension educators and water resource professionals about zebra mussels;
- describing the threats that zebra mussels pose to fish management (stocking) programs, and the aquaculture and bait harvest industries at workshops, meetings, and teleconferences;
- led binational outreach efforts to prevent the accidental spread of ruffe to other areas in the Great Lakes, other inland lakes and watersheds by anglers (examples: produced and distributed 15,000 ruffe fact sheets and 300,000 Ruffe WATCH i.d. cards);
- coordinated the development of a hands-on educational "Exotic Aquatics" traveling trunk to promote student awareness about exotic species problems by providing them with museum-quality preserved specimens, a user guide for students (grades 6-12), and a videotape produced in collaboration with the MNDNR, Bell Museum of Natural History, Illinois-Indiana Sea Grant, and the National Park Service; and
- created a World Wide Web Home Page to broaden distribution and accessibility of exotic species outreach and research materials (http://www.d.umn.edu/~seagr/).

Future needs for public awareness - 1996

- Continue, improve, and expand on those efforts found to be most successful, particularly to raise awareness of zebra mussels in southeast Minnesota near the Mississippi and St. Croix rivers..
- Target specific groups that have not received significant attention in previous years, such as the aquaculture industry, live bait dealers association, and the seaplane association.
- Increase interagency communication by publishing and distributing the exotic species newsletter, On the Loose, for resource professionals.
- Develop, distribute, and post new exotic species informational signs at all public and private water accesses on uninfested waters. The signs would provide boaters with information on several harmful species, instead of just Eurasian watermilfoil that is the focus of current signs at uninfested waters.
- Participate in the DNR boater survey planned for the summer of 1996 to help determine additional needs for public awareness actions specific to boaters.

References Cited

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

Watercraft Inspections

1995 Highlights

- The number of boats inspected in 1995 (42,956) exceeded the 1994 total by more than 9,000.
- Zebra mussels were found on boats exiting waters not infested with zebra mussels. These boats had previously been in the zebra mussel infested Mississippi River.
- MCC Watercraft Inspectors participated in a boat wash feasibility trial at selected infested water access sites.
- A decal program was initiated to remind boaters to inspect their boats when exiting a water body and to allow Watercraft Inspectors to identify boaters who were familiar with the inspection process.

Background

The potential for boaters to accidentally move aquatic exotic species from one lake to another has long been 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 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, see Appendix A) calling for 10,000 hours of random inspections of watercraft leaving "infested" water bodies containing harmful aquatic exotic species such as Eurasian watermilfoil, spiny waterflea, and zebra mussels. Subsequently in 1992, a watercraft inspection program was established by the DNR 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 exotic species to other states. 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 1995

Inspections begin on May 1 and end on October 15 as prescribed in state statute. Within this 24 week period, in 1995, 21,400 inspection hours were logged and 42,956 watercraft/trailer units were inspected.

Accomplishments and responsibilities of MCC Watercraft Inspectors:

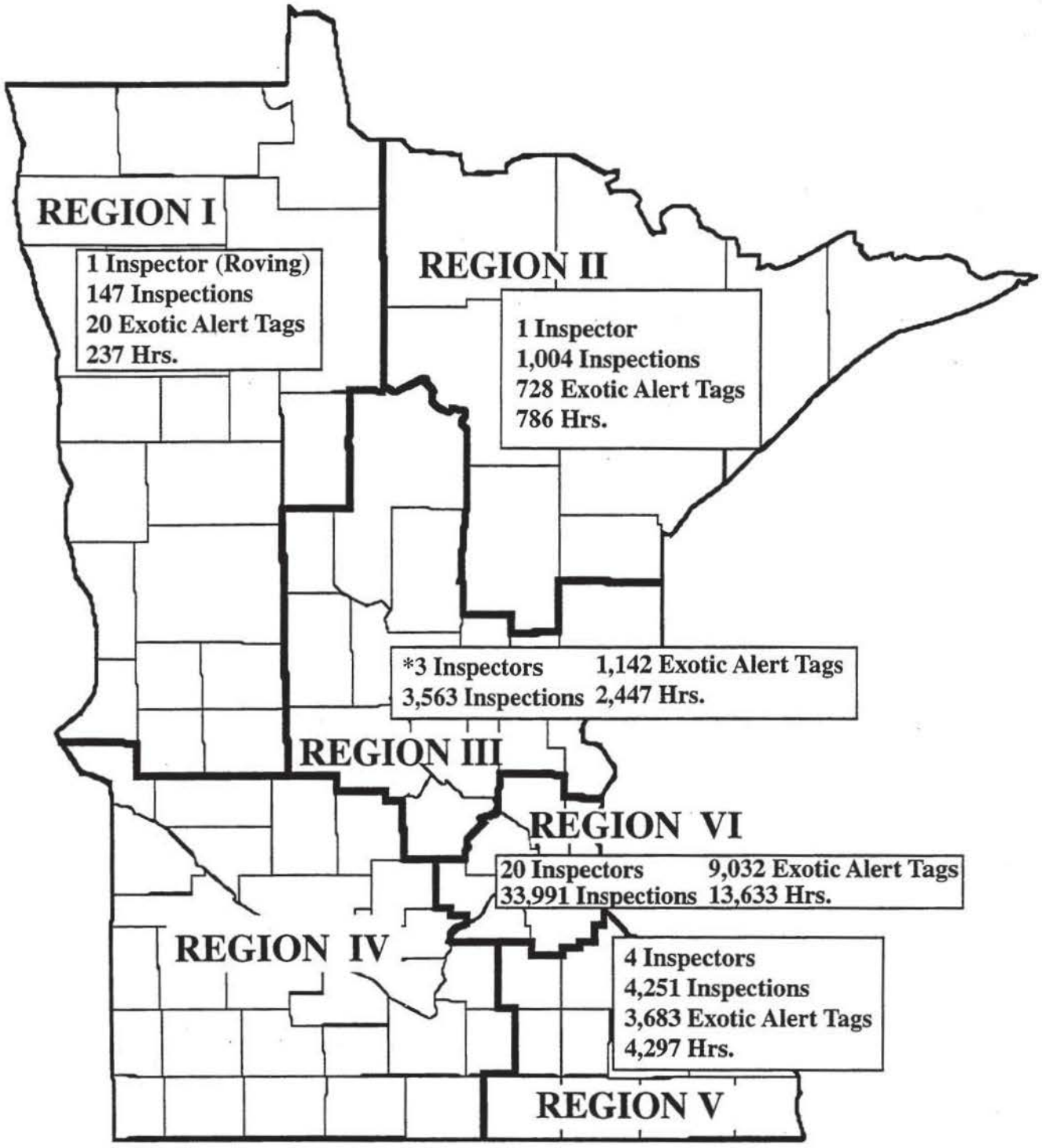
- Assisted the Division of Enforcement with three road checks;
- Worked at the Exotic Species display for each day of the 1995 Minnesota State Fair;
- Conducted inspections at over 15 different fishing tournaments throughout the state;
- Distributed Exotic Alert Tags on 14,605 vehicles with trailers at access points on infested waters; and
- Cleared floating aquatic plants from public water accesses as encouraged in M.S. 84.968 (Appendix A). Removing vegetation from the access sites helps to reduce the amount of exotics such as Eurasian watermilfoil and other aquatic plants adhering to watercraft and trailer units exiting infested waters.

A total of 28 inspectors worked throughout the summer providing information to the public on watercraft inspections and exotic species. (Table 5 and Figure 2). The majority of infested water bodies in the state (67%) are located within the metropolitan area and include some of the most heavily used recreation lakes in Minnesota. As shown in Tables 1 and 2, inspection efforts were concentrated in the seven county metropolitan area where 64% of the inspection hours and 78% of the inspections occurred.

Table 5. MCC Watercraft Inspectors hours spent inspecting watercraft for exotic species in Minnesota during 1995.

Area	Hours Accomplished	% of Time Per Area
Region I - Northwest	237	1%
Region II - Duluth/Superior	786	4%
Region III - Central	2,447	11%
Region V - Mississippi River	4,297	20%
Region VI - Metro	13,633	64%
State-wide Total	21,400	100%

Figure 2. 1995 MCC Watercraft Inspections at Public Water Accesses on Infested Waters.



*Roving inspector spent time in Regions I and III.

The number of inspections conducted per day varies due to weather conditions and boater activity. The number of inspections conducted in 1995 exceeded those in 1994 by over 9000. This may be due to a warm summer in 1995. Between June and August 1995 there were 18 days with temperatures above 90 degrees. In 1994 there were only 3 days with temperatures above 90 degrees between June and August. In addition, 1995 was the "second stickiest summer in 50 years" measured by number of hours with a dew point equal to or greater than 70 degrees. (Weather information provided by the National Weather Service and DNR Climatology Office.) There were also over 21,000 additional boats registered in Minnesota in 1995 when compared to 1994. This may have added to increased boater traffic. The DNR believes that increased inspection activities during typical high use periods, such as holidays and weekends, also contributed to the increase.

Table 6. Number of watercraft inspections conducted by MCC Watercraft Inspectors in 1994 and 1995.

Area	Number of Watercraft Inspected in 1994	Percentage of Inspections in 1994	Number of Watercraft Inspected in 1995	Percentage of Inspections in 1995
Region I - Northwest	193	1%	147	<1%
Region II - Duluth/Superior	541	2%	1,004	2%
Region III - Central	3,720	11%	3,563	8%
Region V - Mississippi River	4,572	13%	4,251	10%
Region VI - Metro	24,865	73%	33,991	78%
State-wide Total	33,891	100%	42,956	100%

Watercraft Washing Feasibility Trial

In response to public interest, the DNR conducted a boat washing feasibility trial during the 1995 boating season. The trial was introduced to evaluate whether watercraft washing may increase the effectiveness of inspection efforts for boats leaving infested water bodies. Supervisors of the MCC watercraft inspectors operated the boat wash at selected infested water access sites for several weekends. Watercraft Inspectors assisted with the boat wash and conducted additional surveys of boaters opinions about boat washing the feasibility trial. (For more information see Boat Washing Feasibility Trial, page 33).

Survey of Boaters at White Bear Lake

A MCC Watercraft Inspector conducted an independent survey at White Bear Lake to fulfill requirements for a college internship. A total of 300 boaters were surveyed between August and September 1995 to gather information about Eurasian watermilfoil (EWM) and the inspection program. The majority of boaters contacted had positive responses to the watercraft inspection program. In response to the questions "Do you think the inspection program is a good idea?", 298 boaters responded "yes". When asked "Do you think the DNR should do more to prevent the spread of EWM?", 281 boaters responded "yes".

Effectiveness

Surveys conducted by Watercraft Inspectors provide the DNR with 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 exotic species. The percentage of boats/trailers carrying vegetation as they exited an infested water body varied widely by county (Table 7). 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 7 illustrate the potential risk of boaters transporting aquatic exotic vegetation from lake to lake if boats are not properly inspected and vegetation removed.

Table 7. Vegetation found on boats and trailers exiting infested waters in 1995 (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 III - Central		
Chisago	10%	596
Crow Wing	8%	72
Kanabec	3%	39
Todd	15%	176
Wright	18%	736
Region V - Mississippi River		
Houston	1%	242
Wabasha	<1%	407
Winona	<1%	1,023
Region VI - Metro		
Anoka	42%	180
Carver	20%	936
Dakota	10%	612
Hennepin	24%	6,358
Ramsey	12%	819
Scott	5%	616
Washington	4%	2,550

This is the first year that inspectors observed zebra mussels on boats exiting the Mississippi River which is infested with zebra mussels (Table 8). The majority of the mussels were found late in the fall, on boats that had been in the river all summer. The largest number of mussels were recorded in Winona county. These occurrences of zebra mussels on boats could be due to an increasing zebra mussel population in the Mississippi River, and/or more observant and efficient inspectors in the Mississippi River area.

Table 8. Zebra mussels found on boats and trailers exiting waters infested with Zebra mussels in 1995.

Counties with Zebra Mussel Infested Water Bodies	Number of Boats & Trailers Exiting with Zebra Mussels	Number of Boats & Trailers Exiting
Region V - Mississippi River		
Goodhue	4	332
Houston	4	242
Wabasha	6	407
Winona	54	1,023
Region VI - Metro		
Dakota	3	612
State-wide Total	71	2,616

Zebra mussels were found on three boats exiting waters not infested with zebra mussels. In Ramsey county, a zebra mussel was found on one boat exiting White Bear Lake. The boat had previously been in the Mississippi River. Two other boats on the St. Croix River were found with zebra mussels. Both boats came from the Mississippi River. These occurrences confirm the potential for the spread of zebra mussels from the Mississippi River to uninfested waters by trailered watercraft or between connected water bodies.

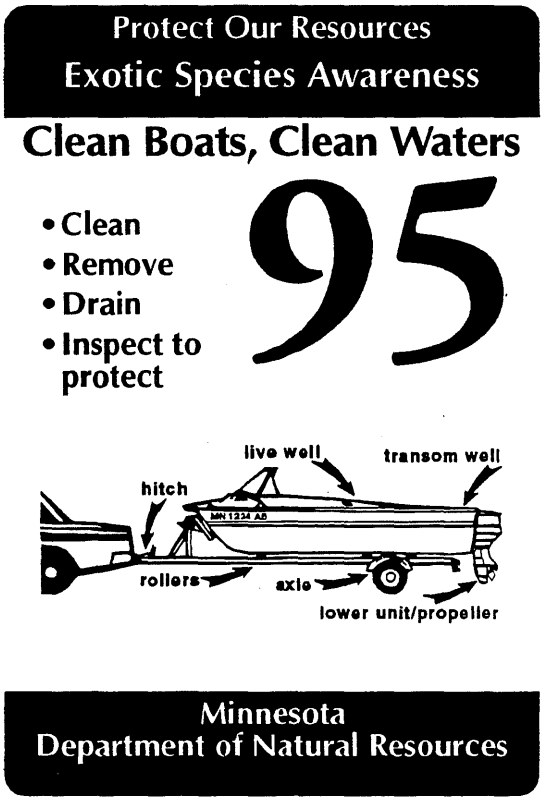
According to survey information collected by Watercraft Inspectors, awareness of exotic species laws is high among Minnesota boaters, however, state-wide awareness appears to be lower in 1995 than in 1994 (Table 9). Awareness increased in some areas of the state, such as Region I and II. The reduction in awareness was most significant in Region V along the Mississippi River. The overall decrease in public awareness of the laws may be do to a decrease in news coverage focused on exotic species. The invasion of Eurasian watermilfoil, zebra mussels, and other exotics is no longer "new" news and therefore received less media attention in 1995 than in previous years. The exotic species program has tried to offset this decline in news coverage by purchasing additional ads and more effectively focusing public awareness effort (see Public Awareness Chapter). In addition, awareness of exotic species laws does not measure whether boaters are cleaning their watercraft adequately. Road checks of trailered watercraft and other enforcement efforts continue to be necessary to evaluate compliance with existing exotic species laws.

Table 9. Awareness of exotic species laws in Minnesota in 1994 and 1995.

	1994		1995	
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 Becker Douglas	42%	193	63%	147
Region II - Duluth/Superior Carlton Cook Lake St. Louis	83%	541	92%	943
Region III - Central Chisago Crow Wing Kanabec Stearns Todd Wright	81%	3,956	69%	3,714
Region V - Mississippi River Goodhue Houston Wabasha Winona	93%	4,603	72%	4,251
Region VI - Metro Anoka Carver Dakota Hennepin Ramsey Scott Washington	95%	24,391	81%	33,901
State-wide Total	92%	33,684	79%	42,956

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 were instructed to (voluntarily) affix the decal to the winch post of their trailer. This allowed inspectors to identify the boaters who inspectors had already been spoken with during the summer. Return boaters with a decal were given a brief reminder to drain water and remove vegetation from their boats. The decals were well received by the public and seemed to reduce the duplication of efforts. The 30,645 decals handed out over the 1995 boating season also reminded boaters to inspect their boat when inspectors were not present.



Future needs/recommendations for watercraft inspections:

- Continue inspections for 20,000 hours during the 1996 boating season.
- Direct a higher percentage of inspection hours to evenings to inspect a higher percentage of watercraft exiting infested waters.
- Provide samples of vegetation, found by inspectors on watercraft exiting selected lakes, to exotic species biologists to confirm plant identification.

Watercraft Washing Feasibility Trial

Summary

The Minnesota DNR Exotic Species Program conducted a boat washing trial during 1995 at public access sites to examine the feasibility of large-scale washing efforts to prevent the spread of exotic species. The washing was offered free of charge and was voluntary. Only 60% of boaters were willing to have their boat washed. Of the boaters having a boat washed, 30% would not be willing to pay to have this done. The remaining boaters would pay $1.00 - $4.00 for this action, but were willing to spend no more than 10 minutes to have the wash done. Based on the low rate of voluntary participation, constraints of space at access sites, the high cost of operating wash units in comparison to the fee that the public thinks is reasonable, the public desire to have the wash done rapidly, and incomplete removal of some aquatic vegetation in the washing, this method does not appear viable for large scale exotics prevention. The use of a single wash unit that would travel throughout the state, and be focussed primarily on public information and awareness has some merit.

Introduction

The prevention of spread of exotic species such as Eurasian watermilfoil and zebra mussels is one of the main goals in the Minnesota Department of Natural Resources'(MDNR) Exotic Species Program. One of the methods of preventing spread which has been advocated is to wash boats which have been in infested waters. High pressure cold water or hot water washing may effectively remove or kill exotic species that are attached to a watercraft, thus preventing inadvertent movement of exotics.

For the past three summers, Ontario Federation of Anglers and Hunters (OFAH) has operated a mobile boat washing program. A three person crew travels to various public access sites, fishing tournaments and other high-use boating events. Washing operations are not confined to infested waters. This program is viewed as a public education and information tool, with displays, brochures and information in addition to the actual boat washing. There are no data on efficacy of the washing; however, it is viewed as a major component of the public awareness efforts against the spread of exotic species.

While boat washing programs such as the OFAH's, by an individual, or washing a small number of watercraft in a limited area may be feasible, there is no information on the usefulness of this method for a large scale prevention effort, such as state-wide. Minnesota has over 70 lakes containing Eurasian watermilfoil and has reproducing populations of zebra mussels in the Mississippi River from the Twin Cities downstream to the Iowa border. Questions such as boater participation, logistics, efficacy, and costs need to be answered to aid in the evaluation of the usefulness of large scale efforts.

During the 1995 boating season, the MDNR Exotic Species Program conducted a limited boat washing trial. The objective was to examine the feasibility and acceptance of boat washing systems at infested water bodies to prevent the spread of exotic species.

Methods

The wash unit used was a gas powered, cold-water pressure washer, 1500 P.S.I. maximum pressure, 3 gallons/minute delivery rate, with an adjustable nozzle and 50' of hose. The unit was connected to a 200 gallon trailer-mounted bulk tank. The wash unit was operated by Minnesota Conservation Corps (MCC) Watercraft Inspection Supervisors on four weekends at infested water access sites. The sites were recommended by MCC personnel as high volume traffic areas with sufficient space for the wash unit (Appendix D). Boaters first received the standard watercraft inspection from a MCC Watercraft Inspector, then were asked if they wished to have their boats washed. These boaters were directed to the wash station located in an area of the access that did not impede traffic flow, where a second MCC Supervisor washed their boat and asked them to fill out a short (5 question) survey (Appendix E). Boaters who refused to have their boat washed were asked for the reason for the refusal.

Results and Discussion

The wash unit was operated during four weekends from July 29 - August 27, 1995. Due to equipment malfunction, no boats were washed August 4 - 6. A total of 215 boats were inspected while the wash unit was at the various access sites. Out of those inspected, 128 (60%) were washed while 87 (40%) of the owners declined the wash (Table 10). Most of the boaters who did not want their boat washed stated that they did not want to take the time.

Table 10. Summary of survey results from boat wash feasibility trials conducted in 1995 by the Minnesota DNR Exotic Species Program. There were 215 boats inspected of which 128 (60%) were washed during the trial.

Responses to survey questions from boaters that had their watercraft washed during boat washing trial. Numbers refer to survey question number.	
1. Feel that washing is an effective method of preventing the spread of exotic species	63%
Are not sure if washing is an effective method of preventing the spread of exotic species	30%
Feel that washing is NOT an effective method of preventing the spread of exotic species	7%
2. Agree that:	
* washing <u>should be mandatory</u> at public and/or private access sites on infested waters	63%
* washing <u>should be encouraged, but be voluntary</u> at access sites on infested waters	37%
3. Would:	
* <u>be willing to pay</u> to have their boat washed	45%
* <u>not be willing to pay</u> to have their boat washed	30%
* <u>are not sure</u> if they are willing to pay	25%
4. Of those willing to pay or not sure, would pay:	
* $1.00 - $2.00	64%
* $3.00 - $4.00	29%
* $5.00 - $6.00	7%
5. Time willing to spend to have boat washed:	
5 minutes	69%
10 minutes	26%
15 minutes	5%

Approximately 2/3 of the boaters who had their boats washed agreed that washing was an effective method to prevent the spread of exotics, while 30% disagreed (Table 10). A similar response was seen for the question of whether boat washing should be mandatory or voluntary, with 63% stating it should be mandatory, either at public or private accesses on infested waters.

Less than half of the boaters (45%) were willing to pay to have their boats washed. Of these boaters, most would pay $4.00 or less for the wash, with about 2/3 of those only willing to pay up to $2.00. However, 30% would not pay, and one in four was not sure if they would pay for the service.

Almost 70% of the boaters would only be willing to spend 5 minutes or less to have the wash completed. Another 26% are willing to spend up to 10 minutes for the wash. Examining only those boaters who feel that washing should be mandatory at infested waters shows that over half (55%) want to spend 5 minutes or less, while 1/3 want this service done in no more than 10 minutes.

While a majority of boaters felt that boat washing should be mandatory at infested water access sites, the fee range which they felt was reasonable ($1.00 - $4.00) and the time they were willing to spend (less than 10 minutes) to support this action are inconsistent with a mandatory program. Several boaters also stated that they did not want to pay at the site, but wanted to pay only once for the season through something such as the boat license surcharge. There were no occurrences of boaters being forced to wait for the wash during the trial study. However, it is likely that at certain popular access sites during busy weekends there would be delays in the washing. These could be substantial and the majority of boaters surveyed indicated they would accept only 10 minutes for the washing, with the highest percentage favoring only five minutes.

Additionally, boaters are not willing to pay enough for the wash to make the effort self-supporting. Factoring in on-site salary costs and unit rental charge, it cost approximately $7.80 to wash one boat in this study. While this figure could be reduced if the number of boats washed increased, it is not likely that a huge number of boats would voluntarily take advantage of this service. With most boaters willing to pay less than $4.00, it seems apparent that the washing would need to be heavily subsidized. Some of the costs for the washing could be reduced. For example, purchasing the wash unit instead of renting would allow the costs to be spread over a long time period. However, the need for an individual to be on site constantly would overrun these cost savings. There would also be other costs (such as trucks and bulk water tanks) that are not included in our estimates and would add to the expense.

Additionally, many of the public water access sites simply are not constructed for boat washing. There is not enough space for stopping traffic and washing boats without creating major delays.

Another problem encountered was the efficacy of the wash. When fragments of aquatic vegetation were wound around trailer axles, or wedged between the boat and trailer, the wash did not effectively remove this material. The MCC personnel operating this system felt that this wash could not be a substitute for visual inspection, which led to some of the boaters questioning its usefulness. It is possible that more time could be taken in the washing to eliminate this problem, but this would create problems in added delay, which the boaters indicated was not acceptable in many cases.

Finally, there was a significant portion of the boating public (40%) who do not want to have their boats washed. Not washing 40% or more of the boats leaving infested waters would hamper the effectiveness and purpose of a program such as this.

Conclusions and Recommendations

The conclusion of the trial is that a large scale boat washing program operated by the Exotics Species Program is not an effective exotics prevention tool. The voluntary nature of the program, the physical access restraints, the high operating costs, incomplete removal of aquatic vegetation, and the unwillingness of the boating public to spend the time and money necessary are the major factors preventing this from being a viable DNR program.

If boat washing is to be considered as a tool for the Exotics Species Program, it should be viewed as a public information and education tool, similar to the Ontario program. A single truck could be fitted with the necessary equipment (bulk tank, storage boxes, wash unit) for washing boats, as well as a large display and other materials on exotic species. This unit could travel throughout the state, washing boats at high traffic access sites, fishing tournaments, and other recreational events. On non-infested waters, the unit could be set up so that run-off from the wash could not enter the waterbody. This type of program would have its focus on public awareness, and could provide exotics information at the point of boater entry to Minnesota waters, as another component of public education.

Acknowledgments

First, I would like to thank Lillian Baker from Metro Forestry for the use of the bulk tank trailer for our water supply. Next, a large thanks to John Barton and Hennepin Parks for the use of their facilities to fill the tanker with water. Finally, a huge amount of this study was done by the MCC Watercraft Inspection Program. Thanks to Michelle Bratager, Watercraft Inspection Program coordinator, for making sure that the schedules, paperwork and field people were there. And most of all, thanks to Rich Lehman, Abigail Hammond, and Barb Scherger for being the people in the field who made this study actually work.

Enforcement

1995 Highlights

- Changes the Department of Natural Resources (DNR) sought in statute to prohibit transport of all water milfoil species (rather than the two species, Eurasian and northern watermilfoil, in 1994 law) were not made by the 1995 legislature. Instead, the statute was amended to prohibit the transport of just Eurasian watermilfoil and allow the transport of native watermilfoils.

- Due to the above statute change, Conservation Officers were not able to enforce the laws regarding transportation of Eurasian watermilfoil. Field identification of milfoil fragments is often inconclusive and officers cannot enforce the law unless a positive identification can be made.

- Adjusting locations and numbers of road checks to include at least one major road check in each DNR regional area, as suggested in the 1994 annual report, was not achieved because enforcement of the milfoil transportation laws was not possible.

- Several training sessions were held as suggested in the 1994 annual report for conservation officers in parts of the state where zebra mussels, Eurasian watermilfoil, and other harmful exotic species are present or where there is high concern over potential infestation. The training included segments on civil citations, exotic species laws, and exotic species identification.

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 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 educate and inform boaters about Eurasian watermilfoil. As more exotic species have become established in Minnesota, road checks have been expanded to detect illegal transportation of other exotic species, including zebra mussels, spiny waterflea, and ruffe. Beginning in 1994, Road checks have been curtailed because of problems with the enforcement of milfoil statutes.

Changes in exotic species enforcement - 1995

Enforcement by conservation officers in the DNR Division of Enforcement was changed significantly from previous years. Because of Statutory changes made in 1995, the laws prohibiting the transport of Eurasian watermilfoil became more difficult to enforce (see regulations section).

The focus of enforcement activity was modified and some aspects of the enforcement activities were reduced. Only three road checks of trailered boats were conducted throughout the state. This is fewer than in previous years. No citations were issued. The Division of Enforcement was extremely reluctant to write citations when the violations cannot be proven in a court of law due to inability to conclusively differentiate Eurasian watermilfoil fragments from fragments of native watermilfoil.

Conservation Officers conducted other enforcement activities including: 1) public and private water access checks on both infested and non-infested water bodies, 2) patrol of restricted areas on water bodies with "limited infestations" of Eurasian watermilfoil, and 3) patterned checks (trailered watercraft stopped at random on a public road). A total of 1783 contacts were made and 14 received either a verbal or written warning. Again, no citations were written.

Zebra Mussels on vessel in St. Croix

In May 1995, numerous zebra mussels were found and removed from a large vessel docked at Red Wing on the Mississippi River and bound for the St. Croix River. The vessel was previously owned and operated in Lake Michigan and was purchased for use in the St. Croix River. In June 1995, the vessel was re-inspected during a routine zebra mussel monitoring dive in the St. Croix River and more zebra mussels were found on the hull. Conservation Officers contacted and informed the owner that the vessel must be removed from the water and cleaned in accordance with Minnesota Statute 84.9692, Subd. 1. (2) which makes it illegal to place a watercraft into uninfested waters of the state if the watercraft has zebra mussels attached. The owner complied and Exotic Species Program staff inspected the cleaning process and approved the re-launch of the vessel.

Future plans and needs regarding enforcement:

- Appoint an Exotic Species Enforcement Officer with statewide responsibility for coordinating exotic species enforcement activities.
- Focus additional patterned checks near lakes with Eurasian watermilfoil infestations in Metro region VI.
- Seek changes to the state statutes regarding milfoil transportation laws. Replace the milfoil transportation laws with prohibitions on the transportation of all aquatic macrophytes (with some appropriate exceptions) on public roads.

Management of Eurasian Watermilfoil

1995 Highlights

- No new lakes with Eurasian watermilfoil were discovered in Minnesota outside the Twin Cities area during 1995.
- The discovery of seven lakes with Eurasian watermilfoil in the Twin Cities area during 1995 raised the number of Minnesota lakes, rivers, and streams with this exotic to 74.
- The Exotic Species and Aquatic Plant Management programs worked with cooperators on more than 40 Minnesota lakes during 1995 to manage Eurasian watermilfoil in these lakes and to limit the spread of the exotic from these lakes.
- The 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 (MDNR 1994). In this report we describe the Exotic Species Program's efforts in 1995 to contain this exotic plant and limit its spread in Minnesota.

Progress in management of Eurasian watermilfoil - 1995:

Prevention of spread of Eurasian watermilfoil in Minnesota during 1995

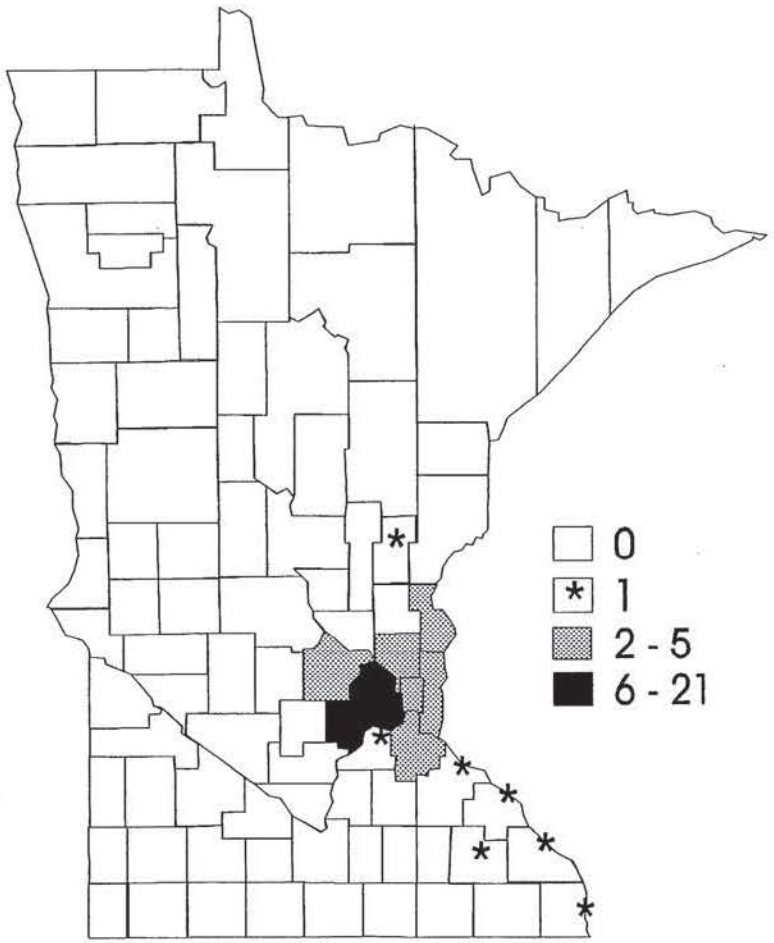
The Exotic Species Program and the boating public appear to be succeeding in their efforts to limit the spread of milfoil in Minnesota. No new lakes with Eurasian watermilfoil were discovered outside the Twin Cities area during 1995. In the Twin Cities area, seven lakes were discovered in 1995 to have Eurasian watermilfoil (Table 10A). This number was higher than the number discovered in 1994 and 1993 but still lower than the number found in any of the five years from 1989 to 1993. Since 1991, most of the Minnesota lakes discovered to have milfoil were located in the Twin Cities area (Figure 3).

It is important to note that there may well be additional lakes with milfoil that have not yet been discovered - we can't determine for certain whether the rate of spread actually decreased or the rate of detection was low. The participation of the public in monitoring the distribution of milfoil remains a critical element in the Exotic Species Program. As in previous years, most reports received in 1995 of suspected occurrences of milfoil turned out to be another plant species. The Exotic Species Program continues to follow through on likely reports as soon as possible because early detection and treatment of milfoil is the key to limiting the spread of this exotic.

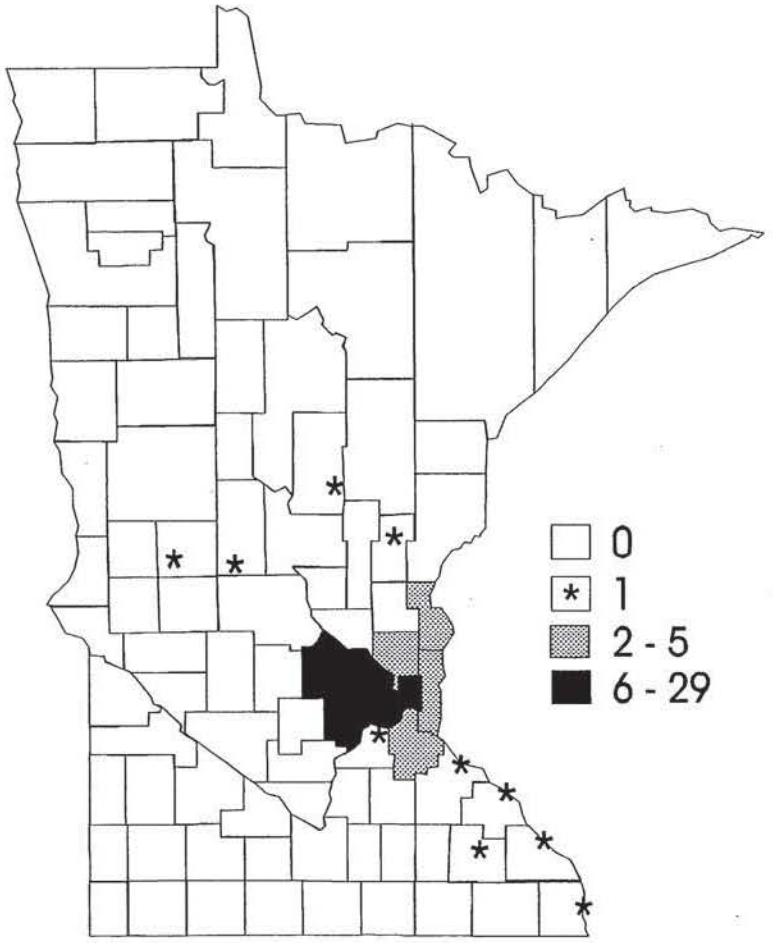
Table 10A. Numbers of lakes or rivers and creeks in which Eurasian watermilfoil was discovered in different years in Minnesota.

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

Figure 3. Distribution in Minnesota of waterbodies infested with Eurasian watermilfoil in 1991 and 1995.



Number of waterbodies infested with Eurasian Watermilfoil in 1991



Number of waterbodies infested with Eurasian Watermilfoil in 1995

Management of Eurasian watermilfoil in Minnesota lakes during 1995

In the spring of 1995, the Exotic Species Program classified bodies of water with milfoil on the basis of surveys done in 1994. For management, the Exotic Species Program assigns lakes to one of six classes (Table 11). Sixteen lakes were designated for high-intensity management and 33 were designated for maintenance management (see below). Five lakes were included in the DNR's study of fluridone herbicide. Another 11 bodies of water were determined to be ineligible for management with State funds, principally because they are not accessible to the general public (see Table 11). Lastly, four bodies of water with milfoil are flowing waters where management of this exotic is not usually attempted.

The seven lakes in the Twin Cities area which were discovered in 1995 to have milfoil included three lakes designated for high-intensity management, two lakes designated for maintenance management, and two lakes determined to be ineligible for management with state funds (Table 11).

Table 11. Classification of bodies of water in Minnesota with Eurasian watermilfoil during 1995.

Classification	Spring	New in Summer	Fall
Eligible for management with State funds			
High-intensity management (high intens.)	16	3	15 (4 to maint.)
Maintenance management (maint.)	33	2	39 (4 from high intens.)
Fluridone herbicide study	5		5
Ineligible for management with State funds			
Public water but no public access	5	2	7
Not public water	4		4
Other			
Flowing water	4		4
Total	**67**		**74**

The Exotic Species Program paid $140,000 to contractors and cooperators for management of Eurasian watermilfoil in Minnesota during 1995 (Table 12). This amount of State funds spent in 1995 is greater than that spent during 1994, which was increased 30% by comparison with 1993. In addition to the $140,000 which was paid to contractors and cooperators during 1995, the Exotic Species Program spent $66,500 on costs of staff time and logistical expenses related to control (see Table 3).

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	Number of lakes treated	State funds (Maint. manage.)	State funds (High-intens.manage.)	Total State funds
1991[1]	20		---	$ 63,000
1992[2]	23		$ 63,000	$ 63,000
1993	23		$ 95,000	$ 95,000
1994	27	$ 80,000	$ 41,600	$ 121,600
1995	40	$ 80,000	$ 60,000	$ 140,000

[1] Costs for this year were estimated by multiplying the number of acres treated by $184, the average cost per acre of applications of 2,4-D made in 1992.

[2] Excluded from this summary are lakes that were treated with Sonar® herbicide.

It is likely that in the future we will experience years when the amount of spring run-off will be low and spring and summer weather will be hot and sunny, that is, drought conditions. Under such conditions, the growth of milfoil is likely to be greater than it was during recent years and there likely will be increased need for funds to control this exotic.

Differences between high-intensity and maintenance management of Eurasian watermilfoil in Minnesota

The difference between the high-intensity and maintenance management are summarized in Table 13. 'High-intensity management' is a term used by Smith et al. (1991:36) to refer to costly and aggressive efforts to reduce the abundance of the plant within the lake and slow its spread to other lakes. High-intensity management is usually undertaken by the Exotic Species Program either on lakes with small, recently discovered populations of milfoil or on lakes in areas of Minnesota where there are few if any other lakes with milfoil. These lakes are typically given high priority in the prioritization system in the Exotic Species Program's management plan for milfoil (MDNR 1994:18-21). In most cases, milfoil is not abundant on lakes in the high-intensity management class, so the plant causes few nuisances for users of these lakes. Examples of such lakes are Bay and Oscar in Crow Wing and Douglas Counties, respectively, which, due to their location, present a risk of spread of milfoil in areas with no other lakes with the exotic. For this reason, the Exotic Species Program will continue to take the lead in control efforts on lakes like these.

Table 13. Summary of differences between lakes designated for either high-intensity or maintenance management of Eurasian watermilfoil (Modified from Smith et al. 1991).

	High-intensity management	Maintenance management
Size of milfoil population	Small	Large
Distribution, within the lake	Few sites close to each other	Many sites throughout lake
Time since discovery	Recently discovered	Not recently discovered
Location in Minnesota	Areas where there are few if any other infested lakes	Areas where there are many other infested lakes
Objectives of management	1) Limit the growth and spread of milfoil within the lake. 2) Prevent spread of milfoil from the lake.	1) Minimize nuisances caused by milfoil. 2) Prevent spread of milfoil from the lake.

'High-intensity management' includes efforts of the Exotic Species Program which in the past were considered attempts to eradicate milfoil from individual Minnesota lakes. Eradication of milfoil from Minnesota lakes is an ideal objective which is rarely achieved. For example, no milfoil was found during 1994 in only four of the more than 25 lakes where the Exotic Species Program attempted to eradicate the exotic by application of herbicide in previous years (Exotic Species Programs 1993, Exotic Species Programs 1994). During 1995, rooted milfoil was found in one of these lakes and was suspected to be present, though not located, in two others. This experience is generally consistent with the report by Smith et al. (1991:35) who could not find any documented cases of eradication.

In two Minnesota lakes, milfoil appears to have been eradicated by application of Sonar® A.S. herbicide in which the active ingredient is fluridone. In addition, the use of this herbicide in these lakes also caused significant and long-lasting reductions in many native plants other than milfoil throughout these lakes. The potential to use this product selectively is the subject of current research by the Exotic Species Program (see section on "Evaluation of fluridone herbicide").

'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. In Minnesota, maintenance management is usually undertaken on lakes where past efforts to eliminate milfoil neither eradicated the plant nor produced significant, long-lasting reductions in its abundance. Most of the lakes in this classification are located in areas of Minnesota where there 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 which are located either off-shore or near public water accesses. These areas are commonly used by the general public, as opposed to nearshore areas adjacent to privately owned property which are used primarily, if not exclusively, by owners.

High-intensity management of Eurasian watermilfoil in Minnesota during 1995

The Exotic Species Program conducted high-intensity management on the 16 lakes with Eurasian watermilfoil assigned to this classification in spring and on three of the seven lakes discovered to have milfoil in 1995 (Table 11). These efforts began with surveys of all 20 lakes by staff of the Exotic Species Program. Following these surveys, applications of herbicide were made to 12 of these lakes by commercial applicators under contract to the DNR. 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 five 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 1995

The Exotic Species Program offered State funding and technical assistance to cooperators on 39 lakes with Eurasian watermilfoil in the maintenance management classification. Some management was undertaken on at least 18 of the 33 lakes designated for management of milfoil in spring and the six lakes added to this classification after survey by the Exotic Species Program in 1995 (Table 11). 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. 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.

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 much 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.

In 1995, the Exotic Species Program worked with cooperators on the 19 lakes designated for high-intensity management of milfoil. This coordination included review of results of surveys by staff of the Exotic Species and Aquatic Plant Management programs, 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 the spring of 1995, the Exotic Species Program notified potential cooperators on 33 lakes designated for maintenance management of milfoil (Table 11) that the Exotic Species Program would make State funds available for potential cooperators on at least 28 lakes. The Exotic Species Program will reimburse cooperators for control work done in 1995 on at least 23 lakes for which cooperative agreements were established. Reimbursements for 1995 will total at least $80,000 (Table 12). Funds allocated for work on individual lakes in 1995, but not spent, will be carried over and added to funds allocated for 1996. Funds allocated for work on individual lakes before 1994, but not spent, will not be carried over and added to funds allocated for 1996.

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 Lake Association, and a number of local units of government.

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 (COE), 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 was found of a decline in milfoil in a Minnesota study site

In 1995, researchers from the University of Minnesota found what may be promising evidence of a decline in milfoil in a study site in Lake Minnetonka. In this site the biomass of milfoil in 1995 was two-thirds less than peak values observed in 1994. Perhaps more importantly, the milfoil did not reach the surface in any but a few locations in the shallowest part of the site during 1995.

Unfortunately, it is not clear why this apparent decline occurred. In this site researchers found a species of weevil *(Euhrychiopsis lecontei)* which is known to be able to damage Eurasian watermilfoil. Nevertheless, the numbers of weevils were lower than levels that have been associated with past declines of milfoil, primarily observed under controlled experimental conditions. It also should be noted that milfoil did not decline during 1995 in another three Minnesota lakes with weevils that also are under study. Current and future research must determine factors which limit densities of weevils to levels less than those known to cause declines in milfoil under controlled, experimental conditions. In addition, researchers will continue to evaluate the potential role of organisms other than weevils, e.g., other insects and pathogenic fungi, and environmental conditions in declines of milfoil.

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. To date, this research has produced three publications in peer-reviewed journals (Newman and Maher 1995; Newman et al in press; Solarz and Newman in press).

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 Natural Resources (LCMR). 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 the COE, research which is described below.

The research by the COE included three projects. A project done by Middlebury College under contract to the COE indicated that the weevil *Euhrychiopsis lecontei* had no significant negative effect on five native milfoil species. An additional report on this research is expected in 1996. The COE Waterways Experiment Station (WES) has attempted to isolate pathogenic fungi from milfoil collected in Minnesota and other northern states. This effort also included dissection of weevils to determine whether they contain microbes that might be pathogenic to milfoil. Preliminary results do not indicate that weevils are vectors for pathogens of milfoil. Lastly, the COE 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. Reports on these studies by the COE are expected to be completed early in 1996.

The Exotic Species Program hopes very much that the COE will continue cooperative research on management of Eurasian watermilfoil in Minnesota and the upper Midwest. This COE 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.

Genetic variation in Eurasian watermilfoil

- Limited genetic variation in milfoil indicates most reproduction is clonal or asexual

Recent research at the University of Minnesota involved the use of "genetic finger-printing" or randomly amplified polymorphic DNA markers to evaluate genetic variation in milfoil. Results of this effort indicated a much higher level of variation than was expected based on previous analysis of isozyms. These results are generally consistent with the belief that most reproduction in Eurasian watermilfoil is by fragmentation (asexual), though some reproduction by seed (sexual) may be occurring in Minnesota lakes.

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
- More research on fluridone is needed

The Exotic Species Program initiated an evaluation of the potential to selectively control milfoil with fluridone, the active ingredient in Sonar® herbicide, because it might be applied to whole lakes. Application of herbicide to whole lakes is not usually permitted in Minnesota where the area in a body of water can be treated with herbicides is limited to 15% of the littoral zone. The littoral zone is the portion of a lake where rooted aquatic plants grow and is legally defined as the area of a lake where water is up to 15 feet deep. The rationale for this limitation is that these plants are beneficial to lake ecosystems in many respects, even though they may cause nuisances for certain users of Minnesota's lakes.

The objective of the Exotic Species Program's evaluation of fluridone is to determine whether application of fluridone at low rates can selectively control Eurasian watermilfoil. Application of fluridone to whole lakes might be acceptable if this use of herbicide reduced or eliminated milfoil and had little if any effect on other plants or other components of lake ecosystems.

Fluridone was applied to two Minnesota lakes in 1994 at rates selected to produce a concentration of 10 ppb in the lake. This application dramatically reduced the amount of milfoil and other plants by September of 1994. In 1995, no milfoil was found in one of the treated lakes, Zumbra, where the amount of other plants continued to decrease. In 1995, Hennepin Parks recorded the lowest secchi disk transparency observed in Zumbra Lake since 1981 when this agency began recording secchi disk observations on this lake (John Barten, Suburban Hennepin Regional Park District, personal communication). In addition, Hennepin Parks found that the concentration of chlorophyll *a* in Zumbra Lake during 1995 was higher than those observed in any of the preceding three years (John Barten, Suburban Hennepin Regional Park District, personal communication). This leads to concern that a reduction in vegetation caused by application of fluridone may lead to dominance by planktonic algae and perhaps a long-term reduction in the abundance of many aquatic plants.

In 1995, milfoil was found in Parkers Lake, the other lake which was treated with fluridone in 1994. This was surprising because the application of fluridone to this lake in 1994 produced concentrations of herbicide which were higher than expected and should have eliminated the exotic. Water draining into a corner of the lake may have carried the fluridone away from milfoil plants and allowed them to survive the treatment. In addition, curly-leaf pondweed reached nuisance-causing levels of abundance in 1995 as it did before treatment.

Studies of the effects on fish communities in vegetation by fluridone were conducted by the University of Minnesota with funding from the Exotic Species Program. This research did not detect any collapses of principle fish populations in the treated lakes. In Zumbra, researchers discovered some evidence that large mouth 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 which protects these fish from predation by other fish.

Studies of the effects on invertebrate communities of reduction in vegetation by fluridone were conducted by Winona State University 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.

Evaluation of triclopyr herbicide

- Milfoil was essentially eliminated from treated areas by triclopyr for one season but re-established during the following year

In 1995, the Exotic Species Program continued to assist an effort by the COE to study the fate and efficacy of triclopyr, the active ingredient in Garlon™ 3A herbicide, after application to a northern lake to control Eurasian watermilfoil. In 1994, the COE, working closely with DowElanco, the manufacturer of Garlon™ 3A, applied this herbicide to two sites in Lake Minnetonka. These applications essentially eliminated milfoil from the sites during 1994 and caused little damage to other submersed aquatic plants. During the spring of 1995, curly-leaf pondweed was abundant in these sites. Surveys conducted in August, 1995 by the COE indicated that the milfoil had re-established, presumably by fragments carried into the sites by water currents. Further results on the fate of triclopyr will become available in the future.

Plant projects by Mr. Miller

- Planting study raised more questions than it answered

In 1993, the Minnesota legislature followed the recommendations of the LCMR and funded a project proposed by Mr. Edward Miller to evaluate the potential to 'replace' Eurasian watermilfoil with native plants following applications of 2,4-D herbicide. In 1995, the project was completed and the results were evaluated by the Exotic Species Program. In general, Mr. Miller's study raised more questions than it answered. It was not clear whether planting reduced the abundance of milfoil and increased the abundance of native plants. There also were indications that the applications of 2,4-D in Mr. Miller's project produced atypical and unusual results. Lastly, planting done in this study may have cost between $1,870 to $16,000 per acre and it is not clear that lake managers will spend this much for planting. At present, the Exotic Species Program cannot support funding for 'follow-up' studies as suggested by Mr. Miller. In addition, the Exotic Species Program sees no justification for 'commercial' or operational planting to attempt to limit the abundance of milfoil at the present time.

Future plans and needs of the Eurasian watermilfoil program:

The Eurasian Watermilfoil Program is now well established and the increase in the surcharge on licenses for watercraft (see M.S. 86B.415 in Appendix A) passed during the 1993 legislative session has generated adequate funds for this program. Priorities for the Eurasian Watermilfoil Program, which are described in detail in the DNR's management plan, include:

- Inform the public 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, and
- Support research on the potential for biological control of milfoil and the biology of this species.

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Management of Purple Loosestrife

1995 Highlights

- 165 Purple loosestrife infestations were treated with herbicide.
- No purple loosestrife was found at 13 sites where purple loosestrife infestations were treated with herbicides in 1994. This control success is limited to the small infestations that are treated soon after purple loosestrife invades an area.
- 21 sites that were treated in 1994 had a 75% reduction in quantity of herbicide needed to control these infestations in 1995. This is directly due to reductions in infestation size from previous treatments made in 1994.
- 100,000 purple loosestrife leaf-eating beetles were released at 45 sites statewide.
- DNR increased its involvement in regional efforts to expand biological control of purple loosestrife.
- Insects released in 1994 to control purple loosestrife survived the winter and became established in 1995.

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. State statutes direct the DNR to coordinate a control program to curb the growth of purple loosestrife (see M.S. 84.966 in Appendix A) and a significant amount of progress has been made toward the development of a sound approach to manage this ecologically 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. Purple Loosestrife Program was established in the DNR in 1987.

Statewide inventory of purple loosestrife

In 1987, the DNR began to inventory sites in Minnesota where purple loosestrife was established. Observations by DNR Area Wildlife Managers, county agricultural inspectors, local weed inspectors, personnel of the Minnesota Department of Transportation, and the general public are reported 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 Fig. 4).

In Minnesota, 40 new purple loosestrife infestations were identified in 1995. Overall, there are now 1,767 purple loosestrife infestations documented in the inventory (Table 14). 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.

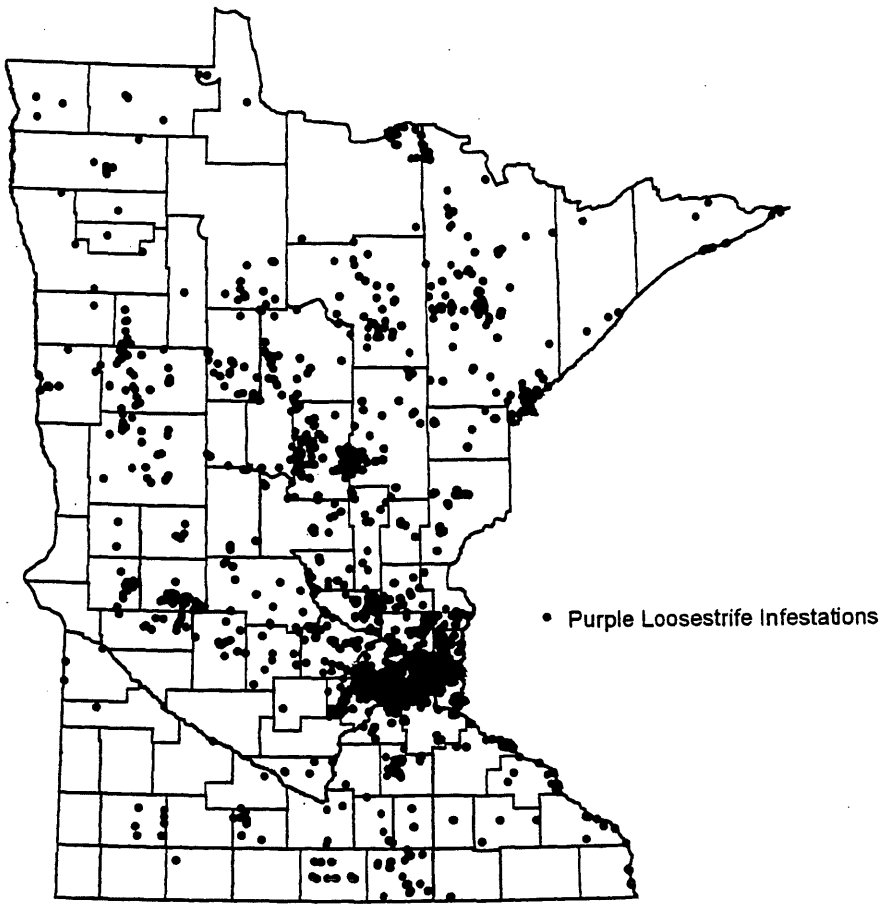

Figure 4. Purple loosestrife infestations in Minnesota as of December, 1995.

Table 14. Purple Loosestrife infestations documented by the Purple Loosestrife Program, Minnesota Department of Natural Resources in 1994 and 1995.

Site Type	Total Sites - 1994	New Sites - 1995	Total Sites - 1995
Lake	538	2	540
River	139	0	139
Wetland	540	11	551
Roadsides and Ditches	376	15	391
Other[1]	134	12	146
Total	**1727**	**40**	**1767**

[1] Includes gardens and other misc. sites.

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 native plants that are monocots). 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 15). This summary includes applications made by DNR personnel, commercial applicators working under contract to DNR, and various cooperators; it is not a complete listing of all herbicide applications made in Minnesota. A similar amount of work was done in 1995.

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

Table 15. Number of purple loosestrife infestations treated in 1995 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

DNR tries to keep loosestrife from infesting downstream lakes. Sites located in the upper reaches of watersheds with little loosestrife are treated before those located in watersheds with large amounts of loosestrife. Implementation of the prioritization scheme in 1991 resulted in fewer large sites (≥ 1000 plants) being treated (Table 15).

During the summer of 1995 the DNR visited 205 purple loosestrife stands for herbicide control work. At 38 sites workers found no loosestrife plants, 13 of these sites had been treated in 1994. Two sites had too many loosestrife plants to treat. Two sites had loosestrife plants which were hand pulled. A total of 165 sites covering 302 acres were treated. Most of the sites treated by the DNR were very small, 62% had less than 100 plants (Table 15). These applications used 35 gallons of herbicide, took 2,261 worker hours and cost $62,688 (Table 16).

Table 16. Summary of herbicide applications to purple loosestrife infestations in 1995. This list includes only applications made by or reported to the Purple Loosestrife Program, Minnesota Department of Natural Resources.

DNR Region	Treated by:	Number of sites treated with Rodeo	Number of sites treated with Garlon 3A	Hour of Labor	Acres Treated	Total Cost
I	DNR	15	17	306	59	$ 12,667
	other					
II	DNR	52	0	368	56	$ 10,544
	other					
III	DNR	24	25	1,262	133	$ 31,799
	other					
IV	DNR	23	0	262	47	$ 6,000
	other					
V	DNR	0	6	58	7	$ 1,548
	other					
VI	DNR		1	5	0	$ 130
	other	5	11	323	61	$ 8,609
Total	**DNR**	**114**	**49**	**2,261**	**302**	**$ 62,688**
	other	**5**	**11**	**323**	**61**	**$ 8,609**

Research on purple loosestrife

In 1995, DNR continued to vigorously support purple loosestrife biological control research. Two different biological control approaches, one using insects and the other fungal pathogens, show promise.

Insects as biological control agents

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 LCMR. 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 tested as potential biological controls for loosestrife in Minnesota. The leaf-feeding beetles and the root-boring weevil passed their first test by surviving through the winter.

Insects were reared in the lab at the University of Minnesota for research and field releases during the summer of 1995. Most of the lab rearing and research efforts is focused on the leaf-eating beetles (*Galerucella* spp.). To date, over 100,000 leaf beetles have been released in 45 sites around the state (see Figure 5).

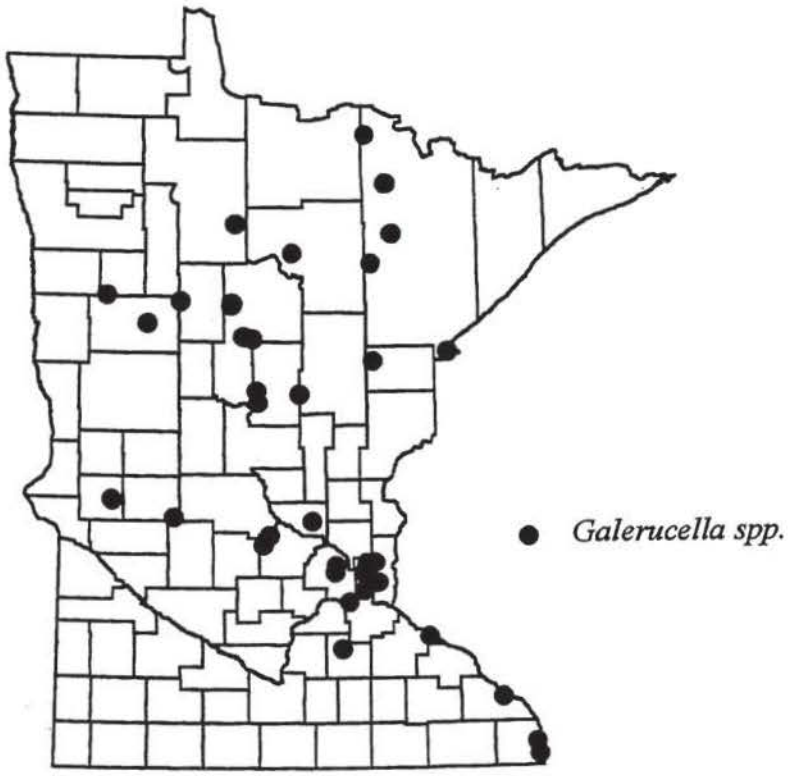

Figure 5. Leaf-eating beetle, *Galerucella* spp. releases in Minnesota as of December, 1995.

Biocontrol insects released in 1994 were found to have established at a majority of the sites. Insect populations increased significantly at a several locations. At one Rice County site in particular, where 500 insects were released in 1994, insects were found on several hundred plants covering a three acre area when the site was resurveyed in 1995.

The DNR is also funding biological research at Cornell University to improve the effectiveness and accelerate the establishment of the insects already present in Minnesota and bring two new insects, both flower feeding weevils, into the state. Researchers believe that multiple insect species which attack different parts of the loosestrife plant, will increase the likelihood of achieving successful control. Cornell provided both root-boring and flower-feeding weevils during the summer of 1994. The flower-feeding weevils received approval from U.S.D.A. for release in the United States in May 1994 and Minnesota was one of the first states to be selected for introductions. A total of one thousand adults were divided up and released in five wetlands in the metro area. The flower-feeding weevils survived the winter and were found at all five release sites in 1995. At two sites, the flower-feeding weevil population increased significantly, showing good reproduction capabilities.

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 Minnesota wetlands.

The 1854 Treaty Authority in northern Minnesota provided $10,000 in funding to the DNR for the establishment of field releases in the Treaty Authority area. This funding was used to purchase insects from Europe. Leaf beetles were released in three sites in the Treaty Authority area in July 1994. In 1995, the 1854 Treaty Authority provided another $10,000 to continue the research and release more insects at new locations in the Treaty Authority Area. This was completed in July 1995 when insects were release at 4 new sites. These sites will be monitored by DNR staff in the coming year.

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. Research will continue in 1996 to isolate and test fungal pathogens that show promise in controlling purple loosestrife.

Management of purple loosestrife in other states

There is a large and rapidly growing effort to implement a comprehensive biological control approach to manage purple loosestrife in North America. Beginning in 1994, over 90,000 leaf-eating beetles have been released in 18 states across the U.S. (CO, IA, ID, IL, IN, MD, MI, MN, MT, NY, OH, OR, PA, SD, UT, VA, WA, WI). Insects are being monitored by local researchers.

During the 1995 field season, Cornell University sent a total of 33,000 adult leaf-eating beetles to 13 states (IL, IA, MT, KS, MD, NJ, TN, PA, WI, OH, ID, CO, NY) and Canada. Among the recipients were Universities, State Departments of Natural Resources, Environmental Conservation, Fish and Game, State Departments of Agriculture, National Wildlife Refuges, Bureau of Reclamation, USDA-APHIS, and the Tennessee Valley Authority. Mass rearing methods were improved and a brochure summarizing the available information was sent to cooperators. In addition 34,932 eggs of root-boring weevil were shipped to 22 states (MN, SD, IN, RI, WA, ME, OR, NE, NH, IL, IA, MT, KS, MD, NJ, TN, PA, WI, OH, ID, CO, NY) and Canada.

The U.S. Fish and Wildlife Service's Federal Aid Program, in a coordinated effort with the Minnesota DNR, has helped to start biological control efforts in seven Midwest states. This effort will provide Midwest states with a source for insects, technical assistance for their initial release, and monitoring strategies. Planning efforts culminated with a meeting with Indiana, Missouri, Michigan, Iowa, Wisconsin, Illinois, and Ohio to coordinate logistics of this effort. A follow-up meeting, held in December 1994, discussed results, needs, and implementation plans for 1995. Twenty two states and 5 Federal agencies are now involved. A national workshop to teach resource managers how to implement a biological control program is planned for 1996. This workshop will be hosted by the Minnesota Department of Natural Resources and the United States Fish and Wildlife Service.

Effectiveness

Effectiveness of this program will be based on short-term and long-term objectives. Control or eradication of small infestations statewide with herbicides is the main short-term objective. Each year, a small number of purple loosestrife infestations (13 in 1995) are eradicated with herbicides in Minnesota. This is critical because these infestations are in watersheds that have very few infestations of loosestrife. This effort helps prevents 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 the dominant one.

Participation of others in purple loosestrife control efforts

In 1994, the DNR worked with a variety of local governments and other organizations to control purple loosestrife in Minnesota (Table 17). Control information and technical assistance was provided to landowners and local units of government.

Table 17. List of cooperators participating in purple loosestrife control efforts and the type of participation.

Government/Organization	Type of Cooperation
Ramsey County	Cooperative agreement to allow Ramsey Co. to utilize state contract to hire commercial applicators.
City of Sunfish Lake	DNR provided equipment and herbicide
1854 Treaty Authority	Provided $10,000 in funding for biological control research in Northern Minnesota.
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
University of Minnesota	partner in statewide biological control efforts, including rearing, releasing and monitoring of insects.
St. Marys University, Winona MN	Providing 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 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 control efforts on small infestations of loosestrife.
- Increased coordination to control loosestrife on other state agency managed areas.

Management of Flowering Rush

1995 Highlights

- The DNR Exotic Species Program investigated and confirmed one newly reported population of flowering rush in Itasca County.
- The Exotic Species Program expanded control activities through a cooperative project with Becker and Wadena County Sentence to Service program.
- Bemidji State University researchers collected baseline information on flowing rush habitat and evaluated control activities through projects funded by the Exotic Species Program and the Pelican River Watershed District.

Background

Flowering rush (*Butomus umbellatus*) is an 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 waterbodies,
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 plot. 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 undesirable exotic plants, such as Eurasian watermilfoil and purple loosestrife. However, once it is established it is difficult to control without harming native vegetation.

Inventory

Flowering rush has been reported from ten Minnesota waterbodies:

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

The Pelican River Watershed District staff have recorded the spread of flowering rush in Becker County from 1976 to the present. DNR Exotic Species Program and Fisheries staff conduct surveys of these sites to estimate flowering rush abundance and native species diversity. The

majority of information available on flowering rush biology and management in Minnesota has been obtained from the Becker County sites.

In 1995, Exotic Species Program staff investigated and confirmed one newly reported flowering rush site in Twin Lake, near the town of Marble, Itasca County. The population has likely been present for many years but had gone unreported until this year when DNR Fisheries staff identified it. This new report was the result of increased exotic species awareness among DNR field staff.

DNR staff reported flowering rush in four waterbodies in Anoka and Rice Counties in the early 1970's but staff have not relocated the plants in recent surveys of the waterbodies. Exotic species program staff discovered additional information on these locations in the fall of 1995 and will plan field investigations in 1996.

Control and Research of flowering rush

The Exotic Species Program continues to assess the potential 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. Existing control options include pulling or cutting small emergent populations by hand, cutting submersed plants with mechanical harvesters, and herbicide applications.

The Exotic Species Program coordinated a flowering rush hand-cutting project at several sites in Detroit Lakes, Becker County. Becker and Wadena County Sentence to Service (STS) crews hand cut marked areas of emergent flowering rush two to three times during the summer of 1995. The results of these projects are being evaluated by Bemidji State researchers through a DNR contract. The researchers will assess the effects of repeated cutting on flowering rush and native species within the plots.

In Becker County sites, submersed flowering rush plants were again mechanically harvested as part of the Pelican River Watershed's lakewide harvesting program. This program is regulated through DNR Fisheries. The Watershed District funded a separate research project through Bemidji State University. Part of this project included assessments of the harvesting program.

The Exotic Species Program staff continued an evaluation of the herbicide Rodeo® (glyphosate) to control flowering rush. Results from 1994 and 1995 indicate that Rodeo provides seasonal control of fully emergent flowering rush stands, but it did not eliminate the exotic plant in test plots. There was no detectable decrease in native species diversity within treated sites.

In Twin Lakes, Itasca County, the DNR issued a permit for herbicide control of emergent flowering rush plants within a city swimming beach area. The herbicide 2,4-D was used because the project goal was to eliminate or reduce all aquatic vegetation within the beach area. Preliminary results indicate that control was effective in providing seasonal control of flowering rush. The site will be monitored in 1996 to analyze the long-term effect of 2,4-D on flowering rush and native vegetation.

Management of flowering rush in other states

Management of flowering rush in other states is minimal. Several other states have requested copies of the DNR flowering rush management plan (1994) and have provided updates on the status of flowering rush in their states. A private consultant from Michigan contacted the DNR

and reported that he has recently observed abundant growth of submersed flowering rush in Michigan lakes (D. Pullman pers comm). He requested information about control options, as Michigan does not have a specific program for flowering rush control.

The U.S. Bureau of Reclamation (U.S. Dept. of Interior) is the only other agency known to have conducted control for flowering rush. They have reduced control research efforts except in some reclamation sites that also contain flowering rush (Boutwell pers. Comm 1995). Bureau staff visited sites in Becker County in 1995 and discussed their experiences with flowering rush with Exotic Species Program staff.

Participation of others in management of flowering rush

Major groups involved in flowering rush management include: DNR Exotic Species Program, DNR Fisheries, DNR Minnesota Conservation Corps, Becker and Wadena Counties Sentence to Service Program, Pelican River Watershed District, and Lakes Sallie and Melissa Improvement Association. Coordination with these individuals and organizations will continue in the future.

The Pelican River Watershed District (P.R.W.D.) manages the existing mechanical harvesting program which is regulated by DNR Fisheries. Part of this program includes harvesting and disposing of submersed flowering rush plants. The P.R.W.D. cooperated with the DNR and STS hand-cutting project by providing shoreline pick-up and removal of cut flowering rush plants. The P.R.W.D. also provided funding for flowering rush research conducted by a student at Bemidji State University. The District also included information about flowering rush in its 1995 mailing to Watershed District residents.

Effectiveness

The Exotics Species Program has provided DNR field staff with information on how to identify harmful exotic species. The newly reported Itasca County flowering rush site was a direct result of this increased awareness among field staff. Additional flowering rush sites may be reported in the future as the general public becomes aware of exotics issues.

The Exotic Species Program contract with Bemidji State researchers was an effective way to gather important detailed data on the relative abundance of flowering rush and the associated native plant species. This information is essential to monitor future control efforts.

Field trials conducted in 1994 and 1995 improved chemical treatment methods for emergent flowering rush plants and manual removal methods for partially emergent plants.

Future needs for flowering rush management

- Continue public awareness about the value of native vegetation and potential problems of introducing exotics. The DNR has proposed regulations in statute and rule that would make it illegal to buy or sell flowering rush in Minnesota.
- Monitor all reported flowering rush sites and investigate any new reports.
- Evaluate research report from Bemidji State and use results to determine future research needs.
- Continue to conduct and/or evaluate current control projects, including small scale hand cutting, herbicide application on select sites, and mechanical harvest of large areas of submersed flowering rush.
- Evaluate new control options, such as the limited use of the herbicide 2,4-D as a non-selective control for partially submergent plants in high priority sites.

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Management of Curly-Leaf Pondweed

1995 Highlights

- The general distribution of curly-leaf pondweed was outlined; it has been reported in 65 of the 87 Minnesota counties.
- Public information about curly-leaf pondweed was provided through literature, public presentations, and watercraft inspections.
- DNR evaluated the potential for curly-leaf eradication and concluded that, because curly-leaf pondweed produces propagules called 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.

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 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 Minnesota. Both lake associations and DNR fisheries staff from southern Minnesota have expressed interest in curly-leaf pondweed management.

Progress in Management of Curly-leaf pondweed in 1995

- DNR Exotic Species Program staff, and DNR fisheries staff participated in a workshop on management of curly-leaf organized by the MN Pollution Control Agency (MPCA). The workshop was held in Mankato on February 7, 1995.

- DNR Exotic Species Program staff reviewed a lake wide curly-leaf control project proposal, which is part of a Clean Water Partnership project, funded through the MPCA, on French Lake, in Rice County. DNR fisheries staff in the Waterville office have also been offering assistance with this project.

- Exotic Species Program staff estimated the distribution of curly-leaf pondweed in Minnesota.

Current Distribution of Curly-leaf pondweed in Minnesota

It is difficult to determine the exact distribution of curly-leaf pondweed in Minnesota because detailed aquatic plant surveys have not been conducted on many lakes. DNR fisheries staff have recently improved the aquatic plant data collected during lake surveys but many lakes remain that do not have a detailed survey completed. In addition, DNR staff also makes notes of aquatic plant communities during other lake surveys, such as when a lake is sounded to determine its bathymetry. However, depending on when a survey is conducted, curly-leaf pondweed may be missed and go unreported. In 1994 DNR Exotics Species Program staff began a search through existing fisheries records to determine which counties in Minnesota had water bodies with curly-leaf pondweed. The University of Minnesota herbarium collection database was also queried to determine which counties have recorded curly-leaf pondweed populations.

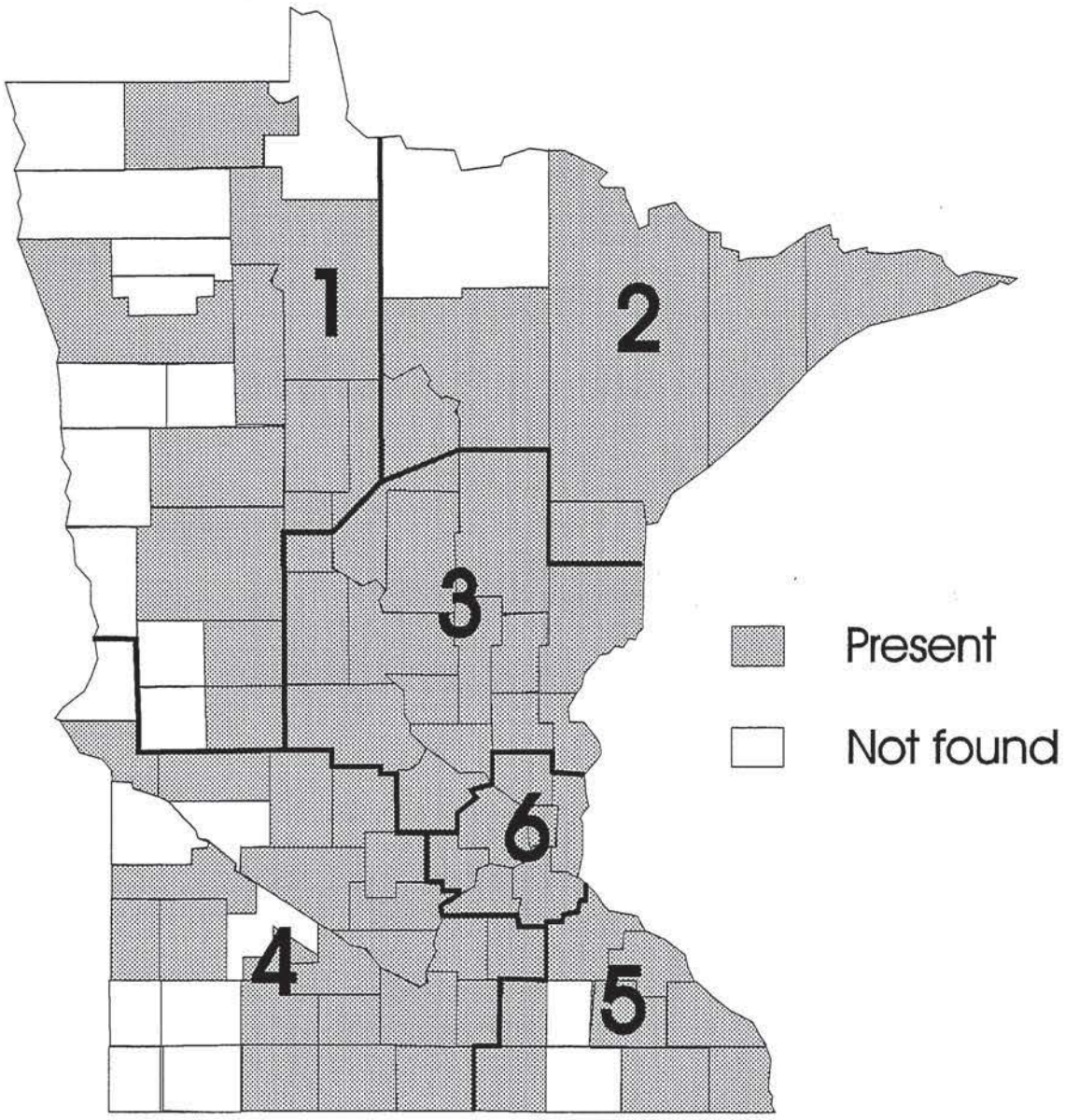
Figure 6 shows every county in Minnesota where there is at least one water body with curly-leaf pondweed recorded. Although most of the counties in the state have at least one record of curly-leaf, there are still many lakes within the state as yet uninfested with this exotic plant. Lake and St. Louis counties, for example have many lakes which have no recorded curly-leaf pondweed populations.

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. Even if a water body is treated with herbicides, it is not possible to eradicate the curly-leaf pondweed turions. There is a bank of turions (similar to a seed bank) in the lake bottom which will produce new curly-leaf plants in the fall. These turions will be present from previous year's growth, even if all of the current summer's curly-leaf pondweed had been killed before it produced turions for that season.

1994 the DNR issued 249 permits for the control of curly-leaf pondweed. Under those permits herbicide was applied to 730 acres and 850 acres were mechanically harvested. Most of the curly-leaf acres treated in 1994 were in region 6 (73%), with an additional 20% treated in region 3 (Figure 6). Totals come from aquatic plant management permittee reports. This information is not yet available for 1995.

Figure 6. Counties in Minnesota with *Potamogeton crispus* (curly-leaf pondweed), numbers refer to DNR regions.



Research on curly-leaf pondweed

As part of a Phase II Clean Water Partnership Program, funded by the MPCA, research is being conducted to determine if a properly timed intensive mechanical harvesting effort can result in a long-lasting reduction of curly-leaf pondweed in French Lake, in Rice County. Curly-leaf currently occupies 40% of French Lake, and represents a recreational nuisance. The curly-leaf die-back in June is associated with a blue-green algae bloom. The objective of the French Lake project is to reduce curly-leaf populations long enough to allow native aquatic plants, which would not die back in mid-summer to proliferate (McComas and Stuckert, 1995). This effort is being conducted in large part by Blue Water Science, a consulting firm, with the cooperation of the DNR, the MN Pollution Control Agency, the French Lake association, and the office of Environmental Health in Rice county. There is some evidence, based on past work by Blue Water Science, that cutting curly-leaf pondweed near the sediment surface, early in the growing season, will kill the plant (McComas and Stuckert, 1995). They are investigating how many years of cutting will be needed to exhaust the turion bank.

Researchers at Mankato State University are working on a restoration project on Duck Lake, in Blue Earth county. In that lake stands of curly-leaf pondweed cover half of the lake's area. They are investigating the relationship between the water quality in Duck Lake and the curly-leaf population. They believe that management of curly-leaf pondweed can beneficially affect lake water quality (Bolduan et al. 1994).

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.
- Implement measures to slow the movement of curly-leaf pondweed from one water body to another. The DNR Exotic Species Program has helped draft legislation which will make it illegal to transport any aquatic plant on a boat or trailer. Passing this legislation would help slow the movement of curly-leaf pondweed even if the exact locations of all curly-leaf populations are unknown.
- Review available research on curly-leaf pondweed control.
- 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

1995 Highlights

- No infestations of zebra mussel were recorded from inland waters in Minnesota.
- Watercraft inspections and public information continued (see Education & Inspection).
- The DNR continued to work with the National Park Service and U.S. Fish & Wildlife Service on the St. Croix River Zebra Mussel Plan as a task force member.

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 waterbody. 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 1995.

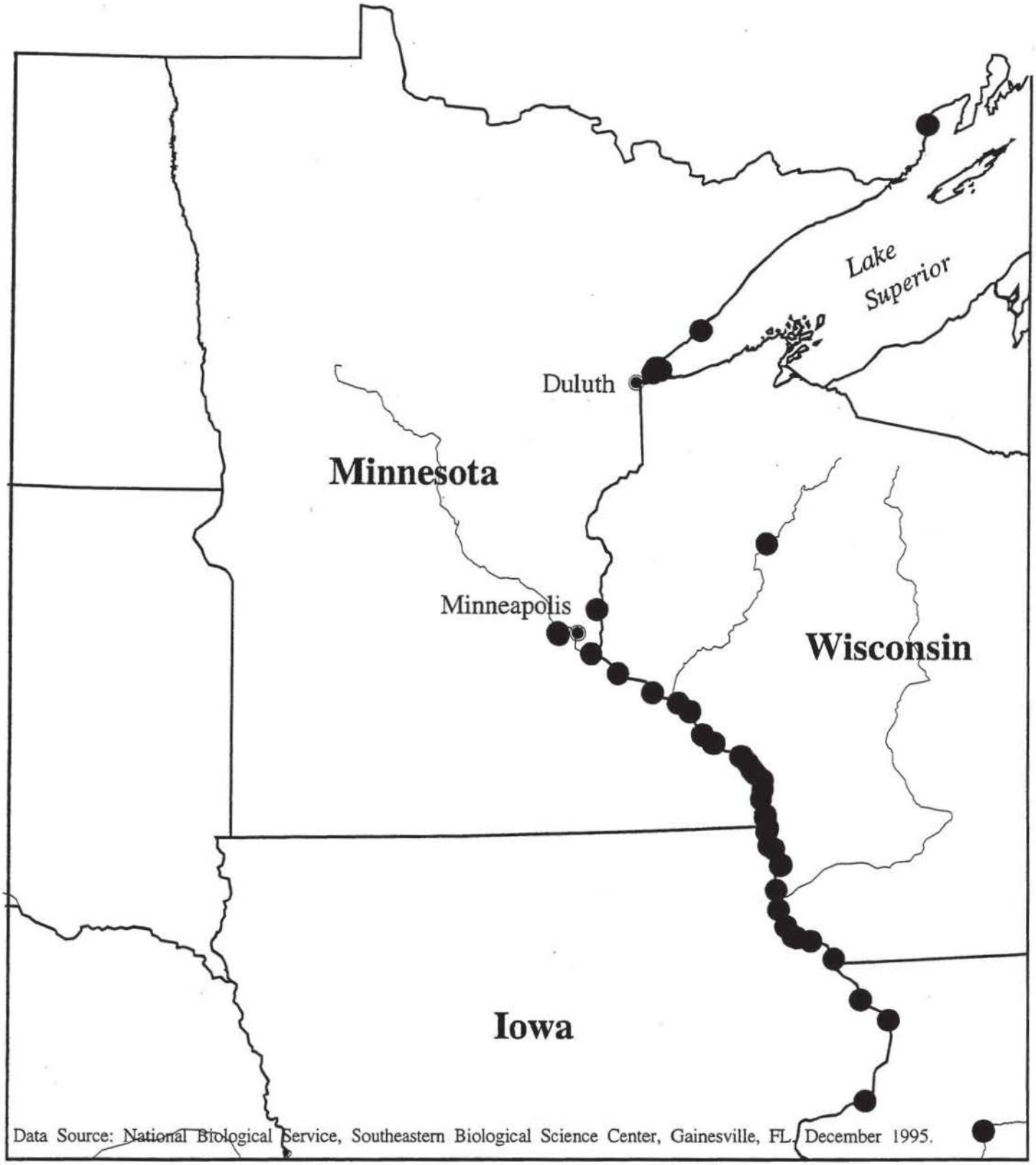
Progress on needs identified for 1995

- Lack of support within state and bordering states led to no moratorium on commercial mussel harvest being enacted.
- Legislation to prevent transport of aquatic vegetation failed in 1995. Efforts to obtain this preventative legislation will be sought in 1996.
- The Exotic Species Program obtained GIS software and training and will continue to work on distributional database.

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 7). Zebra mussels continue to be found in the Duluth Harbor, but no evidence has been found to suggest that these mussels are reproducing. No zebra mussels have been reported from any lakes or inland rivers within the state.

Figure 7. Confirmed Zebra Mussel Sightings as of December, 1995.



The DNR provided financial assistance for dive searches for zebra mussels on the St. Croix River in cooperation with the National Park Service (NPS) and provided technical advice for monitoring activities. DNR staff also responded to public calls concerning zebra mussels found attached to boats removed from the St. Croix River.

DNR staff examined aquatic plant samples collected by MCC Watercraft Inspectors from boats leaving the Mississippi River. One zebra mussel was found attached to vegetation, indicating the possibility of spread of this exotic through plant movement on boats and trailers.

MCC Watercraft Inspectors found zebra mussels attached to 71 boats leaving the Mississippi River (see Watercraft Inspections Section). They also found zebra mussels attached to three boats leaving uninfested waters. However, these boats had all been in the Mississippi River during the summer.

Control of zebra mussels

There was no control of zebra mussels within natural ecosystems conducted in 1995 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. Thus, control is not a viable option once the zebra mussel becomes established in a lake or river. Because safe control methods do not exist, 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).

The DNR required one large vessel (100' length) that entered into the St. Croix River during the summer to be drydocked and cleaned when monitoring discovered significant numbers of zebra mussels on the hull. The boat had been purchased from a Great Lakes owner, had traveled to Minnesota via the Illinois and Mississippi Rivers and likely picked up zebra mussels in it's trip. The vessel was inspected after cleaning by DNR staff and permitted to be relaunched.

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 Fifth International Zebra Mussel Research Conference to gather current information on research being conducted in the United States and Canada.

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 to prevent or slow the spread of the zebra mussel. The phrase "management of zebra mussels" can give false hopes. Because this organism can withstand a lack of water or oxygen for extended periods, has no environmentally acceptable control options, spreads rapidly once established in a lake or river, and has microscopic life stages, detection and prevention of spread are difficult. 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 public awareness and educational efforts.

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 improve control methods. Targeted public awareness and enforcement activities will be used to reduce the rate of movement of zebra mussels, on trailered watercraft. In 1995, increased public awareness and enforcement activity was focused in areas adjacent to zebra mussel infestations. The increase in boats with attached zebra mussels leaving the Mississippi in the fall and the discovery of a mussel attached to aquatic vegetation all indicate that recreational boating will be the major pathway of spread.

Participation with other groups

The 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 (see MDNR 1993). A law enacted in July 1995 prohibits the placement of watercraft with attached zebra mussels into uninfested waters. The DNR will be requiring boat owners on the St. Croix River to remove and clean their boats if zebra mussels are 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.

DNR staff reviewed information on a Minnesota Sea Grant volunteer zebra mussel program. This effort enlists and trains volunteers on inland lakes to look for settled zebra mussels twice a season on docks, boats and other hard substrate. Sea Grant has trained 28 volunteers since spring 1995, and will continue to continue efforts to expand this network.

Future needs for management of zebra mussels

- Document the settlement and attachment of zebra mussels on aquatic macrophytes in the Mississippi River.
- Implement measures to prevent the movement of aquatic vegetation from infested waters.
- Establish a centralized, easily accessible GIS-based database on statewide distribution and abundance through cooperation with Minnesota Sea Grant, or internally within the Exotic Species Program. This effort will provide finer detail for management than is available through the National Biological Survey database.

Management of Rusty Crayfish

Background

The rusty crayfish (*Orconectes rusticus*) is a crayfish 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 our native species. It is more aggressive than our native species of crayfish, and in some lakes where it was introduced, it has displaced other species of crayfish or altered the community composition of this group. Its activities may also reduce diversity and abundance of native vegetation when *O. rusticus* occurs at high densities. 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 in some lakes were reported to feed heavily on *O. rusticus*.

Progress in management of rusty crayfish

The 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. The DNR prohibits 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. The DNR also requires a permit for importing live crayfish or eggs, transfer between waterbodies or commercial harvest.

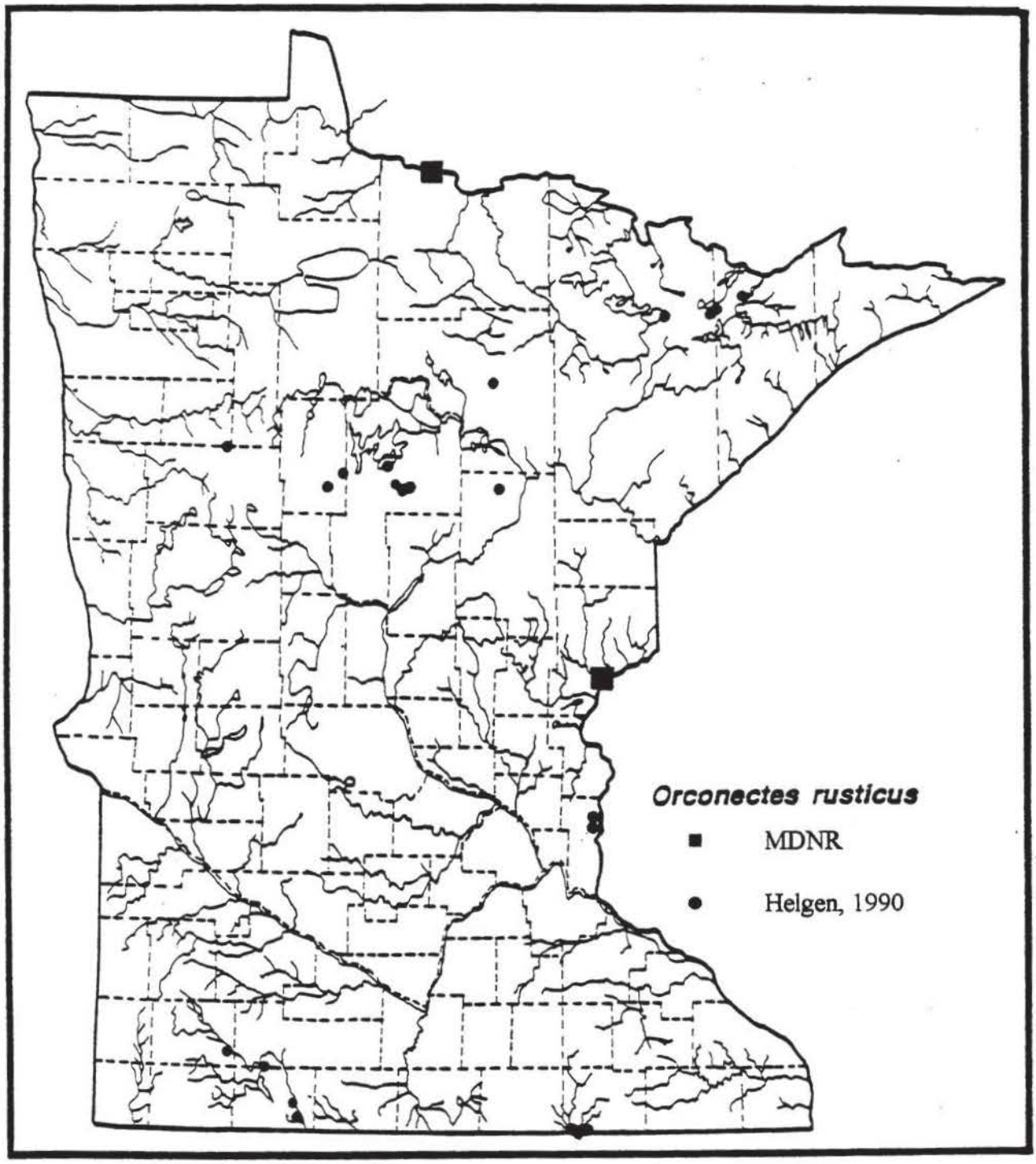
Current distribution of rusty crayfish

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 8). 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, *O. rusticus* is likely present in more Minnesota waters, but simply has not yet been collected.

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 a minimal impact on population abundance because females with eggs and young crayfish are not removed. A study of trapping in a small pond 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. Thus, in any large lake setting, trapping is not likely to succeed in reducing the population or problem.

Figure 8. Rusty crayfish distribution in Minnesota as reported in 1990 (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 aimed specifically at 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 *O. rusticus* have declined to a minimal or non-existent level, aquatic vegetation has re-established beds in some of the lake, and a thriving fisheries is present.

Future needs for management of rusty crayfish

- Survey crayfish throughout Minnesota waters to establish extent of rusty crayfish spread.
- Examine and review the importance of each of the following activities to determine if they pose a significant risk of increasing distribution of the rusty crayfish. For those activities which do pose significant risk, adopt appropriate regulations and/or legislation to reduce this risk.
  - **a.** The use of live crayfish for bait by anglers
  - **b.** The sale of live crayfish by biological supply companies for use in educational institutions.
  - **c.** The commercial harvest of crayfish from natural waters or those known to contain populations of rusty crayfish.
  - **d.** The aquaculture of crayfish.

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

Helgen, J.C. 1990. The Distribution of Crayfishes in Minnesota Section of Fisheries Investigational Report, No. 405, Division of Fish and Wildlife, Minn. DNR.

Management of Ruffe

1995 Highlights

- No ruffe have been discovered in inland waters of Minnesota.
- A ruffe was collected in Lake Superior near Two Harbors, Minnesota.
- Ruffe were listed as undesirable exotic species in permanent rules proposed for adoption by the Department of Natural Resources (DNR).

Background

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

Progress in management of ruffe - 1995

Many of the activities conducted in past years to prevent the spread of ruffe were continued in 1995. 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 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 begun efforts to develop a management plan for ruffe, round goby and other exotic species of fish. The plan will be developed in consultation with the USFWS and Minnesota Sea Grant and is to be completed in 1996.

A federal ruffe control committee was established in 1992. This committee prepared a Ruffe Control Program which required supporting information, including an environmental assessment, an economic assessment, and a summary of public comment on the draft Program. Presently, the Program is being revised in light of new information.

Inventory of ruffe - 1995

The National Biological Service, Lake Superior Biological Station has taken the lead role in ruffe population investigations. The population of ruffe in the St. Louis River estuary continues to increase.

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 9).

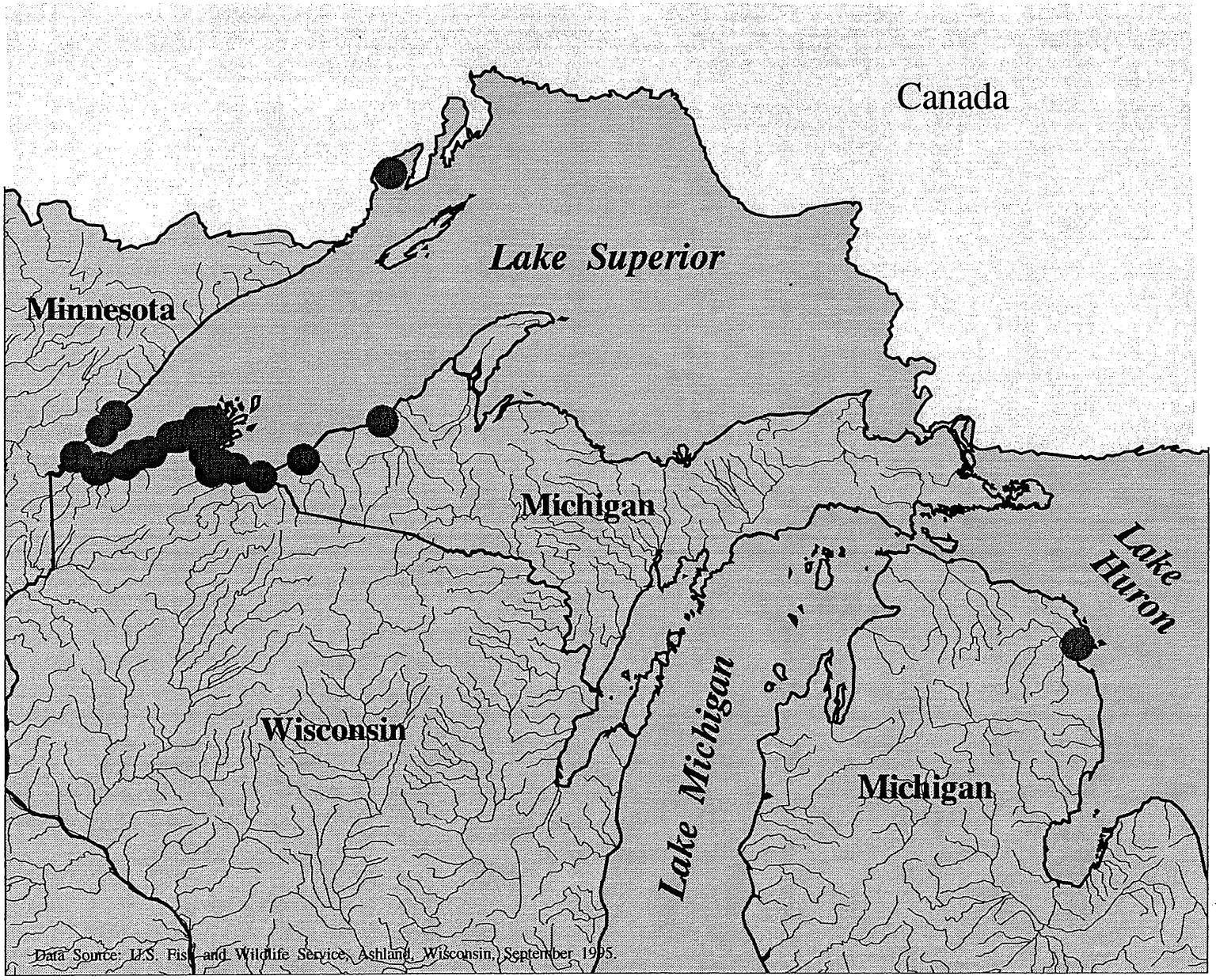

Figure 9. Confirmed Ruffe Sightings as of September 1995.

During routine fish population assessment netting, DNR's Section of Fisheries sets nets in inshore areas of Lake Superior. On June 14, 1995, the DNR's Lake Superior Area Fisheries staff collected a 5.3 inch ruffe in a gillnet in Lake Superior near Two Harbors. 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 1995.

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 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 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, the Federal Ruffe Control Program was revised on November 9, 1995 at a meeting of the Ruffe Control Committee. The revised goal and objectives 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 National Biological Service 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. The U.S. Environmental Protection Agency-Duluth Lab and Minnesota DNR has also funded ruffe research (Leino 1995).

Minnesota Sea Grant received $2 million in funding from the National Sea Grant Program to be used on ruffe research and education efforts. They have funded the following research projects:

- Potential Impacts Of Invading Ruffe On Benthic And Pelagic Ecosystems of the Great Lakes, Carl Richards, Natural Resources Research Institute, University of Minnesota-Duluth;

- Geographic Variation and Colonization Patterns of Ruffe in the Great Lakes: Otolith Signatures and DNA Sequence Divergence, George Spangler, Dept. Of Fisheries and Wildlife, University of Minnesota, St. Paul Campus; and

- Reproduction in Eurasian Ruffe, Patrick Schoff, Natural Resources Research Institute, University of Minnesota-Duluth.

An International Ruffe Research Symposium is planned for early March 1997 in Detroit, 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.

Effectiveness of ruffe management

The effectiveness of 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 and are being evaluated. Regulations 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 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 draft 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 the Superior harbor or in tributaries along the south shore of Lake Superior. Chemical control of ruffe had been proposed for Wisconsin or Michigan waters. Laboratory tests show that ruffe are vulnerable to available fish toxicants, but most information indicates that treatments would not be effective in preventing the spread of ruffe in open systems like the Great Lakes.

Participation of others in ruffe control efforts

The National Biological Service 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 regional 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 USFWS and NBS so that the impact of ruffe on native communities can be ascertained.
- Continue monitoring using routine fish sampling and angler reports.

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Leino, Richard L. 1995. A preliminary evaluation of ruffe reproductive capacities in Lake Superior by histological examination of the ovaries. A report to the Minnesota Department of Natural Resources.

Ruffe Control Committee. 1995. Ruffe Control Program. Submitted to the Aquatic Nuisance Species Task Force, Thomas R. Busiahn, Chairman, USFWS, Ashland WI.

Management of Round Goby

1995 Highlights

- Round goby were first discovered in Minnesota in 1995 in the waters of the St. Louis River estuary by the National Biological Service's crews.
- Round goby is designated a undesirable exotic species in the proposed permanent rules (see Appendix C)
- Round goby identification cards have been designed by Minnesota Sea Grant and ordered by resource agencies, including the DNR, for distribution to anglers in the state.

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 round goby prefers "coarse gravel, shelly, and sandy inshore areas, but migrate to deeper water in winter" (Miller 1986). They feed on bivalves, amphipod crustaceans, polychaetes, chironomids, small fish and fish eggs (Jude, Reider, Smith 1992). The round goby can grow to larger sizes (215-250mm) than native sculpins (Cottus spp.), darters (Etheostoma spp.), and the logperch, which occupy the same habitat type. This size differential, plus the round goby's ability to spawn over prolonged periods and repeatedly (up to six times) every 18-20 days (Jude, Reider, Smith 1992) give this species a competitive edge over native fishes. The round goby have caused a decline in the mottled sculpin populations in the St. Clair River, Michigan by competition for optimal habitat, possible predation effects, interference with spawning, and interspecific competition for food (Jude, Jannsen, Crawford, 1995).

In 1993, Minnesota Emergency Rule 6216.0100 listed round goby as an undesirable exotic wild animal which made it illegal to transport, possess, sell, purchase, import, take, or propagate the species without a permit issued by the Department. This emergency rule expired August 11, 1994. The round goby is designated an undesirable exotic species in the Department's proposed permanent rules that are anticipated to be adopted in March 1996 (see Appendix C). By placing round goby in this regulated classification, transportation of the species will be prohibited on public roads (under Minnesota Statutes 18.317), and the risk that it will be dispersed to inland waters of the state can be reduced.

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, and now to the Lake Superior watershed (see Figure 10). Two specimens of the round goby discovered in the Duluth-Superior harbor (St. Louis River estuary) during 1995: the first was found in July and the second was found on November 7. Both were discovered by the National Biological Service crews. This is the first time that the round goby has been discovered in the state. Round goby have not been identified in any inland waters in the state.

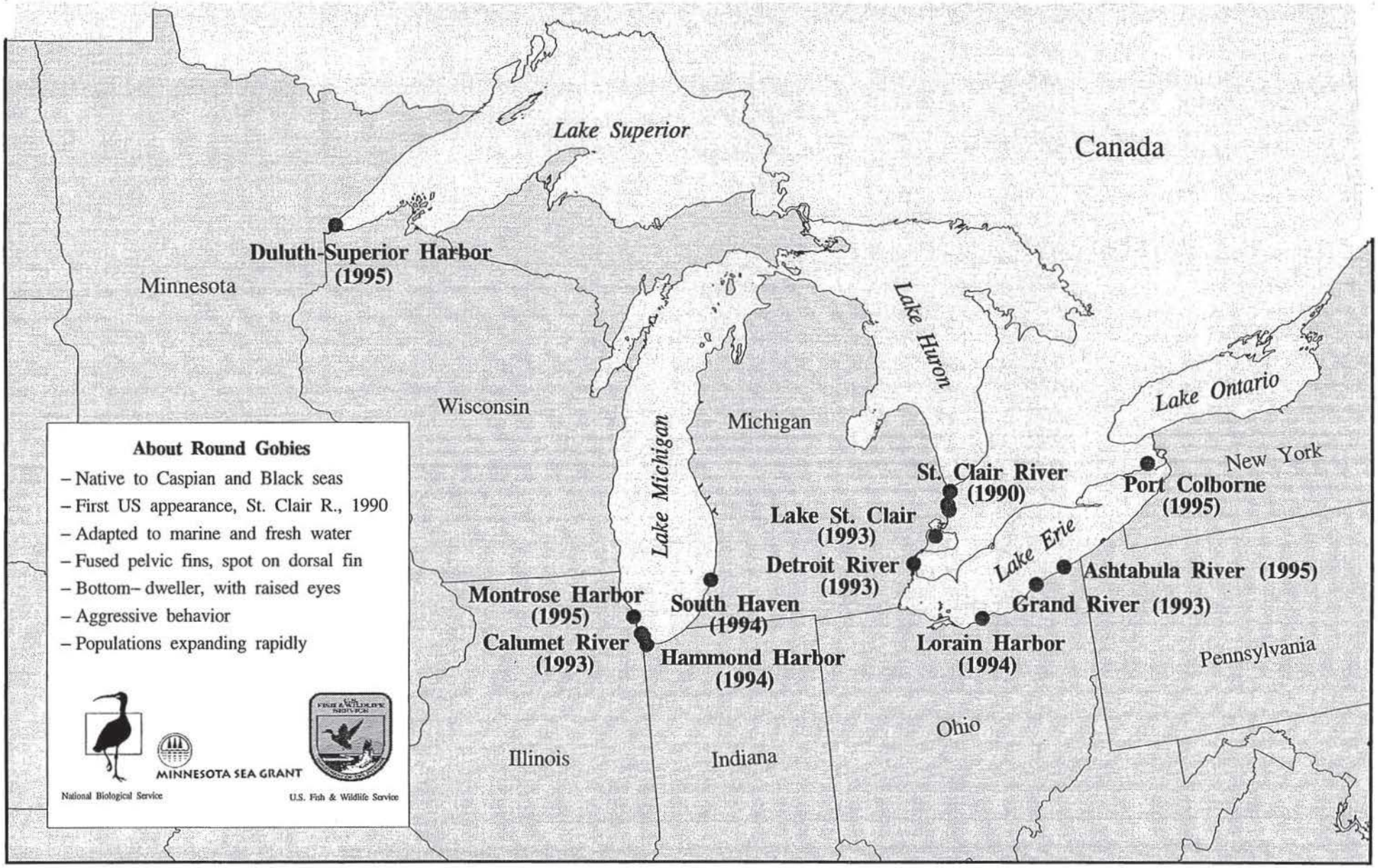

Figure 10. Confirmed Round Goby sightings as of September 1995.

Research on round goby

Research has not been initiated in Minnesota by the DNR. Several research efforts regarding round goby have begun in the Great Lakes region. The primary research work has been done at the University of Michigan (Jude 1992 and 1995). A conference will be held in Chicago during February 1996 to present the latest information on the biology, spread, population dynamics, and impacts of the round goby. A workshop to facilitate research on the goby will be part of 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 federal National Biological Service discovered the species during its work in the Duluth area. Minnesota Sea Grant has been developing informational materials such as an identification card and a fact sheet about the round goby. Both agencies issued press releases regarding the discoveries.

Future needs for round goby management - 1996

- Distribute round goby identification cards as part of the ongoing exotic species public awareness activities in the state.
- Include round goby in the state management plan being prepared for ruffe and other non-indigenous fish species.

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Management of Eurasian Swine

1995 Highlights

- In 1995, there were no changes to the restricted species statutes that pertain to Eurasian swine. It seems clear that the state legislature is satisfied with the prohibition on Eurasian swine herds in the state, except for the six registered herds that are grand fathered by legislation passed in 1993.

- At least two reports of free roaming Eurasian swine were made to the DNR in 1995. A single hog with tusks was reported near Sherburne Nat'l Wildlife Refuge.

- Also, seven Eurasian swine were discovered in a potato warehouse. These animals had been imported from Texas and were to be released into the wild for hunting purposes in the East Grand Forks area. A conservation officer ordered the illegal herd destroyed before any were released.

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. The 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;

- authorized the state to issue permits to possess 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.

Inventory of Eurasian swine - 1995

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 parentage of Eurasian swine. Therefore, it is difficult to determine if swine herds in Minnesota are Eurasian or domestic *(Sus scofa domesticus)*.

Management in other states

The MDA survey conducted in 1993 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 these items as identified in the Wild Hog Report - February 1994.

Future needs for Eurasian swine management - 1996

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

Appendix A - Minnesota Statutes Regarding Exotic Species

Compiled by the Minnesota Department of Natural Resources - Exotic Species Program
(Note: Exotic species rules are not included)

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.
© "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.
© 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.

M.S.18.316 DEFINITIONS.

Subdivision 1. **Applicability.** The definitions in this section apply to this section and section 18.317.

Subd. 2 **Ecologically harmful exotic species.** "Ecologically harmful exotic species" has the meaning given in section 84.967.

Subd. 3. **Undesirable exotic species.** "Undesirable exotic species" means ecologically harmful exotic species that have been determined by the commissioner of natural resources to pose a substantial threat to native species in this state.

Subd. 4. **Watercraft.** "Watercraft" means any contrivance used or designed for navigation on water and includes seaplanes.

Subd. 5. **Water milfoil.** "Water milfoil" means Eurasian water milfoil, myriophyllum spicatum.

Subd. 6. **Waters of the state.** "Waters of the state" has the meaning given in section 103G.005, subdivision 17.

Subd. 7. **Zebra mussels.** "Zebra mussels" means a species of the genus Dreissena.

History: *1995 fss c 1 s 2.*

M.S. 18.317 UNDESIRABLE EXOTIC SPECIES.

Subd.1. **Transportation prohibited.** Except as provided in subdivision 2, a person may not transport water milfoil, zebra mussels, or undesirable exotic species on a road or highway, as defined in section 160.02, subdivision 7, or on forest roads.

Subd.1a. **Placement Prohibited**. A person may not place undesirable exotic species in public waters within the state.

Subd. 2. **Exception.** Except as otherwise prohibited by law, a person may transport water milfoil or undesirable exotic species for disposal as part of a harvest or control activity conducted under a permit or as specified by the commissioner.

Subd. 3. **Launching of watercraft with water milfoil or undesirable species prohibited.**

(a) A person may not place a trailer or launch a watercraft into waters of the state if the trailer or watercraft has attached to it water milfoil, zebra mussels, or other undesirable exotic species. A conservation officer or other licensed peace officer may order the removal of water milfoil, zebra mussels, or other undesirable exotic species from a trailer or watercraft before the trailer or watercraft is placed or launched into waters of the state.

(b) A commercial harvester shall clean aquatic plant harvesting equipment of all aquatic vegetation at a suitable location before launching the equipment in another body of water.

Subd. 3a. **Inspection of Watercraft and Equipment**. (a) Watercraft and associated equipment including weed harvesters, that are removed from any waters of the state that the commissioner of natural resources identifies as being contaminated with Eurasian water milfoil, zebra mussels, or other undesirable exotic aquatic plants and wild animals identified by the commissioner of natural resources, shall be randomly inspected between May 1 and October 15 for a minimum of 10,000 hours by personnel authorized by the commissioner of natural resources. Beginning in calendar year 1994, a minimum of 20,000 hours of random inspections must be conducted per year.

Subd. 4. **Enforcement.** This section may be enforced by conservation officers under sections 97A.205, 97A.211, and 97A.221, subdivision 1, paragraph (a), clause (1), and by other licensed peace officers.

Subd. 5. **Penalty.** A person who violates subdivision 1, 1a, 3, or 3a is guilty of a misdemeanor. A person who refuses to obey the order of a peace officer or conservation officer to remove water milfoil, zebra mussels, or other undesirable exotic species from a trailer or watercraft is guilty of a misdemeanor.

History: *1990 c 391 art 10 s 3; 1990 c 559 s 1; 1992 c 594 s 1-6; 1993 c 235 s 1; 1994 c 623 art 1 s 1-7; 1995 fss c 1 s 3.*

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

ECOLOGICALLY HARMFUL SPECIES

M.S. 84.966 CONTROL OF PURPLE LOOSESTRIFE:

Subd. 1. **Definition:** For the purpose of this section, "purple loosestrife" means Lythrum salicaria, Lythrum virgatum, or combinations thereof.

Subd. 2. **Establishment of Control Program:**

The commissioner of natural resources shall coordinate a control program to curb the growth of purple loosestrife. The commissioners of agriculture and transportation must aid and corporate with the commissioner of natural resources to establish, implement and enforce the control program.

History: *1987 c 404 s 107; 1988 c 690 art 1 s 21; 1994 c 623 art 1 s 10.*

M.S. 84.967 ECOLOGICALLY HARMFUL SPECIES; DEFINITIONS.

Subdivision 1. **Scope.** For the purposes of sections 84.967 to 84.9692, the following terms have the meanings given them.

Subd. 2. **Ecologically Harmful Exotic Species.** "Ecologically harmful exotic species" means non-native aquatic plants or wild animals that can naturalize, have high propagation potential, are highly competitive for limiting factors, and cause or may cause displacement of, or otherwise threaten, native plants or native animals in their natural communities.

Subd. 3. **Limited Infestation of Eurasian Watermilfoil.** "Limited infestation of Eurasian water milfoil" or "limited infestation" means an infestation of Eurasian watermilfoil that occupies less than 20 percent of the littoral area of a waterbody up to a maximum of 75 acres, excluding water bodies where mechanical harvesting is used to manage Eurasian watermilfoil or where no Eurasian watermilfoil control is planned.

History: *1991 c 241 s 1; 1991 c 254 art 2 s 9; 1994 c 623 art 1 s 11.*

M.S. 84.968 ECOLOGICALLY HARMFUL SPECIES: MANAGEMENT PLAN; REPORT

Subdivision 1. **Management Plan**. (a) By January 1, 1993, a long-term statewide ecologically harmful exotic species management plan must be prepared by the commission of natural resources and address the following:

(1) coordinated detection and prevention of accidental introduction;

(2) coordinated dissemination of information about ecologically harmful exotic species among resource management agencies and organizations;

(3) a coordinated public awareness campaign regarding ecologically harmful exotic animals and aquatic plants;

(4) a process for the commissioner to identify and list appropriate or certain ecologically harmful exotic species as undesirable exotic species that must not be sold, propagated, possessed, or transported except under permit;

(5) coordination of control and eradication of ecologically harmful exotic species on lands and public waters; and

(6) develop a list of exotic wild animal species intended for nonagricultural purposes, or propagation for release by state agencies or the private sector.

(b) The plan prepared under paragraph (a) must include containment strategies that include:

(1) participation by lake associations, local citizen groups, and local units of government in the development and implementation of lake management plans;

(2) a reasonable and workable inspection requirement for boats and equipment participating in organized events on the waters of the state.

(3) allowing access points infested with ecologically harmful exotic species to be closed, for not more than a total of seven days during the open water season, for control or eradication purposes, and requiring posting of signs

(4) provisions for reasonable weed-free maintenance of public accesses to infested waters; and

(5) notice to travelers of the penalties for violations of laws relating to ecologically harmful exotic species.

Subd. 2. **Report.** The commissioner of natural resources shall be January 1 each year submit a report on ecologically 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, eradication, inspections, and research;

(2) an analysis of the effectiveness of management activities conducted in the state,
including chemical eradication, 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 by species;

(6) an estimate of future management needs.

History: *1991 c 241 s 2; 1991 c 254 art 2 s 10; 1992 c 594 s 7; 1994 c 623 art 1 s 12; 1995 fss c 1 s 9.*

M.S. 84.969 COORDINATING PROGRAM, GRANTS, AND REGIONAL COOPERATION
Subd. 1. **Coordinating Program.** The commissioner of natural resources shall establish a statewide coordinating program to prevent and curb the spread of ecologically harmful exotic animals and aquatic plants.
Subd. 2. **Grants.** The coordinating program created in subdivision 1 may accept gifts, donations, and grants to accomplish its duties and must seek available federal grants through the federal Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. A portion of these funds shall be used to implement the plan under section 10.
Subd. 3. **Regional Cooperation.** The governor may cooperate individually and regionally, with other state governors in the midwest for the purposes of ecologically harmful exotic species management and control.
History: *1991 c 241 s 3; 1991 c 254 art 2 s 11.*

M.S. 84.9691 RULEMAKING AND PERMITS.
Subdivision 1. **Rules.** (a) The commissioner of natural resources may adopt emergency and permanent rules restricting the introduction, propagation, use, possession, and spread of ecologically harmful exotic species in the state, as outlined in section 84.967.
(b) The commissioner shall adopt rules to identify bodies of water with limited infestation of Eurasian watermilfoil. The areas that are infested, and where control is planned, shall be marked and prohibited for use.
© A violation of a rule adopted under this section is a misdemeanor.
Subd. 2. **Permits.** The commissioner may issue permits regulating the propagation, possession, taking, or transportation of undesirable exotic species for disposal, research, education, or control purposes. The commissioner may place conditions on the permit and may deny, modify, suspend, or revoke a permit.
History: *1991 c 241 s 4; 1991 c 254 art 2 s 12; 1992 c 594 s 8; 1994 c 623 art 1 13; 1994 c 636 art 2 s 1; 1995 fss c 1 s 10.*

M.S. 84.9692 CIVIL CITATIONS AND PENALTIES.
Subdivision 1. **Authority to issue.** After appropriate training, conservation officers, peace officers, and other staff designated by the commissioner may issue warnings or citations to persons who:
(1) unlawfully transport water milfoil or undesirable exotic species on a public road;
(2) place a trailer or launch a watercraft with undesirable exotic species attached into waters of the state;

(3) operate a watercraft in a marked Eurasian water milfoil limited infestation area; or
(4) damage, remove, or sink a buoy marking a Eurasian water milfoil infestation area.
Subd. 1a. **Definitions.** For purposes of this section, "undesirable exotic species," "water milfoil," "watercraft," "waters of the state," and "zebra mussels" have the meanings given them in section 18.317.

Subd. 2. **Penalty Amount.** A citation issued under this section may impose up to the following penalty amounts:
(1) $50 for transporting visible water milfoil on a public road;
(2) $100 for transporting visible zebra mussels, live ruffe, or live rusty crayfish on a public road;
(3) for attempting to place or placing a watercraft, trailer, or plant harvesting equipment with visible zebra mussels attached into waters of the state not identified by the commissioner as infested with zebra mussels, $500 for the first offense and $1,000 for a second or subsequent offense;
(4) $100 for operating a watercraft in a marked Eurasian water milfoil limited infestation area other than as provided by law;
(6) $100 for intentionally damaging, moving, removing, or sinking a milfoil buoy; or
(7) $200 for attempting to place or placing a watercraft, trailer, or plant harvesting equipment with visible water milfoil attached into waters of the state.
Subd. 3. **Payment of Penalty.** If not appealed under subdivision 4, civil penalties are payable to the commissioner no later than 30 days after issuance. Fines collected under this section must be credited to the water recreation account.
Subd. 4. **Appeals.** Citations may be appealed under the procedures in section 116.072, subdivision 6, if the person 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.
Subd. 5. **Enforcement of Field Citations.** Field citations may be enforced under section 18.317.
Subd. 6. **Cumulative Remedy.** The authority of conservation officers to issue field 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.
History: *1993 c 235 s 2; 1994 c 623 art 1 s 14,15; 1995 fss c 1 s 11-13.*

LICENSES

M.S. 86B.401 WATERCRAFT LICENSES.

Subd. 11. **Suspension for not removing water milfoil or other undesirable exotic species.** (a) The commissioner, after notice and an opportunity for hearing, may suspend for a period of not more than one year the license of a watercraft if the owner or person in control of the watercraft or its trailer refuses to comply with an inspection order of a conservation officer or other licensed peace officer or an order to remove water milfoil, zebra mussels, or undesirable exotic species from the watercraft or its trailer as provided in section 18.317, subdivision 3.
(b) For purposes of this subdivision, "undesirable exotic species," "water milfoil," and "zebra mussels" have the meanings given in section 18.317.
History: *1990 c 391 art 9 s 21; 1990 c 559 s 2; 1991 c 291 art 8 s 2; 1992 c 594 s 9; 1993 c 375 art 1 s 2; 1994 c 623 art 1 s 19; 1995 fss c 1 s 14.*

M.S. 86B.415 LICENSE FEES.

Subd. 7. **Watercraft surcharge.** A $5 surcharge is placed on each watercraft license under subdivisions 1 to 5, for control, public awareness, law enforcement, monitoring, and research of nuisance aquatic exotic species such as zebra mussel, purple loosestrife and Eurasian water milfoil in public waters and public wetlands.
History: *1990 c 391 art 9 s 24; 1991 c 199 art 1 s 12; 1991 c 254 art 2 s 19; 1992 c 594 s 10; 1993 c 235 s 3; 1995 c 220 s.*

HARVEST AND CONTROL OF AQUATIC PLANTS

103G.615 PERMITS TO HARVEST OR DESTROY AQUATIC PLANTS.

Subd.1. **Authorization.** (a) The commissioner may issue permits, with or without a fee, to:
(1) gather or harvest aquatic plants, or plant parts, other than wild rice from public waters;
(2) transplant aquatic plants into public waters;
(3) destroy harmful or undesirable aquatic vegetation or organisms in public waters under prescribed conditions to protect the waters, desirable species of fish, vegetation, other forms of aquatic life, and the public.
(b) Application for a permit must be accompanied by a permit fee, if required.
Subd. 2. **Fees** (a) The commissioner shall establish a fee schedule for permits to harvest aquatic plants other than wild rice, by order, after holding a public hearing. The fees may not exceed $200 per permit based upon the cost of receiving, processing, analyzing, and issuing the permit, and additional costs incurred after the application to inspect and monitor the activities by the permit.
(b) The fee for a permit for chemical treatment of rooted aquatic vegetation may not exceed $20 for each contiguous parcel of shoreline owned by an owner. This fee may not be charged for permits issued in connection with lakewide Eurasian water milfoil control programs.
© A fee may not be charged to the state or a federal government agency applying for a permit.
(d) The money received for the permits under this subdivision shall be deposited in the treasury and credited to the game and fish fund.
Subd 3. **Permit standards.** The commissioner shall, by order, prescribe standards to issue and deny permits under subdivision 2. The standards must ensure that aquatic plant control is consistent with shoreland conservation ordinances, lake management plans and programs, and wild and scenic river plans.
History: *1990 c 391 art 7 s 62; 1992 c 462 s 18; 1993 c 235 s 4.*

103G.617 EURASIAN WATER MILFOIL EDUCATION AND MANAGEMENT.

Subd. 1. **Definition.** For the purposes of this section, "Eurasian water milfoil" means myriophyllum spicatum.
Subd. 2. **Inventory.** The commissioner shall inventory and monitor the growth of Eurasian water milfoil on lakes in the state. The commissioner may use volunteers to aid in the inventory effort.
Subd. 3. **Education.** The commissioner shall publish and distribute informational materials to lakeshore owners and boaters on the control problems of Eurasian water milfoil.
Subd. 4. **Management.** The commissioner shall coordinate a control program to manage the growth of Eurasian water milfoil with appropriate local units of government, special purpose districts, and lakeshore associations. Technical assistance may be provided by the commissioner upon request.
Subd. 5. **Research.** The commissioner shall initiate cooperative research with the University of Minnesota and other public and private research facilities to study the use of nonchemical methods, including biological control agents, for control of Eurasian water milfoil.
History: *1990 c 391 art 7 s 63; 1993 c 235 s 5.*

103G.625 MUNICIPAL CONTROL OF AQUATIC VEGETATION AND ORGANISMS.

Subdivision 1. **Authority.** The governing body of a municipality or town may expend funds for the control or destruction of harmful or undesirable aquatic vegetation or organisms in public waters and may cooperate with other governing bodies and landowners in the control or destruction.

Subd. 2. **Permit required.** The control or destruction of the aquatic vegetation or organisms may not be started unless a permit has been obtained from the commissioner under section 103G.615 and the work is done in accordance with the terms and conditions of the permit.

Subd.3. **Funding.** (a) The governing body of a municipality or town may use any available funds and may levy a tax not to exceed the lesser of (1) 0.01596 percent of taxable market value, or (2) 50 cents per capita, to implement this section.

(b) To provide funds in advance of collection of the tax levies, the governing body may, at any time after the tax has been levied and certified to the county auditor for collection, issue certificates of indebtedness in anticipation of the collection and payment of the tax. The total amount of the certificates, including principal and interest, may not exceed 90 percent of the amount of the levy and must become payable from the proceeds of the levy not later than two years from the date of issuance. The certificates shall be issued on terms and conditions as the governing body may determine and sold as provided in section 475.60.

© If the governing body determines that an emergency exists, it may make appropriations from the proceeds of the certificates for authorized purposes without complying with statutory or charter provisions requiring that expenditures be based on a prior budget authorization or other budgeting requirement.

(d) The proceeds of a tax levied or an issue of certificates of indebtedness must be deposited in a separate fund and expended only for purposes authorized by this section. If a disbursement is not made from the fund for a period of five years, money remaining in the fund may be transferred to the general fund.

History: *1990 c 391 art 7 s 65; 1994 c 505 art 3 s 3.*

SESSION LAWS

1991 SESSION LAWS - CHAPTER 241 CHECKS OF TRAILERED BOATS.

(a) The Commissioner of natural resources shall establish a two-year program of at least five checks per year of trailered boats. The purpose of the checks is to inspect boats and trailers for Eurasian water milfoil fragments, and to inform and educate the boat owners about Eurasian milfoil and other exotic species and how to prevent their spread.

(b) The commissioner shall assess the effectiveness of the program established in paragraph (a), keep records on the occurrence of Eurasian water milfoil fragments or other exotic species, and report to the legislature by January 1, 1993.

1992 SESSION LAWS

Biological Control of Eurasian Water Milfoil

160,000

This appropriation is to the commissioner of natural resources for a research program leading to biological control of Eurasian water milfoil.

$166,000 for the fiscal year ending June 30, 1992 and 166,000 for the fiscal year ending June 30, 1993, are appropriated to the commissioner of natural resources from the water recreation account for control, public awareness, law enforcement, monitoring, and research of exotic species such as zebra mussel, purple loosestrife and Eurasian water milfoil in public waters and public wetlands. Any unencumbered balance in the first year does not cancel and is available for the second year. (effective the day following enactment)

$219,000 is appropriated from the water recreation account in the natural resources fund to the commissioner of natural resources for control, public awareness, law enforcement, monitoring, and research of nuisance exotic species in public waters. Of this amount, $80,000 may be used to conduct access inspections under section 5.

1993 SESSION LAWS

CHAPTER 235

Management of Eurasian water milfoil in White Bear lake.

By May 31, 1993, the department of natural resources shall recommend appropriate management methods for the control of Eurasian water milfoil in White Bear Lake to be implemented by the White Bear Lake conservation district in cooperation with local units of government, lake associations, and other local citizen groups.

Appropriation.

$347,000 in fiscal year 1994 and $448,000 in fiscal year 1995 are appropriated from the water recreation account in the natural resources fund to the commissioner of natural resources for control, public awareness, law enforcement, monitoring and research on nuisance aquatic exotic species in public waters and wetlands.

CHAPTER 172, Article 1., Sec. 14, Subd. 12,

This appropriation is from the trust fund to the commissioner of natural resources to research biological control for purple loosestrife and Eurasian watermilfoil. The purple loosestrife research must be done in cooperation with the commissioner of agriculture. $100,000 is for the propagation, release, and evaluation of insects for purple loosestrife control; $50,000 is for the development of mycoherbicides to control purple loosestrife; $200,000 is for evaluation of biocontrol agents for Eurasian watermilfoil fungi and insects; and $50,000 is to research the biology of Eurasian watermilfoil. The $250,000 for Eurasian watermilfoil must be matched by $200,000 of nonstate funds.

1995 SESSION LAWS

CHAPTER 220, Section 19, Subdivision 13 (a). Biological control of Eurasian water milfoil and purple loosestrife - continuation. $250,000 of this appropriation is from the trust fund and $50,000 is from the future resources fund to the commissioner of natural resources for the second biennium of a five-biennium project to develop biological controls for Eurasian watermilfoil and purple loosestrife. This project must be completed and final products delivered by December 31, 1997, and the appropriation is available until that date.

Appendix B - Selected Minnesota Rules

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" or "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" or "Milfoil Area" must appear on the sign in at least two-inch high black letters.

Appendix C - Proposed Ecologically Harmful Exotic Species Permanent Rules

(as published in the State Register on December 26, 1995)

Rules as proposed (all new material)

6216.0100 PURPOSE.
The purpose of parts 6216.0100 to 6216.0600 is to prevent the spread of ecologically harmful exotic species, and undesirable exotic plants and wild animals, into and within the state as authorized by Minnesota Statutes, sections 17.457, 18.316, 18.317, and 84.967 to 84.9692.

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, 17.4985, 18.316, 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 waterbodies identified by the commissioner as having populations of select ecologically harmful exotic species such as zebra mussel, Eurasian water milfoil, ruffe, spiny water flea, or white perch.
Subp. 5. **Littoral area.** "Littoral area" means those areas of a water body 15 feet or less in depth.

6216.0250 UNDESIRABLE EXOTIC SPECIES.
Subpart 1. **Designation.** The species in subparts 2 to 6 are undesirable exotic species because they pose a substantial threat to native species in the state.
Subp. 2. **Aquatic Plants.**
A. Eurasian watermilfoil (*Myriophyllum spicatum*);
B. hydrilla (*Hydrilla verticillata*);
C. European frog-bit (*Hydrocharis morsus-ranae*);
D. flowering rush, (*Botomus umbellatus*);
E. any variety, hybrid, or cultivar of purple loosestrife (*Lythrum salicaria, Lythrum virgatum,* or combinations thereof); and
F. water chestnut (*Trap natans*).
Subp. 3. **Birds.** Mute swan (*Cygnus olor*).
Subp. 4. **Fish.**
A. Grass carp (*Ctenopharyngodon idella*);
B. rudd (*Scardinius erythrophthalmus*);
C. ruffe (*Gymnocephalus cernua*);
D. sea lamprey (*Petromyzon marinus*); and
E. white perch (*Morone americana*).
Subp. 5. **Invertebrates.**
A. Rusty crayfish (*Orconectes rusticus*); and
B. zebra mussel species (all species of the genus *Dreissena*).
Subp. 6. **Mammals.**
A. Asian raccoon dog, also known as finnraccoon (*Nyctereutes procyonoides*);
B. European rabbit (*Oryctolagus cuniculus*); and
C. any strain of nutria (*Mycocastor coypu*).

6216.0300 IDENTIFICATION, NOTICE, AND MARKING OF INFESTED WATERS AND LIMITED INFESTATIONS OF EURASIAN WATER MILFOIL.

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 the infestation at all public accesses to identified waterbodies. At any time the commissioner may identify additional waterbodies or identify those waterbodies which no longer are infested waters.

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

Subp. 3. **Delineation and markers for limited infestations of Eurasian water milfoil.** Areas of infestation of Eurasian water milfoil 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.

6216.0400 RESTRICTED ACTIVITIES ON INFESTED WATERS AND WATERS WITH LIMITED INFESTATIONS OF EURASIAN WATER MILFOIL.

Subpart 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 gillnetting season for the identified waterbody or require that gill nets used in the infested waters not be used in other waterbodies. 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 re-setting those nets in noninfested waters.

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

A. Entry by boaters, anglers, or other water users and their equipment into waters where limited infestations of Eurasian water milfoil have been delineated in accordance with part 6216.300 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 water milfoil have been delineated in accordance with part 6216.300 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.

6216.500 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 waterflea 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 M.S. 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 work permit or water appropriation permit issued by the commissioner, pursuant to M.S. 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 undesirable 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 undesirable exotic species.

D. Fish raised in artificial water basins that have populations of undesirable 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 undesirable exotic species provided it contains the same undesirable exotic species as the source waters.

Subd. 6. **Infested waters diversion or transportation permits.** Applications for permits issued pursuant to this part to divert or transport water from infested waters shall be made on forms obtained from the commissioner and shall contain information as the commissioner may prescribe. The department shall act upon the application within 90 days of receipt. Failure on the part of the department to act upon the permit within the required time shall not be construed as approval of the application. Permits shall state all the conditions and limitations upon which they are based. A permit may be modified at any time by the department.

6216.0600 VIOLATIONS; CONFISCATIONS.

Unless a different penalty is prescribed, a violation of parts 6216.0100 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 department's discretion, destroy it. Where infested water is being appropriated, or diverted or transported without a permit, or otherwise contrary to the provisions of parts 6216.900 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 D - Access sites used in the boat wash feasibility trials conducted in 1995 by the Minnesota DNR Exotic Species Program.

Site	Water Body
County Access	White Bear Lake
Crystal	Crystal Lake
Hendrickson	Lake Minnetonka
Spring Park	Lake Minnetonka
Hidden Falls	Mississippi River
Hastings Jaycee Municipal	Mississippi River

Appendix E - Survey form given to boaters agreeing to have their boats washed in boat wash feasibility trials conducted in 1995 by the DNR Exotic Species Program.

BOAT WASH SURVEY

1. From what you understand right now, is boat washing an effective means of preventing the spread of harmful exotic species such as zebra mussels or Eurasian watermilfoil?

   _____ YES _____ NO _____ NOT SURE

2. If you think that boat washing is effective in preventing the spread of exotics, would you agree that. . . (Check all that you agree with)

   ___ boat washing at public accesses on infested waters should be mandatory
   ___ boat washing at public and private accesses on infested waters should be mandatory
   ___ boat washing at all accesses on infested waters should be encouraged, but voluntary
   ___ boat washing is not practical and should not be considered
   ___ other _____

3. Would you be willing to pay to have your boat washed to try and reduce the potential spread of exotic species?

   _____ YES _____ NO _____ NOT SURE

4. **If you answered "YES" or "NOT SURE" to the previous question**, what would you consider a reasonable amount to pay to have your boat washed?

___ $1.00-$2.00	___ $ 7.00-$ 8.00	___ $13.00-$14.00
___ $3.00-$4.00	___ $ 9.00-$10.00	___ $15.00-$16.00
___ $5.00-$6.00	___ $11.00-$12.00	___ Other _____

5. What would you consider a reasonable amount of time to have to spend to have your boat washed before leaving a water access?

   ___ 5 minutes
   ___ 10 minutes
   ___ 15 minutes
   ___ up to 30 minutes
   ___ other _____