

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

DIVISION OF ECOLOGICAL SERVICES

STAFF REPORT 42

**Control of Rooted Aquatic Vegetation,
Algae, Leeches, Swimmer's Itch, 2006**

April 2007

**A Summary of Permitted Control Work for Aquatic Vegetation,
Algae, Leeches, Swimmer's Itch, 2006**

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Minnesota Department of Natural Resources

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Executive Summary 2006 Aquatic Plant Management Program

In Minnesota the state is the owner of wild rice and other aquatic vegetation growing in public waters (M.S. 84.091). The Minnesota Department of Natural Resources (DNR) regulates the harvest, transplanting and destruction of aquatic plants in public waters through a permit program. The purpose of the Aquatic Plant Management (APM) permit program is to protect the beneficial functions of aquatic vegetation while allowing riparian property owners to obtain reasonable access to public waters.

Permits/Properties/Fees

The number of public waters where aquatic plant management is permitted has increased gradually from 1953 until 2000. However, from 2003 through 2005 the numbers of lakes with permitted APM activity have remained essentially the same. During this period, there was an average of 898 public waters with permitted APM activity annually. In 2006 the number of public waters with permitted APM activity rose to 953.

The increase in numbers of permits issued from 2003-2005 has averaged nearly 350 per year. In 2006, there were 438 more permits issued than in 2005. The Central Region which includes the seven county metropolitan area, typically issues more permits for more properties than any other DNR regional office. In 2006, the Little Falls Office (Central Region 3B) at the northern part of the Central Region issued 63 more permits to 106 more properties than were issued in 2005. The St. Paul office (3A) of the Central Region issued 41 fewer permits and there were 104 fewer properties in 2006.

The numbers of aquatic plant management permits increased in all other DNR Regions. In the Northwest Region, there were 187 more permits and 242 more properties in 2006 than in 2005. The Northeast Region issued 181 more permits in 2006 than in 2005 to 287 more properties. In the South Region, the number of permits increased by 48 and the number of permitted properties increased by 78 properties. The numbers of properties involved in the APM program statewide increased by 609 in 2006.

Permit revenue increased from approximately \$270,500 in 2005 to nearly 288,603.36 in 2006. The average fee per property was a little over \$24.00 in 2006.

AUAPCD

The Department first began issuing permits for Automated Untended Aquatic Plant Control Device's (AUAPCD's) in 1997. Now, permits for AUAPCD make up more than half of the active Aquatic Plant Management permits. The number of single season permits issued in 2006 is up by 23 statewide over 2005. The number of single year permits issued has increased annually since 1998. The 2005 total of 1081 is more than double the number of 1-year permits issued in 1998. After a decline in the number of three-year duration permits issued over the previous three years, three-year duration permits issued in 2006 increased by 163 over 2005. The three-year permit option is allowed for persons who limit the size of the area of AUAPCD operation to 50 feet alongshore or one half there frontage whichever is less and no more than 2,500 square feet. Persons who obtained a three-year permit in 2006 will not have to reapply again until the year 2009. Some people (164 of those reporting) were permitted to, but did not run their device in 2006. In 2006, about 41% of the permits issued allowed the use of automated aquatic plant control devices like the Crary WeedRoller, the Colman Beach Groomer, Lake Restoration Lake Sweeper and similar home made devices. The remaining 59% of the aquatic plant management permits allowed chemical or other mechanical removal as the method of control. These numbers are nearly identical to the permit distribution among methods in 2005.

Most AUAPCD permits are issued to a single property owner. Although AUAPCD's make up 41% of the permits issued, they only account for about 15% of the total number of properties permitted in 2006. The other 85% of properties were permitted to use other mechanical methods or herbicides for aquatic plant control.

Summary of Aquatic Plant Management permits issued in 2006 for harvesting, herbicide use and channels and all AUAPCD's.

Region	Issued in 2006		All	AUAPCD				All
	Harvest Chemical	Channel*	Active Channel*	Issued 2006		Issued 2005	Issued 2004	Active Permits
				1 year	3 year	3 year	3 year	
Reg 1	476	74	-	647	294	196	215	1352
Reg 2A	88	11	-	0	4	6	5	15
Reg 2B	615	20	-	208	227	166	175	776
Reg 3A	741	11	-	78	35	27	13	153
Reg 3B	342	6	-	135	71	74	93	373
Reg 4	158	13	-	36	7	6	22	71
All	2420	135	637	1104	638	475	523	5932

Summary of all APM permits issued, fees collected, numbers of lakes properties treated and harvested in 2006.

Region	All Permits Issued in 2006	All Lakes*	Fees**	Properties Permitted in 2006	Avg. Fee /Property	All Reporting ***		
						Harvest Work	Chemical Treatment	Both
Reg 1	1491	272	\$53,250.00	1595	\$33.36	100	219	22
Reg 2A	103	49		323		8	38	1
Reg 2B	1070	146		1646		54	460	23
Reg 2 total			\$50,949.17	1969	\$25.88			
Reg 3A	865	270		5240		35	473	10
Reg 3B	554	130		2058		22	206	7
Reg 3 total			\$12,576.60	7298	\$23.54			
Reg 4	214	86		1029	\$12.22	26	83	3
2006 TOTAL	4297	953	\$288,603.36	11892	\$24.27	245	1479	66
2005 TOTAL	3859	894	\$270,496.32	11283	\$24.58	213	1409	59
CHANGE	438	59	\$18,107.04	609	-\$0.31	32	70	7

* Includes all lakes, ponds, ditches and streams listed on APM permits for 2006.

** Fee totals provided by Carol Rushenberg.

*** Data tabulated from 961 surveys returned.

INTRODUCTION

Value of Aquatic Plants

Aquatic plants are essential components of most freshwater ecosystems. In many lakes, plants are the base of the aquatic food chain. The habitat aquatic plants provide in the shallow near-shore areas is important to both aquatic and terrestrial animals. They also serve important functional roles in lakes by stabilizing the lake bottom, cycling nutrients, and preventing shoreline erosion.

Many of Minnesota's most sought-after fish species depend heavily on aquatic vegetation throughout their life histories. Yellow perch, northern pike, muskellunge, pan-fish, and bass all depend on aquatic vegetation to provide food, spawning habitat, and nursery areas. Juvenile fish of most species feed on small crustaceans and insects that are abundant in stands of aquatic vegetation. Even species that may not require vegetation for spawning depend on the cover and forage found in aquatic vegetation.

Many species of wildlife are dependent on aquatic plants for food and nesting sites. Ducks eat the seeds and tubers produced by various water plants. Other aquatic plants, which are not eaten directly by waterfowl, support many insects and other aquatic invertebrates that are important sources of food for migratory birds and their young. Ducks have been known to alter migration patterns in response to food availability. Emergent aquatic vegetation provides nesting cover for a variety of waterfowl, wading birds, shorebirds and songbirds. The reproductive success of ducks that nest near lakes is closely tied to available aquatic plants and the cover it provides to hide young birds from predators.

The muskrat, an important furbearer, is almost entirely dependent on aquatic vegetation for food and shelter. Minnesota's largest mammal, the moose, also relies heavily on aquatic vegetation for food.

The distribution of many amphibians and reptiles is directly linked to the vegetation structure of aquatic habitats. Species preference of particular habitat types is related to food availability, types of escape cover and specific microclimates. Emergent, and submerged vegetation, support invertebrate populations that provide an important food source for amphibians and reptiles. During the breeding season some species of frogs call from emergent vegetation at the water's edge and their egg masses are often attached to aquatic plants. Aquatic turtles often eat submerged vegetation, which is an important source of calcium.

Beyond providing food and shelter for fish and wildlife, aquatic vegetation is important in maintaining a stable lake environment. Aquatic vegetation helps maintain water clarity by limiting the availability of nutrients, and preventing suspension of bottom sediments. Aquatic plants limit erosion of shorelines by moderating the effects of wave and ice erosion. A healthy native plant community is also important in preventing the establishment of non-native invasive aquatic plants. In short, aquatic plants serve many important functions for lakes, fish and wildlife. Many of the things that we enjoy most about lakes are directly linked to aquatic vegetation.

The Aquatic Plant Management Program

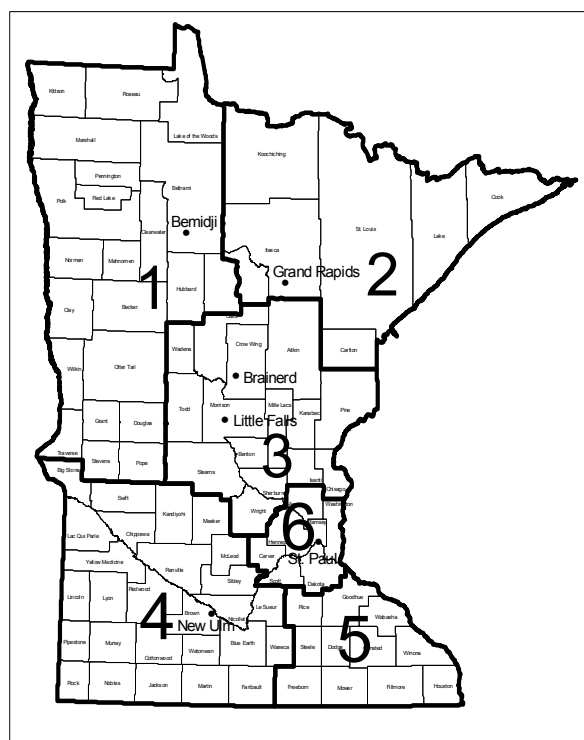
Riparian property owners (lake shore property owners) in Minnesota have a legal right to use and access the lake adjacent to their property. Aquatic vegetation may interfere with a lakeshore homeowner's ability to exercise that right. The purpose of the DNR's Aquatic Plant Management Program is to preserve the functions of aquatic vegetation while allowing the

homeowner the ability to use the lake. Other aquatic organisms can also interfere with the lakeshore property owner's enjoyment of the lake. Swimmer's itch, caused by the immature life stage of a parasite common in waterfowl, can cause significant and sometimes severe discomfort in humans depending upon a person's sensitivity to the organism. Algae (plankton and filamentous) can also create a nuisance and occasionally unhealthy conditions when they become over abundant. Relief from these nuisances may also be sought under an aquatic plant management permit.

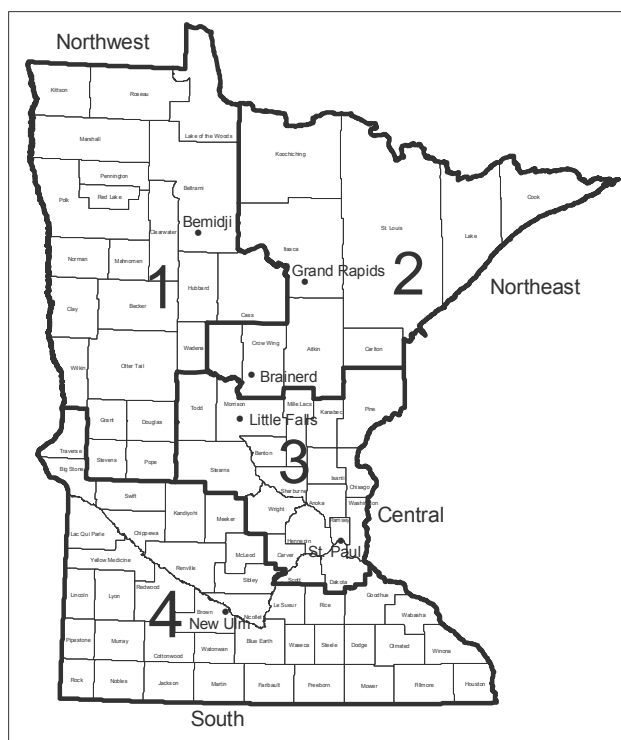
Administrative Regions

In July of 2002 the number of DNR administrative regions was reduced. The previous six region structure was reduced to four administrative regions. The Brainerd Lakes Region, previously Region Three, was divided up between the Northeast Region (Region Two) and the Metro Region (Region Six), now the Central region. The southeastern part of the state, Region Five, was combined with the South Region or Region Four. Aquatic plant management permits were issued as they had been in the six-region structure through the remainder of the 2002 open water season. In 2003 APM permits were issued according to the new regional boundaries.

Pre- July 2002



Post-July 2002-October 2006



The number of staff reviewing APM permit applications increased concurrent with the reduction of DNR regions. The reorganization moved some regional headquarters farther away from the major centers of APM permit activity (Appendix Figure G). The Brainerd DNR Office, now in the Northeast Region, retained an Aquatic Plant Management specialist because the Brainerd Lakes Area is a center of APM permit activity. The Brainerd (2B) area office is responsible for application review for Aitkin, Crow Wing, and southern Cass Counties. Grand Rapids (2A) the location of the Northeast Regional DNR Headquarters is responsible for application review for

Carlton, St. Louis, Lake, Cook, Koochiching, and Itasca Counties. The Central Region added an APM position to the Little Falls Fisheries Office to accommodate the large number of permits previously issued from the Brainerd Office. The Little Falls office (3B) is responsible for application review for Benton, Isanti, Kanabec, Pine, Mille Lacs, Morrison, Sherburne, Stearns, Todd and Wright Counties. The Central Region DNR Headquarters in St. Paul (3A) is responsible for application review for the metropolitan area, Anoka, Carver, Chisago, Dakota, Hennepin, Ramsey, Scott, and Washington Counties. In October of 2006 the Central Region boundaries were expanded to include Goodhue, Wabasha, Olmsted, Winona, Fillmore, and Houston Counties along the Mississippi in Southeastern Minnesota. The new regional structure makes historical comparisons between regions more difficult. However, it is still possible to identify statewide trends and make comparisons between years.

The DNR's, Division of Fish and Wildlife is responsible for the administration of the Aquatic Plant Management Permit Program. Riparian property owners apply for a permit to their Regional Fisheries Manager. The Northwest, Northeast, and Central DNR Regions have Aquatic Plant Management Specialists who make site inspections and review applications for permit. In 2006, an Aquatic Plant Management Specialist was hired for the South Region. This person works out of the New Ulm Regional Fisheries office. Prior to 2006, site inspections and application review in the South Region were the responsibility of the Area Fisheries Supervisors.

The recommendation for the disposition of the permit application (approval, modification or denial) is determined during the review process. This decision often involves a discussion with the lakeshore property owner. When applications for APM permits are received for shallow lakes where waterfowl management is the primary focus, the Aquatic Plant Management Specialist will seek the advice of the Area Wildlife Manager. When applications are modified or denied the applicant may appeal to the Commissioner's Office for review. The purpose of this review is to determine if the permit decision was based upon rule standards. Finally, permit decisions can be appealed to an Administrative Law Judge through the contested case hearing process.

The coordinator of the Aquatic Plant Management Program is in the Division of Ecological Services. This position is the department's contact with commercial aquatic plant harvesters, aquatic herbicide applicators, and the Minnesota Department of Agriculture (MDA). The coordinator provides technical expertise on aquatic plant control methods, and permitting requirements to lakeshore property owners and Department staff. The coordinator works to insure consistent interpretation of the APM rules throughout the Department. This position administers exams, and issues operating permits to commercial aquatic plant harvesters. This person also reviews appeals of permit decisions for the Commissioner. The Program Coordinator maintains current labeling for aquatic plant control products and provides that information to field personnel. The Program Coordinator also prepares an annual report on program activities (this document) and coordinates the development of informational materials and forms provided to riparian property owners asking about aquatic management.

The APM program coordinator supervises staff in the Division of Ecological Services whose job responsibility includes enforcement of aquatic pesticide rules and pesticide label requirements. An Aquatic Pesticide Enforcement Specialist conducts inspections of herbicide applications in public waters to monitor compliance with state and federal pesticide law and respond to reports of pesticide misuse (Appendix Tables E and F). The U.S. Environmental Protection Agency (EPA) partially funds DNR's aquatic pesticide enforcement activities through a grant administered by MDA.

Regulations

Authority for the DNR's aquatic plant management program is found in Minnesota Statutes M.S. 84.091 Subdivision 1, which designates ownership of wild rice and other aquatic vegetation in public waters to the State. M.S. 103G.615 authorizes the Commissioner of the DNR to issue permits to harvest or destroy aquatic plants, establish permit fees, and prescribe standards to issue or deny permits for aquatic plant control. The standards for the issuance of permits to control aquatic vegetation and the permit fee structure are found in MN Rules Chapter 6280. Minnesota Statutes and Rules can be reviewed at the Revisor of Statutes website <http://www.leg.state.mn.us/leg/statutes.asp>.

A permit from the DNR is required to use pesticides in public waters (generally any body of water 2.5 acres or larger within an incorporated city limit, or 10 acres or larger in rural areas), to use an automated aquatic plant control device, and to control emergent vegetation such as cattails, wild rice or bulrush. A riparian property owner may, without a permit, physically remove (cut, pull, or harvest) *submerged* vegetation along one half the individual's lake frontage or 50 feet, whichever is less. The total area may not exceed 2,500 square feet. In addition, a boat channel up to 15 feet wide, and as long as necessary to reach open water, may also be maintained by mechanical means without a permit. If floating leaf vegetation is interfering with riparian owner access a channel, not more than fifteen feet wide, extending to open water, may be mechanically maintained without a permit. The vegetation that is cut or pulled must be removed from the lake and the managed area must remain in the same location each year.

The mechanical control of purple loosestrife, a plant on the Minnesota Department of Agriculture's noxious weed list, does not require a permit from the DNR. However, herbicide control of purple loosestrife below the ordinary high water level on public waters does require a permit. Because of the plant's status as a noxious weed, these permits are issued free of charge.

Beyond the permit requirement, any pesticide used in lakes must be labeled for aquatic use and registered with the United States Environmental Protection Agency. When using an aquatic herbicide all label instructions and precautions must be followed. The permittee must post areas treated with herbicides so that anyone entering the area is informed of the herbicide application. The signs contain the following information: the name of the applicator, the treatment date, the name of the product used, expiration dates of any water use restrictions on swimming, fishing, household, and other uses. The DNR provides these signs to permittees and commercial applicators at no cost. A list of herbicides most commonly used for aquatic plant control and the amount used under permit in Minnesota is found in Appendix A.1 and A.2.

Summary of Aquatic Plant Management Program Activities in 2006

The following is a summary of Aquatic Plant Management Program (APMP) activities in 2006. The data for this report comes from four sources: permittee survey forms (2006 Appendix Table C and D), commercial aquatic applicator and harvester reports, and Aquatic Plant Management (APM) permits. Commercial applicators, harvesters, and riparian property owners who do control work in public waters are required to provide a yearly summary of their APM activity. With this information the past year's activities can be summarized, the control of aquatic vegetation in public waters is monitored, and trends in aquatic plant management are identified.

Survey forms are mailed to permit holders that did their own aquatic plant control work. Prior to 2000, permit holders that hired commercial applicators to perform the control work for them were included in the survey. They were asked to answer only those few questions pertinent to their situation. This often caused confusion and permittees would either not respond or would

send the form to the commercial service for completion. In addition, when commercial applicators do the control work there are usually many customers on a single permit. However, only one of those customers is listed as the permittee, hence you must rely on one individual to provide accurate information for up to 100 or more other people. Since commercial pesticide applicators are required by law to keep detailed records, and their reporting is generally more precise, permit holders who hire a commercial firm are no longer asked to complete a survey form.

Survey forms were sent to all permittees that did their own chemical or mechanical control work. Of the 1,179 surveys mailed 961 (81.5%) were returned. A separate survey was sent to all 1,737 AUAPCD permit recipients, 1,550 (89.2%) were returned.

Permit Issuance

In 2006, a total of 4,297 permits were issued statewide for APM activities, 438 more than in 2005 (Appendix G provides a map of the county by county distribution of permits and permitted properties). These permits were issued for properties on 953 public waters (i.e. lakes, ponds, and streams) in 2006 (Figures 1, 2, and 3). In 2006, there were 1,742 permits issued for the operation of Automated Untended Aquatic Plant Control Devices (AUAPCD). The remaining 2,555 permits were issued to municipalities and lakeshore homeowners for either pesticide use (includes algae and swimmer's itch control) or mechanical control (cutting, pulling, or harvesting) of aquatic vegetation.

Over the last 15 years, the number of public waters where permits are issued has almost doubled. Little increase occurred until 1999 when the number of public waters with permitted APM activity increased sharply (Figures 2 & 3). The number of public waters with permitted APM activity in 2006 was 953, 59 more lakes than in 2005.

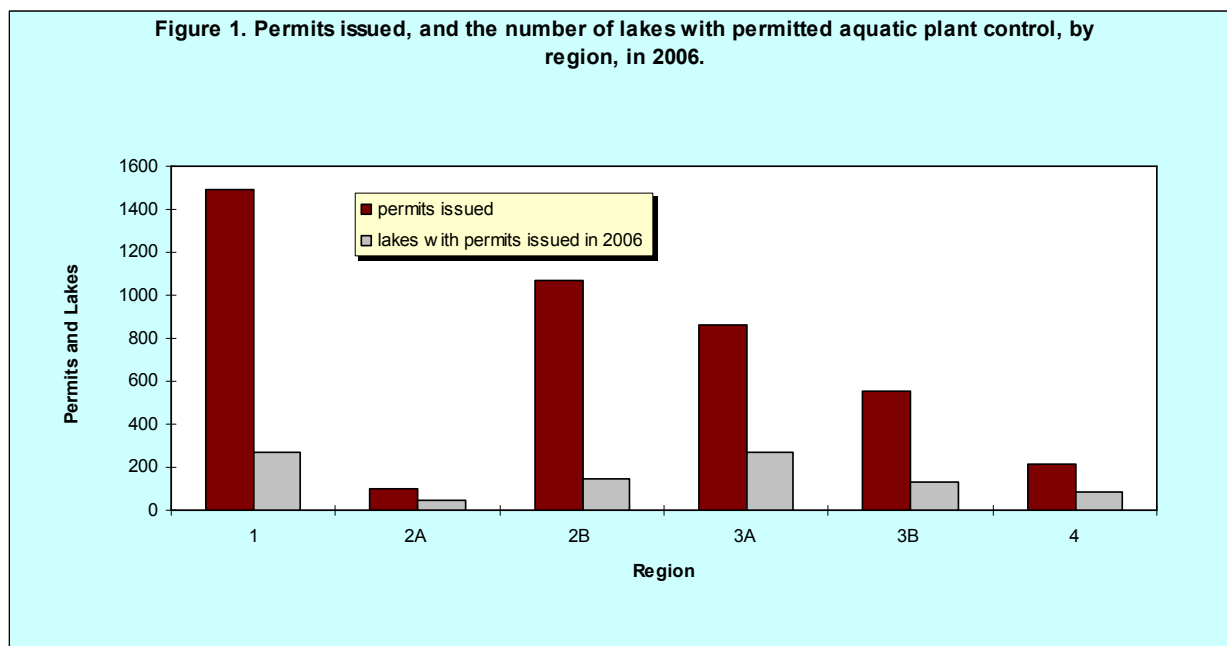


Figure 2. Numbers of permits issued for mechanical and chemical control (excluding AUAPCD) of aquatic vegetation, algae, and swimmer's itch, and numbers of lakes where permits were issued 1992-2006.

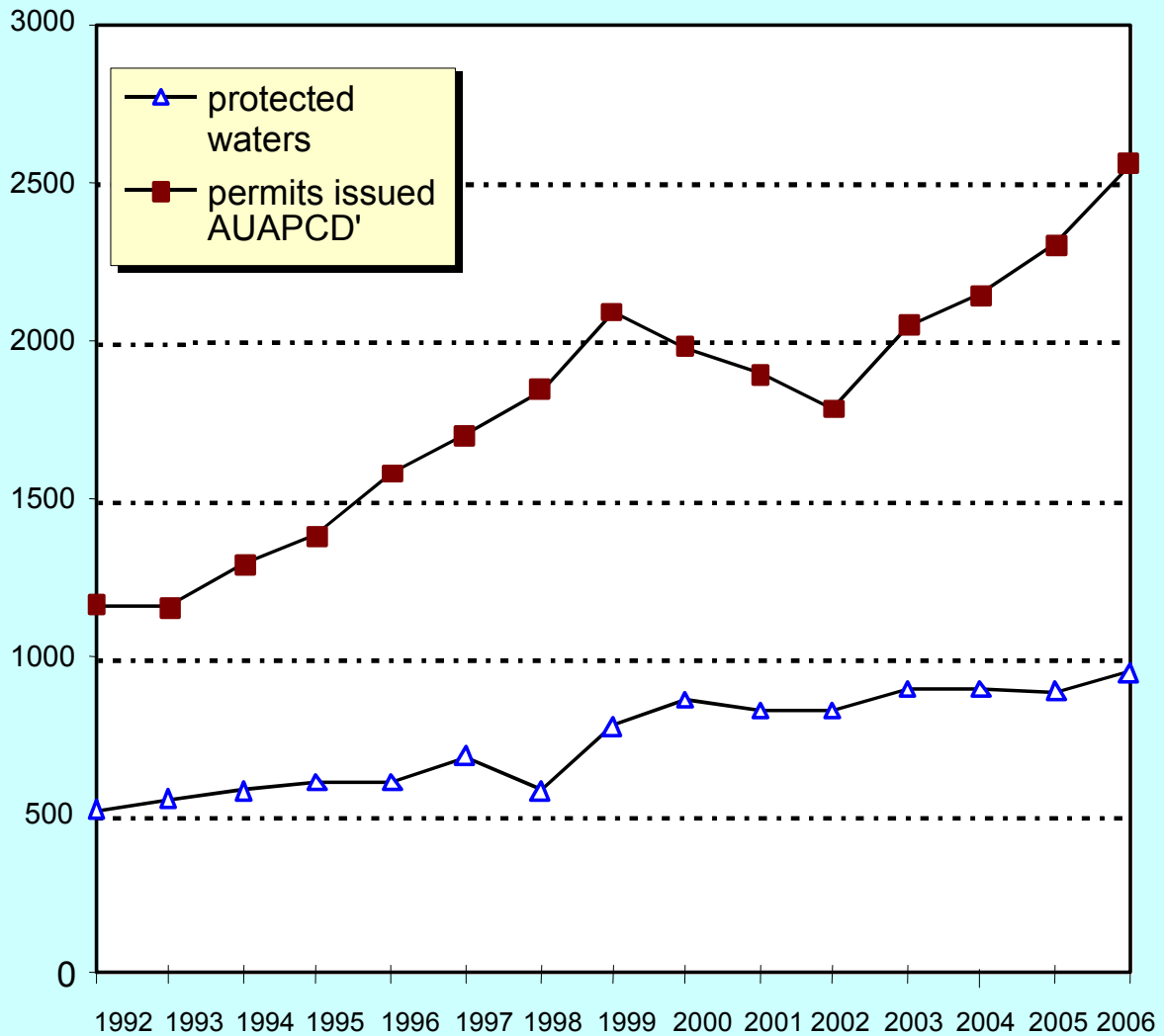
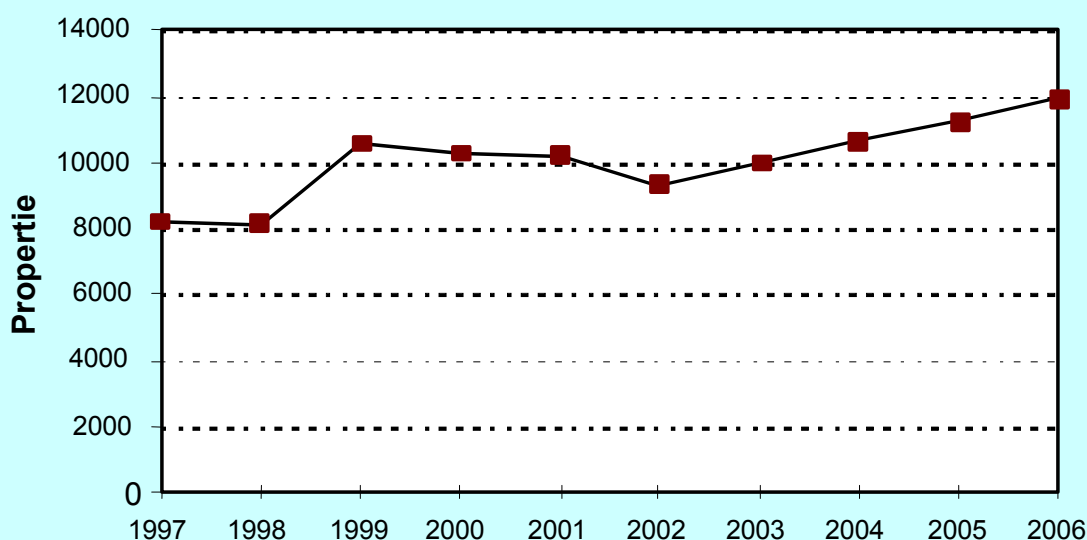


Figure 3. Numbers of riparian properties permitted for APM statewide, 1997-2006.



Aquatic plant management permit issuance increased annually from 1992 until about 1999. Then in the early 2000's the numbers of permits issued decreased and there was a corresponding decrease in the numbers of participating properties. Permit numbers and properties began to increase again in 2003 through 2006. Spring of 2000 was the beginning of several years in a row that were cooler and wetter than normal in the Metro area. Cooler temperatures may have contributed to the decline in lakeshore property owners participating in the Aquatic Plant Management program.

Lakeshore homeowners may apply for an aquatic plant management permit as a group. Group permits are more popular in the Twin Cities metropolitan area than in greater Minnesota (Table 1). Homeowner's on large group permits can benefit from the \$750 cap on permit fees. The individual permit fee begins to decrease at 21 properties. Some permits have more than 100 properties listed on a single permit. In 2006 there were 11,892 properties covered by the 4,297 permits issued.

The statewide average number of properties per permit in 2006 was slightly lower in 2005 at 2.8 properties. The Central Region, which includes the Twin Cities metropolitan area, typically has larger group permits than other areas of the state. In 2006, the Central Region averaged 6.1 properties per permit issued. The Northwest Region averaged just over one property per permit (1.1); the Northeast Region averaged nearly two properties per permit (1.7). The number of permitted properties in the Southern Region in 2005 was (5.7), but decreased to (4.8) properties per permit in 2006.

Table 1. Permits grouped by the number of properties listed (excluding AUAPCD) by Region, 2006.

Region		1	2A	2B	3A	3B	4
Permits/property:	>100	0	0	0	4	1	4
	51-100	0	3	2	12	6	3
	21-50	1	0	5	48	16	2
	11-20	1	0	7	62	20	2
	2-10	4	0	12	115	31	13
	1	1307	74	884	628	422	143

The rules regulating aquatic plant removal from public waters allow for an inspection of the treatment site the first time an application is received or when there are changes requested to previously issued permits. Aquatic plant management specialists and area fisheries staff visit these sites to determine if the standards for permit issuance in APM rules are met prior to issuing a permit for plant removal. This is also an opportunity to determine what kinds of plants and habitat are present in the treatment area. During these inspections, the size of the area may be reduced to protect important habitat based on the observations and professional judgment of the specialist. The number of applications received for shoreline vegetation removal and the numbers of permits that are issued as requested is shown in Table 2.

Table 2. Percent of permits requesting near shore control that are issued as requested by region in 2006.

	Region						
	1	2A	2B	3A	3B	4	Statewide
Number of applications requesting near shore control	1487	76	1013	503	414	154	3647
Permits issued as requested	1148	64	814	367	285	96	2772
% of permits issued as requested	77.1	84.2	80.4	73.0	68.8	62.3	76.0

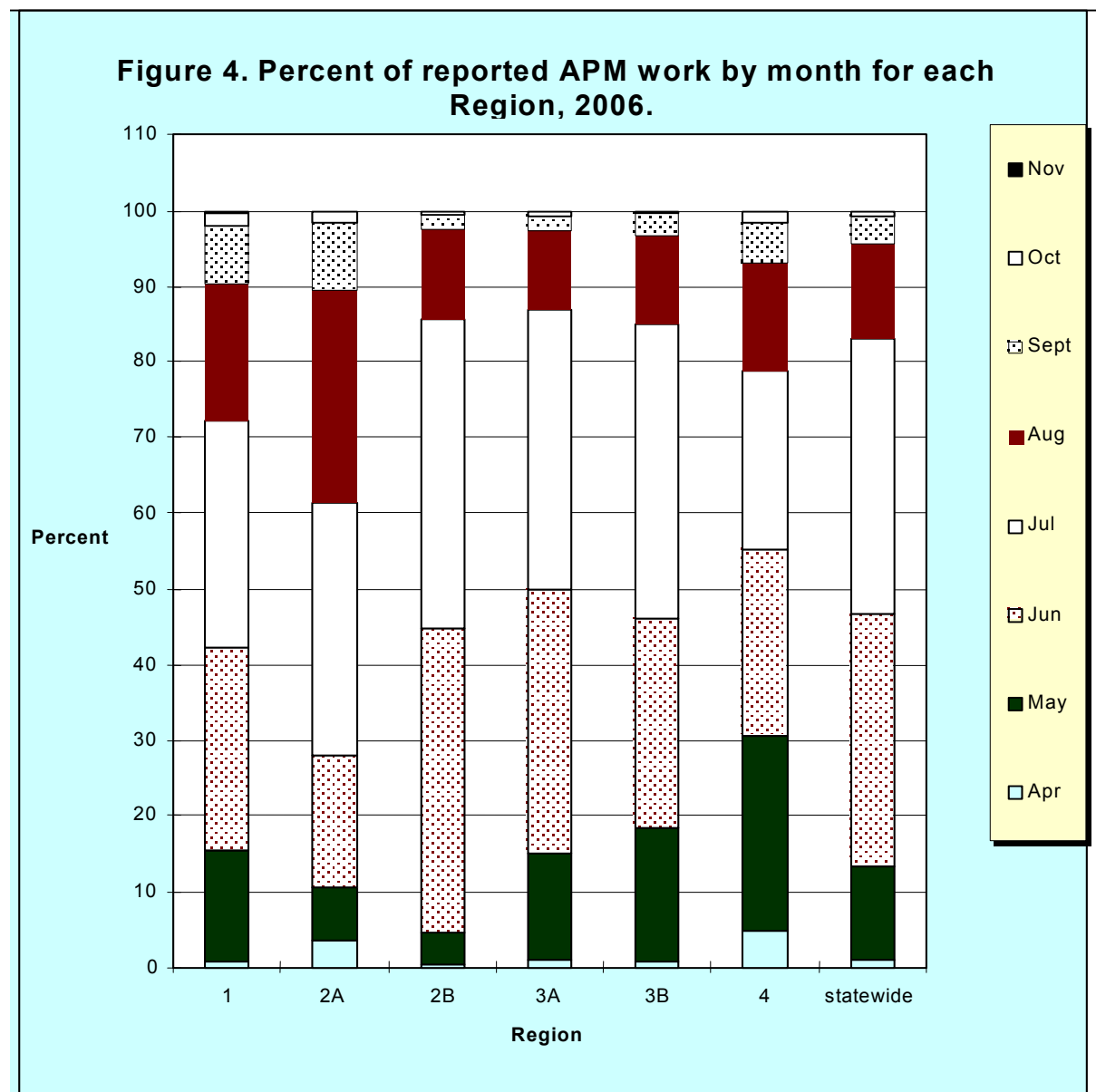
Permit Fees

Permit fees were increased during the 2003 legislative session. People applying for APM permits after August 1, 2003 were required to pay the higher fee. The new fee increased many types of APM permit from \$20.00 per property to \$35.00 per property. The cap on large group permits was increased from \$200 to \$750. All permits in 2006 were issued under the new fee structure.

Revenues in 2006 were \$288,603.36 about \$18,107.04 more than 2005. The average permit fee per property owner in 2005 was \$23.97 in 2006 the average fee per property was \$24.27. There is still economy of scale for large group permits, hence the statewide average cost per property was a little above \$24.00 in 2006, and still close to \$11.00 less than the cost of an individual permit under the new fee structure.

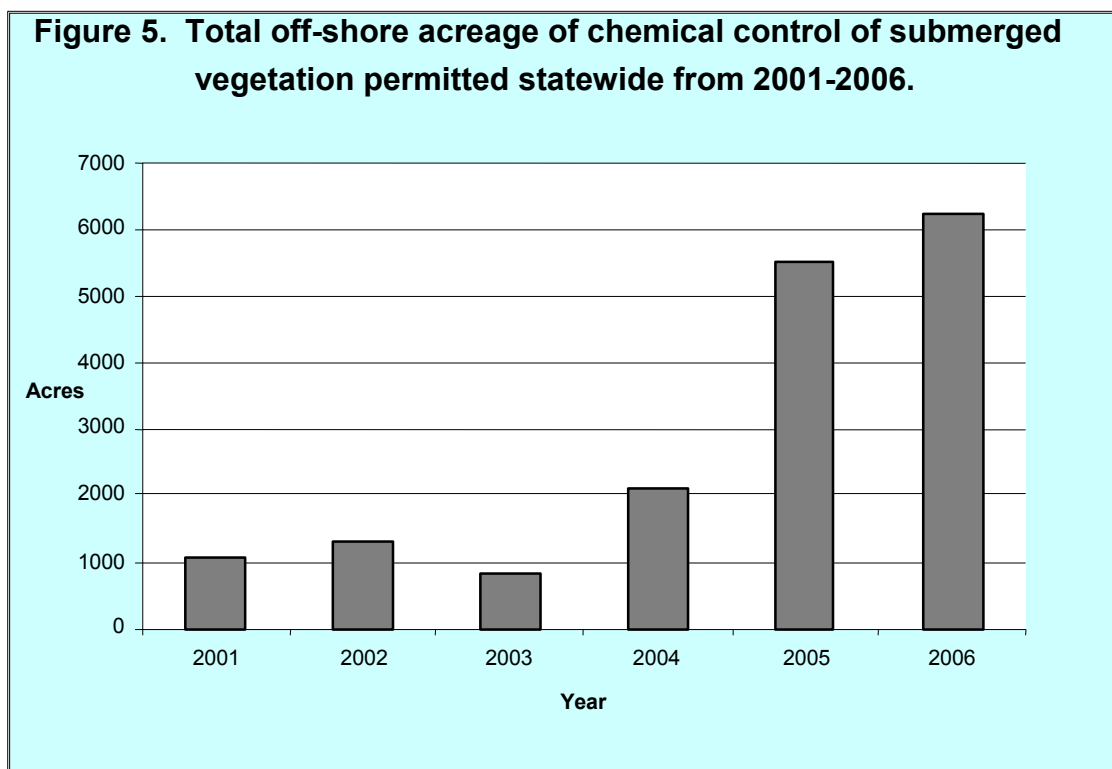
Timing of Treatment

Permits are issued for the open water season, generally from May through September 1. However, aquatic plant control can begin as early as January and extend through November. In 2006, about 82% of the permitted work, reported statewide, was completed in June, July, and August (Figure 4). Because most aquatic plant control in Minnesota is recreationally motivated this pattern has been consistent over time.



Acres of aquatic plant control permitted

The number of acres permitted for submerged aquatic plant control (both chemical and mechanical methods) fluctuates annually and has increased sharply in recent years. This may mean that aquatic plant control is highly variable depending on the season. One contributing factor is the offshore control of aquatic vegetation (Figure 5) focused primarily on non-native invasive species. A few large Eurasian watermilfoil and curly-leaf pondweed treatments, can have a significant influence on the total number of acres permitted for treatment. This was evident in 2004 and 2005. In 2004, several lake-wide treatments of curly-leaf pondweed in the Central Region were responsible for the increase in treated acres. These lakes in addition to Lake Benton, a 3000-acre lake in Lincoln County, (South Region), were treated again in 2006 with an aquatic herbicide to manage curly-leaf pondweed. As the interest in managing invasive species increases offshore control work is likely to continue.



Again, in 2006, about 41% of all permits issued for aquatic plant control permitted the use of plant removal with AUAPCD's. Aquatic plant control using herbicides, plant harvesting, and plant removal by hand, accounted for the remaining 59% of the permits issued for aquatic plant management (Figure 6). It is important to remember that a limited amount of mechanical control of submerged and floating leaf vegetation can be done without a permit and a permit is always required when herbicides or automated devices are used for aquatic plant control. The total area permitted statewide for the various methods of near shore aquatic plant removal and the average area permitted per property in 2006 are found in Table 3.

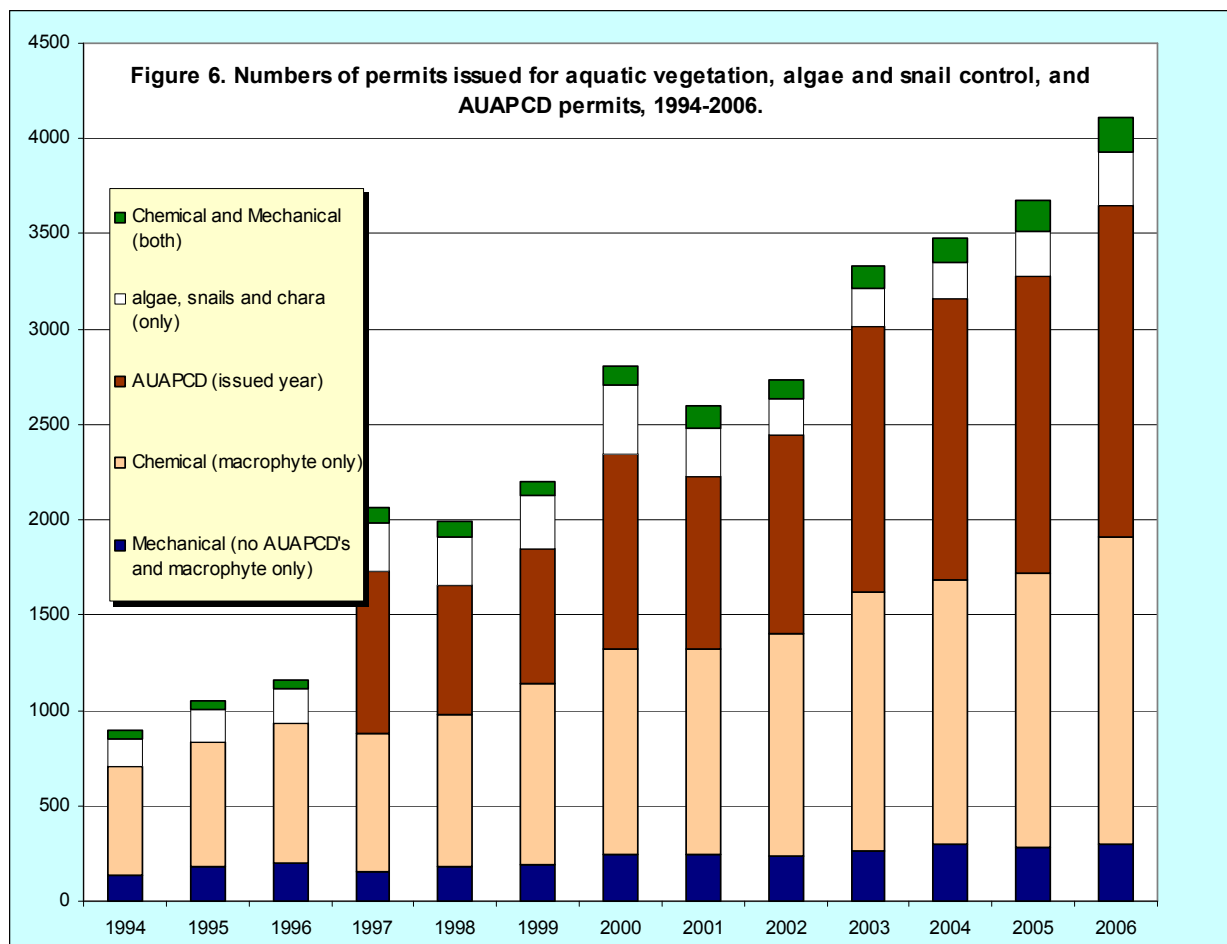


Table 3. Total near shore area permitted, in acres, by region, for control of submerged vegetation, swimmer's itch and AUAPCD use 2006.

Control	Region						Total number of acres	Properties	Avg. Acres /Property
	1	2A	2B	3A	3B	4			
Herbicide control excluding open water treatment	37.1	7.2	85.5	697.0	245.0	141.8	1213.6	6100	0.199
Mechanical control excluding open water removal	17.0	0.5	26.0	69.2	2.4	103.7	218.8	597	0.366
Swimmer's itch control	33.6	6.6	55.3	124.3	21.3	8.4	249.5	4930	0.051
AUAPCD 2005 issued	71.5	0.2	33.3	8.8	12.7	2.0	128.5	1743	0.074

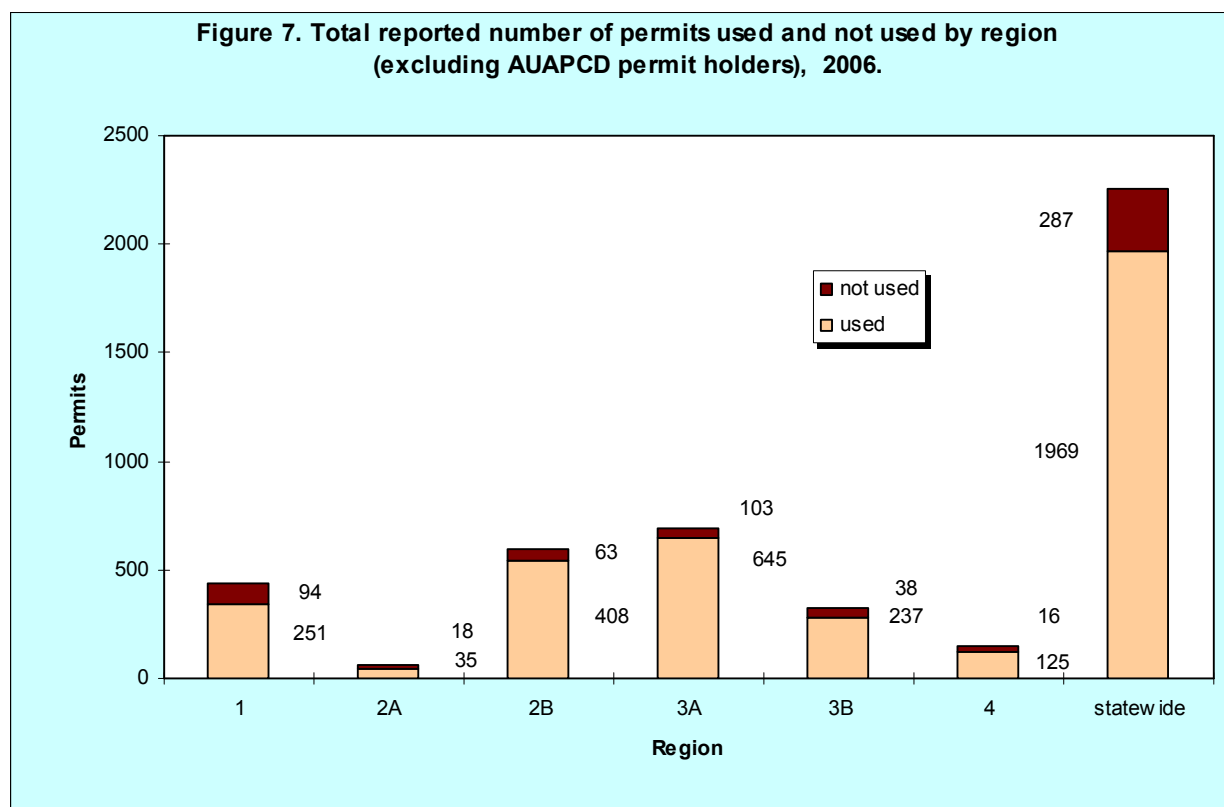
* Includes all permits with swimmer's control.

Numbers of Aquatic Plant Removal Permits Used

Each year some permits issued for aquatic plant management activities are not used (Figure 7). Statewide, 87% of permits issued were reported used by the permittees or commercial applicators/operators doing the work, this is up from 2005. Permittees indicating that their permit was not used, were asked to indicate why by responding to one or more choices provided on the survey. The results are summarized in Table 4, below. In 2006, the reason most frequently given (53%) for not using an APM permit was that the property owner was unable to do the permitted work; 18% reported not doing the work because of getting their permit too late.

Table 4. Response by permit holders to choices indicating why their APM permit was not used, expressed as a percent by region in 2006.

	Region						Statewide
	1	2A	2B	3A	3B	4	
Nuisance condition did not develop	11	12	9	27	24	12	14
Got permit too late	20	12	15	7	20	12	18
Unable to do the work	55	65	47	60	48	47	53
Other	14	12	29	7	8	29	17
Total	100	100	100	100	100	100	100

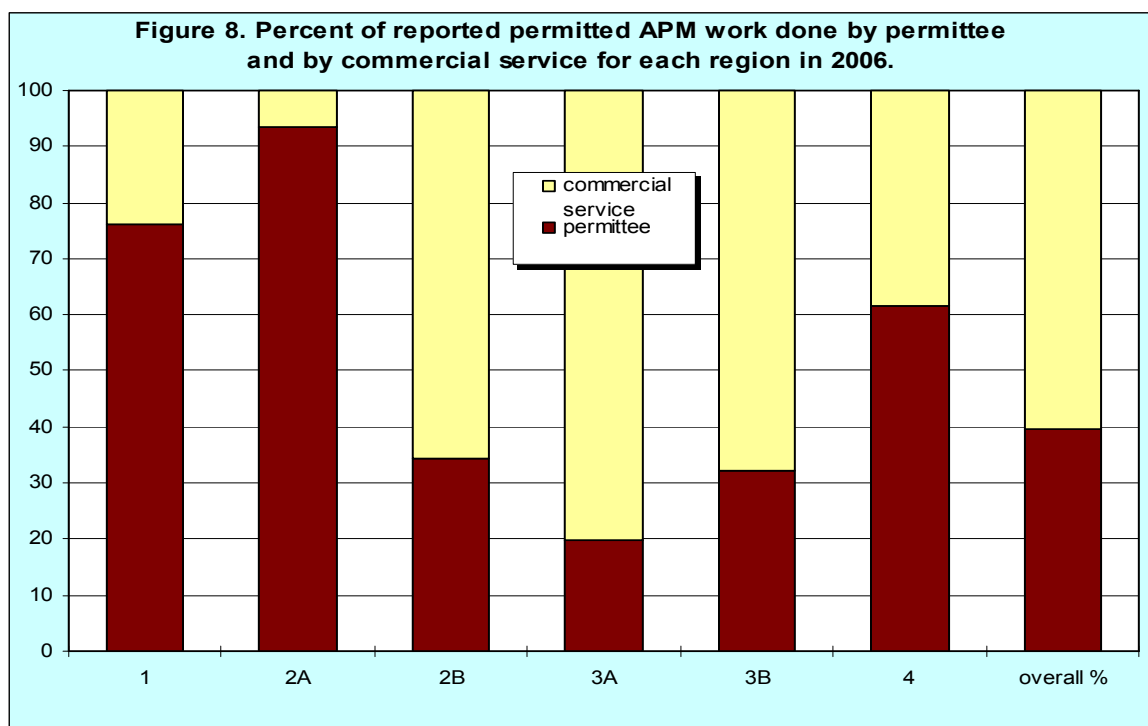


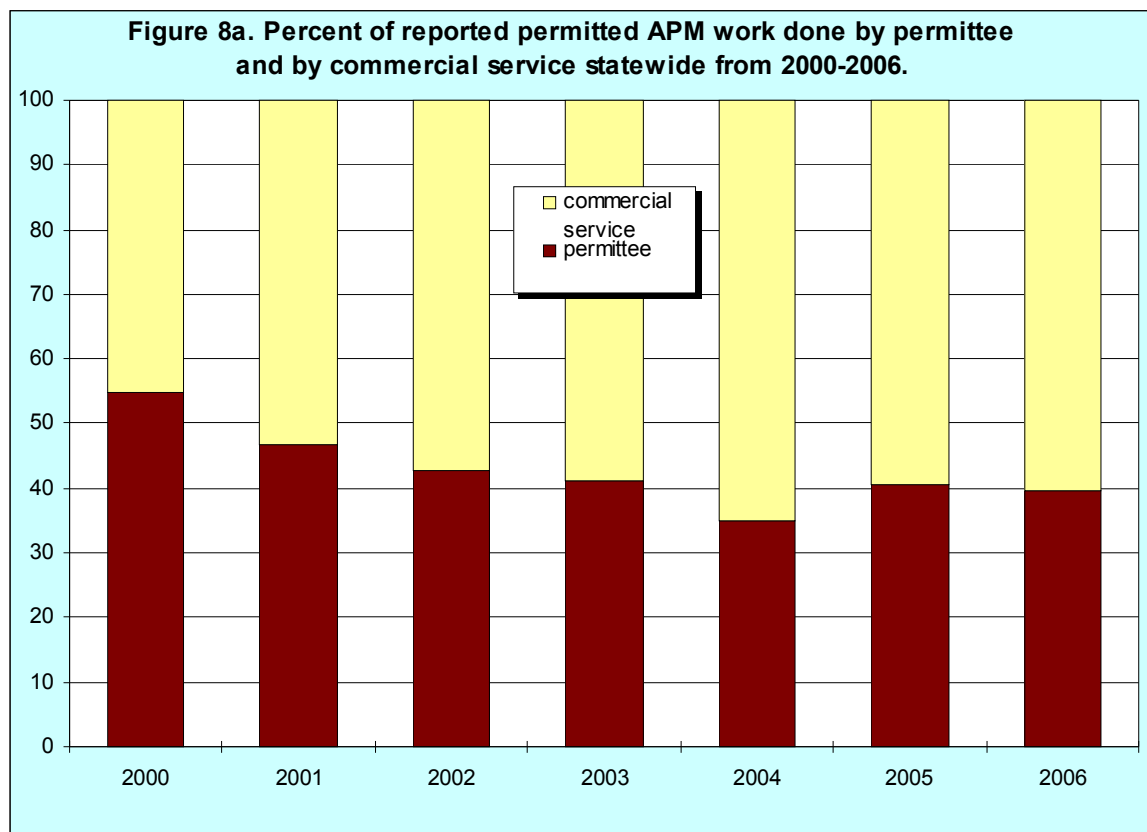
Lakeshore homeowners perform about 40% of mechanical and herbicide control permitted statewide. About 60% of the control work in 2006 was done by commercial applicator and aquatic plant harvesting companies. This represents about a 4% increase over the percent of the work done by commercial applicator and aquatic plant harvesting companies in 2005. Permit holders in the Central Region hire commercial services more frequently than any other region (Figure 8). Commercial aquatic plant management companies perform about 76% of the control in the Central Region. In 2006, 56% of the control in the Northeast Region was done by commercial service. However, most of the commercial treatment was done in the Brainerd Lakes Area (2B), most permitted control in the Grand Rapids area (2A) is still done by the homeowner. Permit holders perform about 76% of the control in the Northwest Region and 62% in the South Region. Figure 8a shows the trend in percent of permitted aquatic plant control performed by commercial service over the last seven years.

Satisfaction

Permittees who personally undertook aquatic plant control activities were asked to indicate their satisfaction with the results of the aquatic plant control. Generally, permit holders were satisfied with the results of the control. About 65% of the respondents were satisfied with the results of the herbicide control. About 78% of those responding were satisfied with the results of treatments to control swimmer's itch and 68% of respondents were satisfied with results of mechanical control. It is important to remember that permit holders hiring commercial services were not included in the survey.

Permit holders, excluding AUAPCD permittees, were asked if they would apply for a permit in 2006. Of the 940 responses, 720 (77%) said they would reapply next year a 6% increase from 2005. The number of permittees reporting that they would not apply (19 or 2.0%) was slightly less than in 2005. Approximately 21% (201) of the permit holders responding indicated that they were unsure if they would reapply for permit in 2007. Regardless of their response, all 2006 permit holders whose permit expires will receive permit application materials prior to the start of the 2007 open water season.





Automated Untended Aquatic Plant Control Devices (AUAPCD)

Before 1997 the operation of an automated mechanical aquatic plant control device did not automatically require an APM permit, and few AUAPCD permits were issued. The Aquatic Plant Management Rules were revised to require a permit for the operation of these devices because of their potential to excavate bottom sediments, and impact spawning habitat. In 2006, there were 1,742 permits issued for these devices statewide. Of those permits 1,104 were issued for a one-year term and 638 were issued for a 3-year permit term. Permits are issued for 3 years if the applicant agrees to a reduced area of operation and qualifies for a 3-year permit based on the vegetation types present. More than 79 percent of the AUAPCD permits were issued in the Northwest and Northeast Regions; this percentage was unchanged from 2005. In addition to the permits issued in 2006, there are active three-year permits issued in 2004 and 2005 (523 and 475 respectively). Of the 1,737 surveys mailed 1,505 (89%) of the AUAPCD permit holders statewide responded to the questionnaire. Three year AUAPCD permit holders issued permits in 2004 and 2005 were not surveyed.

There are at least three different companies producing AUAPCD's that are used in Minnesota, the Crary Company WeedRoller®, the Colman Beach Groomer and the Lake Restoration Lake Maid. Permits for 29 homemade devices were also issued in 2006. Based on survey results, a little over half of AUAPCD owners in Minnesota have owned their device for more than three years (59% of the respondents). In contrast, 26% have owned their device from 1 to 3 years and 14% have responded that they have owned their device for less than one year.

Most of the people responding to our questionnaire (84%) were the sole owner of an AUAPCD. In 2006, two permit holders stated that they rented the device the same as in 2005. Some homeowners opt to purchase the device cooperatively and share it during the summer months.

Approximately 16% of the people who used an AUAPCD in 2006 either, borrowed, owned and shared, or jointly owned their AUAPCD, a slight increase from 2005.

Lakeshore homeowners have two AUAPCD permit options, provided the location is suitable for the operation of these devices. The annual renewal option is used when the lakeshore homeowner operates in an area greater than 2,500 square feet or more than 50 feet alongshore. The three-year permit option showed a moderate increase in 2006 (Figure 9). The three-year permit option has steadily declined in popularity the last two-years (Figure 9). Reasons for this decline likely include; people are not satisfied with the limitations of the three-year permit option and are applying for an annual permit, or people who have gotten three-year permits in the past are not renewing their permits when the permit expires.

The manufacturer of the WeedRoller® has stated that with time people will need to use the WeedRoller® less frequently to achieve acceptable control. The company explained that once the plants were gone there would be little need to use the machine. We have asked the question, how often do you operate your AUAPCD? and sorted the responses by the length of time people had indicated they had owned the machine. Recent AUAPCD owners are more likely to operate the device longer than those people who have owned the device for several years (Figure 10). About 164 persons permitted to operate an AUAPCD stated that, for various reasons, they did not operate the device in 2006, up from 135 in 2005.

The AUAPCD had higher satisfaction ratings than other methods of aquatic plant control. When asked, were you satisfied with your AUAPCD, 98% of those responding indicated that they were satisfied with these devices this is identical to 2005.

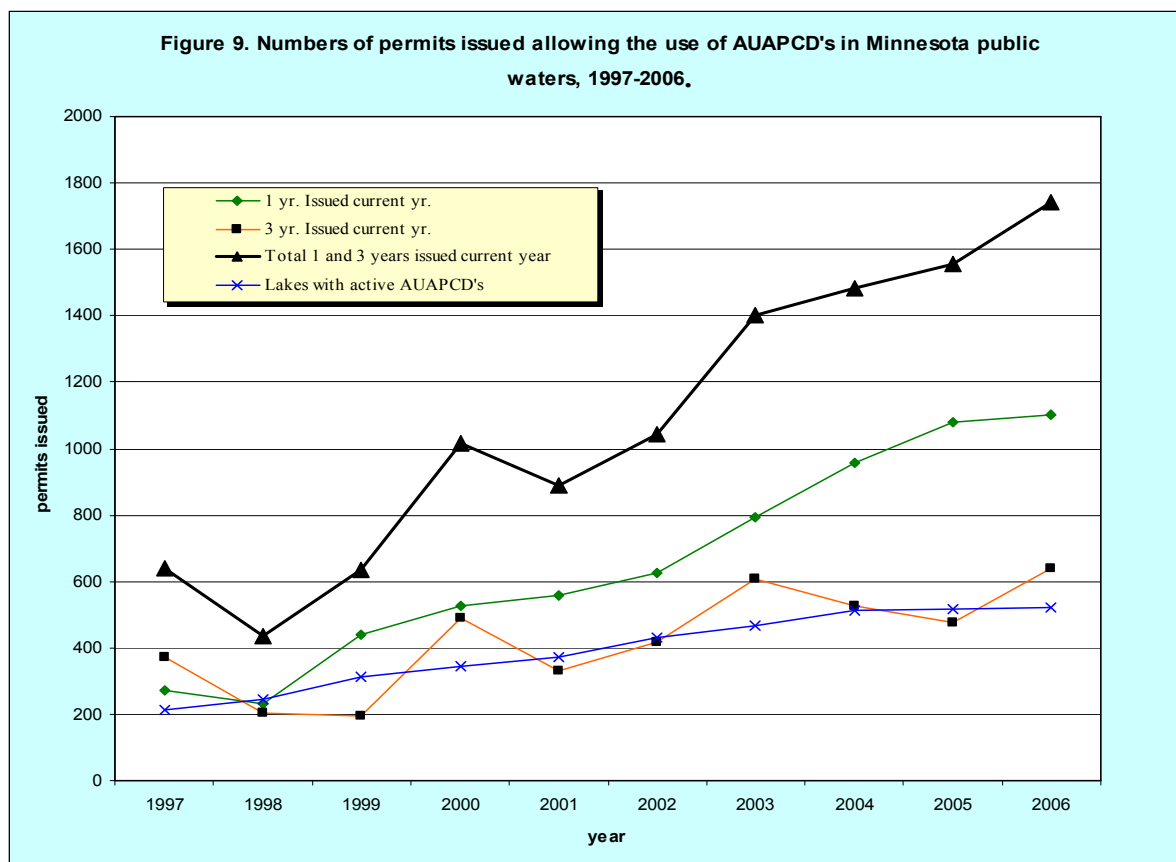
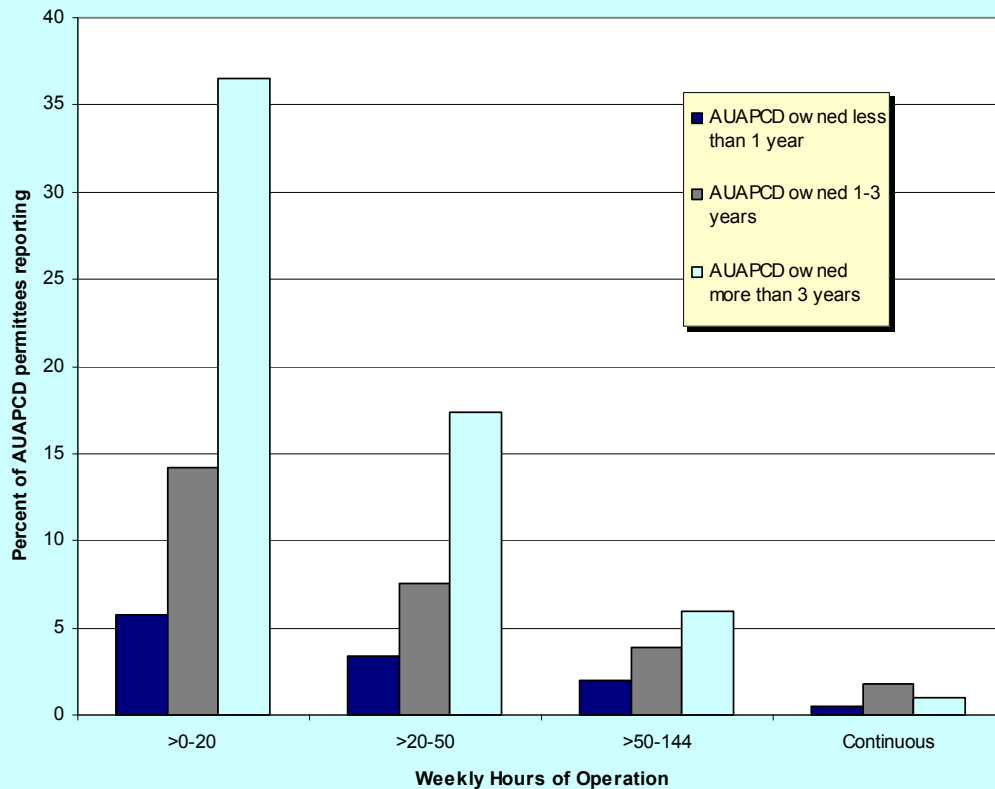


Figure 10. AUAPCD use from May through September, 2006 catagorized by length of ownership expressed as a percent of all AUAPCD permittees reporting.



The DNR sends AUAPCD permit holders a sticker to help Conservation Officers and APM staff identify permitted units. Beginning in 2000 use of the sticker became a mandatory condition of the permit. About 98% of the permit holders responding to this question had no difficulties displaying the sticker.

Invasive Species Control

In addition to oversight (permitting) responsibilities for aquatic plant management efforts conducted by individuals to improve access or recreational use, the DNR has statewide control programs for two, non-native invasive aquatic plants: purple loosestrife and Eurasian watermilfoil. In addition, to the efforts to manage these invasive species the DNR has recently expanded its research and management efforts focused on curly-leaf pondweed.

Curly-leaf pondweed

Curly-leaf pondweed (*Potamogeton crispus*) is a non-native invasive, submersed aquatic plant species introduced to Minnesota at the turn of the 20th Century. Curly-leaf pondweed is known to occur in 740 Minnesota lakes in 68 of the 87 counties in Minnesota. In many lakes this plant causes severe recreational nuisances.

Curly-leaf pondweed's life cycle is considerably different than native aquatic plants. When native aquatic plants are just beginning to grow (mid to late May) curly-leaf pondweed is forming dense mats on the lakes surface that can interfere with recreation and the growth of native aquatic plants. By mid-summer, (early to mid July) curly-leaf plants begin to die back, which results in rafts of dying plants piling up on shorelines. But before the plants die they form vegetative propagules called turions (hardened stem tips). New plants sprout from turions when they germinate in the fall (Catling and Dobson, 1985). The die back is often followed by an increase in phosphorus (Bolduan et al., 1994) and undesirable algal blooms. These algae blooms interfere with light penetration and can also reduce native plant abundance.

Standard control methods provided relief to lakeshore property owners from the recreational nuisances caused by surface mats of curly-leaf pondweed, but had no long-term effect on the abundance of the plant. Recent research conducted by the U.S. Army Corps of Engineers (ACE) has revealed promising control strategies that may help to reduce the abundance of this plant. The key to the new strategies for the control of curly-leaf pondweed is treating the plant early in the season (when water temperatures are between 50 and 60 degrees F). If this early season treatment strategy is repeated in successive years the turion bank will be depleted, reducing the overall abundance of the plant, the severity of algae blooms, and give native vegetation a competitive advantage.

The Department of Natural Resources is conducting early season curly-leaf pondweed treatments in cooperation with several lake associations on a trial basis to determine the effectiveness of this strategy. In 2006, two lakes were treated with the aquatic herbicide fluridone and several others were treated with Aquathol K. These lakes will be treated and monitored for at least 3 successive years to determine if it is possible to:

1. Reduce the interference with use of the lake caused by curly-leaf pondweed.
2. Reduce the abundance of curly-leaf pondweed for long periods of time.
3. Increase the abundance of native, submersed aquatic plants.
4. Reduce peaks in concentrations of phosphorous and associated algal blooms.

See the 2006 Invasive Species Program Annual report for more detailed information on this project (http://files.dnr.state.mn.us/ecological_services/invasives/annualreport.pdf).

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Purple Loosestrife

Purple loosestrife, a non-native invasive plant that can out compete native wetland vegetation, was introduced to North America from Europe in the 1800's and until 1987 was a common ornamental sold by nurseries and landscape companies. Natural resource managers became aware of the plant's invasive nature and disruptive effects on native wetland vegetation in the early 1980's. The DNR, concerned about the plants impact on native species and wildlife habitat, conducted preliminary surveys to determine the status of the plant in Minnesota. The survey revealed that 77 of Minnesota's 87 counties had populations of purple loosestrife in wetlands, lakeshore, stream banks and ditches. In 1987 Minnesota became one of the first states in the nation to develop a program to control this invasive plant. Purple loosestrife was designated a noxious weed, which makes it illegal to import, buy, sell, propagate and transport. The main components of the purple loosestrife program are:

- An inventory of purple loosestrife sites is maintained and used to prioritize control efforts.
- Carry out management activities including chemical and biological control.
- Support research to evaluate and expand control efforts.
- Monitor and evaluate the success of biological control and other management efforts.
- Public education/awareness efforts to involve the public in the management of this plant.

Large stands of purple loosestrife are extremely difficult to control because of their enormous seed bank; therefore, it is necessary to prioritize purple loosestrife control efforts. Highest priority stands are those located in watersheds with little purple loosestrife. Those stands that do exist are small and newly established (e.g., they consist of a few plants covering a small area) and are found near the headwaters of the watershed. Because of their small size these newly established sites are poor candidates for biocontrol. Rodeo, a broad-spectrum glyphosate herbicide, is used to spot treat high priority purple loosestrife sites with a backpack sprayer.

Minnesota's herbicide control effort has been reduced dramatically since the introduction of bio-control agents began in 1992. In 2006, DNR staff treated a total of 94 purple loosestrife sites with 0.43 gallons of Rodeo herbicide. Most of these sites were very small with the majority having fewer than 100 plants. For more detailed information on Minnesota's purple loosestrife program, see the 2006 Invasive Species Annual Program report. (http://files.dnr.state.mn.us/ecological_services/invasives/annualreport.pdf)

Eurasian Watermilfoil

Eurasian watermilfoil, hereafter called milfoil, is an exotic aquatic plant introduced to North America in the mid-1900's. It was first identified in Minnesota in 1987 in Lake Minnetonka. Milfoil is a submerged aquatic plant that can displace native vegetation. The plant reproduces by fragmentation, establishes itself readily in disturbed areas, and has the potential to become a nuisance in Minnesota lakes. The main strategies of the Eurasian watermilfoil program are:

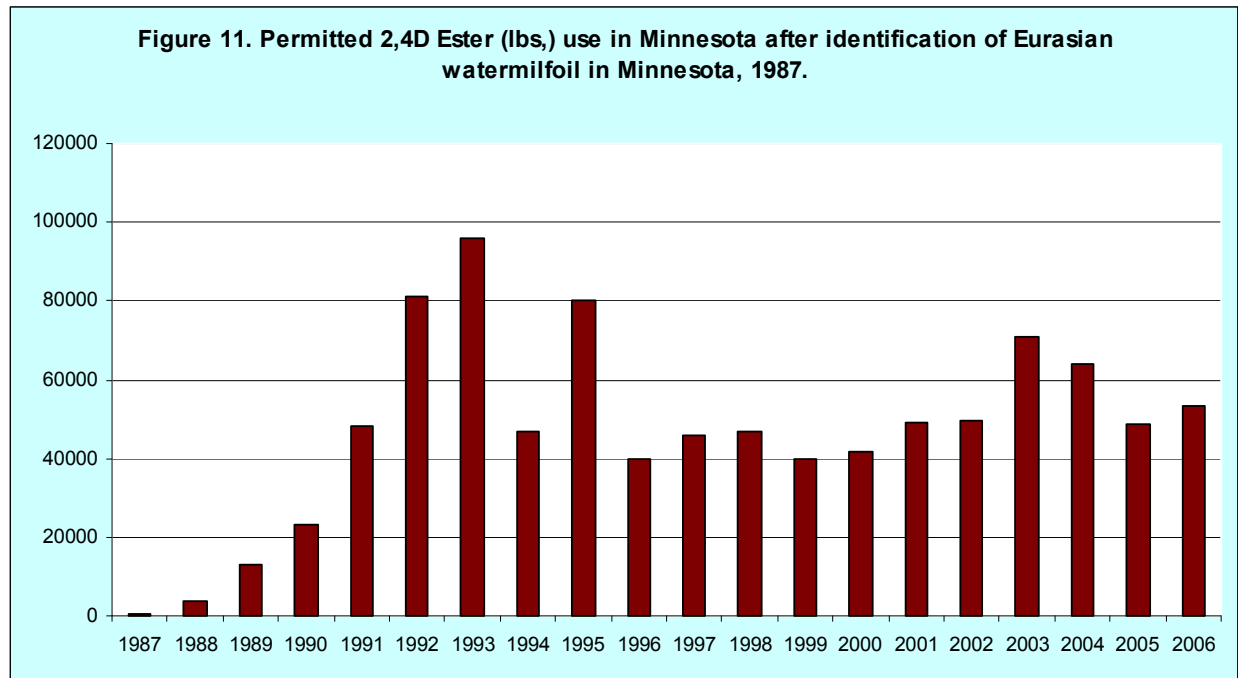
- Slow the spread of the plant through public education and awareness activities.
- Support lake associations and local units of government to manage problems caused by milfoil.
- Maintain an accurate inventory of populations.
- Investigate new control methods and the biology of the plant.

Eurasian watermilfoil was discovered in 13 additional water bodies in 2006. There are now 190 Minnesota lakes known to have populations of this invasive submersed aquatic plant.

The most commonly used herbicide for control of milfoil is a granular 2,4-D ester product labeled for aquatic use. In 2001, a liquid dimethylamine salt 2,4-D product was registered for aquatic use and has been applied to milfoil in Minnesota. Late in 2002, a liquid trimethylamine salt, triclopyr product, was registered for aquatic use and is available for control of milfoil in Minnesota. These systematic herbicides are preferred because they are the most selective products available.

The total reported 2,4-D use in 2006 for milfoil was 50,487 pounds. The total reported annual use of 2,4-D ester products since 1987 is provided in Figure 11. For more detailed information on the management of invasive species see the 2006 Invasive Species Program Annual Report. The report may be reviewed on line at http://www.dnr.state.mn.us/ecological_services/invasives/index.html.

In 2006, the DNR provided \$82,000 in state funds to cooperators on 23 lakes for management of milfoil. The DNR spent an additional \$11,000 on control work at public water accesses to control Eurasian watermilfoil to help minimize its spread between lakes.



APPENDIX

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Table A. A list of commonly used herbicides registered by the EPA for aquatic use and approved by the MN DNR.

Product Name	Selective	Broad Spectrum	Active Ingredient (Formulation)
<u>Part 1. Aquatically labeled systemic herbicides.</u>			
Aquacide (Pellet)	X		2,4 Dichlorophenoxyacetic Acid (Sodium Salt)
Navigate® (Granular)	X		2,4 Dichlorophenoxyacetic (Butoxyethyl Ester)
Aqua-Kleen (Granular)	X		2,4 Dichlorophenoxyacetic (Butoxyethyl Ester)
Sonar™ (Liquid or Granular)	X		Fluridone
Rodeo (Liquid)		X	Isopropylamine salt of Glyphosate
Aqua Master (Liquid)		X	Isopropylamine salt of Glyphosate
Aqua Neat		X	Isopropylamine salt of Glyphosate
Aqua Pro		X	Isopropylamine salt of Glyphosate
Renovate		X	Triclopyr
Habitat		X	Isopropylamine salt of Imazapyr (<i>licensed applicator only</i>)
<u>Part 2. Contact Herbicides.</u>			
Aquathol (Liquid or Granular)		X	Dipotassium salt of endothall
Hydrothol 191 (Liquid or Granular)		X	Mono-amine salt of endothall (<i>liquid by licensed applicator only</i>)
Reward (Liquid)		X	Diquat dibromide (<i>licensed applicator only</i>)
<u>Part 3. Copper Compounds (Algaecides and Herbicides).</u>			
Citrine Plus (Liquid or Granular)	X (A)		Copper-Ethanolamine complex
Komeen (Liquid)	X (H)		Copper-Ethylenediamine complex
K-Tea	X (A)		Copper-Triethanolamine complex
<u>Part 4. Other.</u>			
Copper sulfate	X (A)		CuSO ₄ (at least 2 aquatic labeled products)
Aquashade (Liquid)		X	Acid Blue 9 / Acid Yellow 23 (Filters light in wavelengths required for plant growth)
Green Clean	X (A)		Sodium carbonate peroxyhydrate

Table B. Reported various aquatic herbicide use statewide, 1981-2006.

Year	2,4-D ester lbs.	2,4-D salt lbs.	2,4-D amine/ acid gal.	Aquathol lbs.	Aquathol gal.	Diquat (Reward) gal.	Hydrothol 191 lbs.	Hydrothol 191 gal.	copper sulfate lbs.
1981	150	370	0	1,900	1,300	730	3,200	390	*
1982	120	320	0	1,700	1,500	550	4,200	44	*
1983	-	350	0	1,400	1,500	560	11,900	31	*
1984	110	130	0	730	980	780	7,300	80	*
1985	25	270	0	740	1,200	870	14,000	100	*
1986	25	370	0	1,100	1,400	1,200	6,900	170	*
1987	100	1,400	0	1,100	1,400	1,400	13,000	62	*
1988	3,700	600	0	950	1,300	1,300	11,000	100	*
1989	13,000	470	0	910	1,300	1,700	12,000	200	*
1990	23,000	290	0	680	1,100	1,500	9,500	130	*
1991	48,000	1,300	0	1,400	850	1,400	9,600	210	55,400
1992	81,000	320	0	870	1,600	1,700	9,000	67	64,000
1993	96,000	400	0	830	1,000	1,600	5,000	240	34,600
1994	45,000	700	0	710	940	1,800	10,000	510	59,800
1995	80,000	87	0	930	700	2,300	8,300	420	55,000
1996	39,000	400	0	1,000	730	1,900	8,900	830	32,500
1997	46,000	290	0	1,200	700	2,400	7,800	820	39,700
1998	47,000	440	0	790	1,280	2,580	4,460	670	50,800
1999	39,800	650	0	1,050	740	2,280	4,190	740	31,600
2000	41,500	700	0	1,380	1,850	2,970	5,820	530	41,900
2001	49,300	1,000	0	700	2,600	2,700	3,900	950	58,200
2002	49,400	700	20	540	2,660	2,530	4,220	760	42,200
2003	71,100	634	336	339	2,515	2,370	7,610	429	47,100
2004	64,100	1,068	216	366	5,200	2,856	8,040	643	53,700
2005	48,800	1,154	533	1,077	7,054	2,773	6,744	715	63,500
2006	53,400	805	215	1,530	8,757	2,953	11,653	126	46,967

* Data not available

Table C. Aquatic Plant Management Report Survey Results, Chemical-Mechanical, 2006.

1. Was your 2006 permit used?

782 Yes, permitted work was done.

25 No, because: The nuisance conditions did not develop.

29 No, because: I got the permit too late.

95 No, because: I was unable to get the work done.

30 No, because:

Thanks! Please use the back for comments

961

2. When my permit expires:

720 I will reapply for a permit. **19** I will not apply for a permit.

201 I am undecided at this time.

3. The method of control was:

201 mechanical or hand removal.

516 chemical treatment.

65 mechanical and chemical treatment.

4. A. Were you satisfied with the aquatic plant control work done (for **Swimmers Itch** control only skip to 4.B) ?

424 YES

57 NO

173 wasn't as good as expected

B. If you treated for **Swimmers Itch** were you satisfied with the control ?

142 YES

8 NO

31 wasn't as good as expected

5. When was the work done?

15 April **154** May **240** June **284** July **226** August **78** September **16** October **1** Nov.

0 uncertain

6. To provide us with some idea of how much control actually took place we would like to know if the control work done was the entire area allowed by the permit or less than the allowed area.

590 Yes, control work was done on the entire area permitted

178 No, less control work was done than the permit allowed

Table D. Aquatic Plant Management Report Survey Results, AUAPCD, 2006.

1. The type of AUAPCD device I use is a:
 - 1278** Crary WeedRoller®
 - 38** Lake Restoration Lake Maid
 - 177** Colman Beach Groomer
 - 29** home made
 - 28** unknown
2. I used an AUAPCD this year.
 - 1386** Yes
 - 164** No, I did not use an AUAPCD this year.
3. The AUAPCD I used in 2005-
I have owned for:

167 less than 1 year	Is jointly owned and shared with the other co-owners and	2 was rented.
307 1 - 3 years	has been for:	17 was borrowed.
682 more than 3 years	25 less than 1 year	
	54 1 - 3 years	
	129 more than 3 years	

4. How often monthly did you operate the AUAPCD you used ?

		few	several	many	
	not	hours	hours	hours	continuous
	used	>0-20	>20-50	>50-144	
In May:	829	384	113	45	13
In June:	222	591	374	156	41
In July:	116	596	432	187	53
In August:	225	671	319	126	43
In September:	998	290	63	23	10

5. Were you satisfied with the AUAPCD you used?

1348 Yes
34 No

6. Did you have any problems displaying the sticker you got with your permit ?

22 Yes, please explain: _____
1355 No _____

What Did You Use?

How Much Did You Use?

(concentrated product before mixing)

Copper sulphate	<u>11,044.00</u> lbs.	Navigate	<u>14,100.00</u> lbs.	Aquakleen	<u>3,820.00</u> lbs.
gran.Hydrothol 191	<u>7564</u> lbs.	Aquacide	<u>805</u> lbs.		
liq. Aquathol K	<u>141</u> gal., qts., oz.	Citrine Plus	<u>0.8</u> gal., qts., oz.		
gran.Aquathol	<u>691</u> lbs.	Rodeo	<u>131.5</u> gal., qts., oz.		
liq. Hydrothol 191	<u>6</u> gal., qts., oz.	other: Weedtrine D 26.3	lbs., gal., qts., oz.		
Reward	<u>0.8</u> gal., qts., oz.	other: Habitat 2.3	lbs., gal., qts., oz.		

Table E. Aquatic Pesticide Enforcement Citizen Complaint Investigations, 2006.

Date	Complaint	Lake Name	County	Observation	Action	Result
June 7	Possible unauthorized herbicide treatment	Gervais	Ramsey	Use inspection coincided with the time and place of complaint	Contacted property owner explaining that treatment was proper	No violation. Complainant was satisfied with a detailed explanation of the treatment.
June 8	Aquatic plant removal without a permit	Whitefish	Crow Wing	Restoration work had not been completed	Brainerd APM Specialist notified conservation officer	Unknown
June 21	Unauthorized herbicide treatment by applicator	Lafayette Mtka	Hennepin	No on site inspection	Lake Management reported its own action in a timely manner	Verbal warning that any further unauthorized activity would be turned over to enforcement
June 22	Possible unauthorized chemical application	Sunnybrook	Washington	No field inspection	Contacted the commercial applicator for an explanation and application records	The records indicated proper treatment of permitted areas. The complainant was given a detailed explanation of the treatment procedure. 2007 treatments will be supervised.
July 26	Witnessed purple loosestrife being collected and transported in private vehicle to be sold in nursery	Cosmos	Meeker	Referred to MDA	Unknown	Unknown
August 3	Wild Rice treated with herbicides without APM permit	Norway	Crow Wing	Field inspection found wild rice dead (samples collected)	MDA notified, applicator records reviewed, conservation officer notified	Case open
August 18	Emergent vegetation including wild rice treated with herbicides without a permit	Section 12	Aitkin	Field inspection found dead wild rice	Conservation officer issued a cease and desist order, citation issued at later date	Case closed
August 24	Possible unauthorized chemical application	Sugar	Wright	Field inspection	Along with the Regional APM Specialist and area CO the property was inspected and the property owner contacted	The property owner admitted to chemical application inconsistent with the permit he had. A citation was issued.

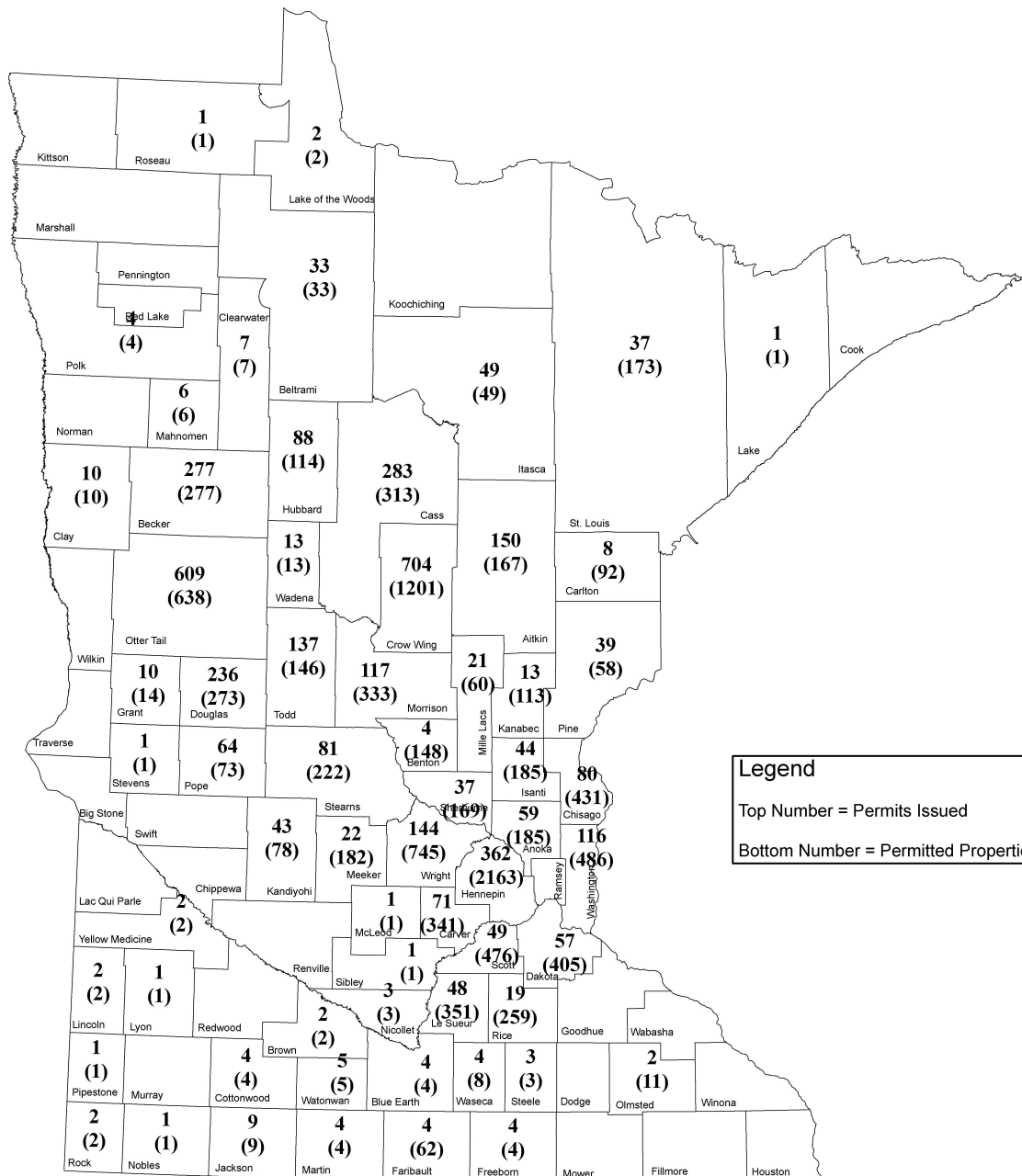
Table F. Aquatic Pesticide Enforcement Use Inspections, 2006.

Treatment Date	County	Lake	Applicator	Number of Treatments Inspected
April 18	Hennepin	Medicine	Lake Restoration	1
April 20	Hennepin	Medicine	Lake Restoration	1
April 27	Ramsey	Silver (nsp)	Aquatic Engineering, Inc	2
May 2	Chisago	Rush (west)	Lake Restoration	2
May 2	Morrison	Crookneck	Professional Lake Management	5
May 3	Crow Wing	Lower Mission	Professional Lake Management	1
May 5	Dakota	Blackhawk	Lake Management	2
May 9	Hennepin	Libbs Mtk.	Midwest Aquacare	2
May 16	Cass	Norway	Professional Lake Management	1
May 17	Crow Wing	Sebie	Professional Lake Management	1
May 18	Hennepin	Bass	Lake Management	2
May 21	Chisago	Green	Green Lake Association	2
May 22	Crow Wing	Mayo	Professional Lake Management	1
May 23	Crow Wing	Crow Wing	Ron Duy Jr.	1
May 23	Ramsey	Silver (nsp)	Aquatic Engineering Inc.	2
May 24	Kanabec	Knife	Minnesota Shoreline Restoration	2
June 1	Ramsey	Johanna	Lake Restoration	2
June 5	Hennepin	Eagle	Lake Restoration	2
June 6	Hennepin	Phelps Mtk.	Lake Management	2
June 7	Ramsey	Gervais	Lake Improvement	2
June 8	Anoka	Coon	Lake Restoration	2
June 14	Carver	Pierce	Lake Management	2
June 19	Washington	White Bear	Lake Restoration	1
June 20	Sherburne	Long	Professional Lake Management	2
June 23	Carver	Zumbra	Midwest Aquacare	2
June 28	Cass	Leech	Lake Restoration	3
July 5	Chisago	South Center	Lake Restoration	2
July 10	Hennepin	Phelps Mtk.	Lake Management	2
July 12	Isanti	Blue	Lake Management	2

Table F. (Continued)

Treatment Date	County	Lake	Applicator	Number of Treatments Inspected
July 14	Carver	Lotus	Lake Restoration	2
July 18	Ramsey	Silver (nsp)	Aquatic Engineering Inc.	1
July 20	Mille Lacs	Mille Lacs	Professional Lake Management	10
July 20	Washington	White Bear	Lake Management	1
July 25	Chisago	Green	Green Lake Association	1
July 26	Freeborn	Fountain	City of Albert Lea Parks	1
August 7	Morrison	Alexander	Professional Lake Management	1
September 20	Crow Wing	Bay	Lake Restoration	1

2006 Aquatic Plant Management Permits and Properties by County



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