# MINNESOTA DEPARTMENT OF NATURAL RESOURCES

# DIVISION OF ECOLOGICAL RESOURCES

**STAFF REPORT 48**

**Management of Rooted Aquatic Vegetation, Algae, Leeches, Swimmer's Itch, 2009**

**May 2010**

# Management of Rooted Aquatic Vegetation, Algae, Leeches, Swimmer's Itch, 2009

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**Executive Summary 2009 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.

## Public Waters/Permits/Properties/Fees

In 2009 there were 920 public waters with permitted APM activity. The number of public waters where aquatic plant management is permitted increased gradually from 1953 until 2000. From 2003 through 2009 the number of lakes with permitted APM activity stabilized at around 900 per year.

In 2009 there were 36 more permits issued than in 2008. The annual increase in the numbers of permits issued from 2003-2007 was approximately 360 permits per year. The numbers of permits issued statewide decreased in 2008 and 2009 when compared to the high of 4,633 permits issued in 2007. The Central Region (3A), which includes the seven county metropolitan area, typically issues permits for more properties than any other DNR regional office. In 2009 the Central Region issued 25 fewer permits than in 2008. The largest decrease in the number of permits issued was in Region 2A (down 58 permits from 2008).

The numbers of properties involved in the APM program statewide decreased for the third consecutive year. There were 94 fewer properties permitted in 2009 than in 2008. The number of properties with permitted aquatic plant management activities decreased in regions 2A, 2B and 3B. Regions 1, 3A and 4 saw small increases in the numbers of participating properties.

Permit revenue increased a small amount from about $300,000 in 2008 to about $303,000 in 2009. The average fee per property in 2009 was $28.45, up slightly from the average fee per property in 2008.

## Automated Aquatic Plant Control Devices

The Department first began issuing permits for Automated Aquatic Plant Control Device's (AAPCD's) in 1997. In 2009 permits for AAPCD's accounted for about 40% of the active Aquatic Plant Management permits. The remaining 60**%** of the aquatic plant management permits issued allowed chemical or other mechanical removal as the method of control.

The APM rules provide two permit options for AAPCD operation. A person applying for a permit to operate the device in an area greater than 2,500 square feet is required to obtain an annual permit. However, a three-year permit option is available for persons who limit the size of the area of AAPCD operation to 2,500 square feet or less (*Minnesota Rules*, part 6280.0450, subp.3, item A). Revisions to the APM rules implemented in the 2009 permit season restrict submersed aquatic plant removal to 100 feet of shoreline or one-half the owner's frontage whichever is less (*Minnesota Rules*, part 6280.0350, subp. 1a). Due to this change many more permit holders became eligible for an AAPCD permit of three year duration in 2009.

In 2009 there were 700 more three-year AAPCD permits than were issued 2008. The number of single season permits issued in 2009 decreased by the same amount. Persons who obtained a three-year permit in 2009 will not have to reapply again until the year 2012. Automated aquatic plant control device permit issuance was up nearly 8% in 2009 over 2008.

Most AAPCD permits are issued to a single property owner. In 2009 AAPCD's made up 42% of the permits issued and accounted for 31% of the total number of properties permitted.

Summary of Aquatic Plant Management permits issued in 2009.

| Region | Harvest Chemical*** | 2009 Issued Channel* | 2009 Active Channel** | AAPCD's with chemical control | AAPCD Issued 2009 1 year | AAPCD Issued 2009 3 year | AAPCD Issued 2008 3 year | AAPCD Issued 2007 3 year | All Active Permits | Issued Restoration Permits |
|---|---|---|---|---|---|---|---|---|---|---|
| Reg 1 | 503 | 51 | - | 69 | 221 | 764 | 197 | 248 | 1,933 | 16 |
| Reg 2A | 90 | 12 | - | 0 | 0 | 5 | 7 | 7 | 109 | 3 |
| Reg 2B | 605 | 20 | - | 53 | 99 | 308 | 211 | 220 | 1,443 | 6 |
| Reg 3A | 759 | 9 | - | 8 | 88 | 43 | 21 | 18 | 929 | 12 |
| Reg 3B | 435 | 14 | - | 19 | 63 | 180 | 61 | 102 | 841 | 10 |
| Reg 4 | 198 | 11 | - | 6 | 16 | 55 | 23 | 52 | 344 | 8 |
| All | 2,590 | 117 | 802 | 155 | 487 | 1,355 | 520 | 647 | 6,401 | 55 |

* Channel permits are of unlimited duration issued to the property owner to mechanically maintain a channel to more than 16 shoreline feet wide of vegetation.
** All active permits as of 12/23/2009. Total by Region cannot be calculated because Region boundaries were changed in 2003. All Active Permits = Permits issued in 2009 and all active AAPCD and channel permits excluding restoration permits.
*** Excludes permits for AAPCD's

Summary of all APM permits issued, fees collected, numbers of lakes, properties treated and harvested in 2009.

| Region | Permits Issued in 2009* | Lakes** | Fees*** | Properties Permitted in 2009 | Ave. Fee/ Property | All Reporting **** Harvest Work | Chemical Treatment | Both |
|---|---|---|---|---|---|---|---|---|
| Reg 1 | 1,488 | 250 | $ 55,990 | 1,488 | $ 37.63 | 117 | 203 | 35 |
| Reg 2A | 95 | 44 | | 95 | | 13 | 45 | 4 |
| Reg 2B | 1,012 | 152 | | 1,471 | | 23 | 451 | 26 |
| Reg 2 total | | | $ 46,835 | 1,566 | $ 31.18 | | | |
| Reg 3A | 890 | 264 | | 4,816 | | 39 | 560 | 10 |
| Reg 3B | 678 | 136 | | 1,899 | | 22 | 309 | 19 |
| Reg 3 total | | | $ 177,939 | 6,715 | $ 26.50 | | | |
| Reg 4 | 269 | 74 | $ 20,096 | 875 | $ 22.97 | 25 | 111 | 13 |
| 2009 TOTAL | 4,432 | 920 | $ 302,860 | 10,644 | $ 28.45 | 239 | 1,679 | 107 |
| 2008 TOTAL | 4,396 | 925 | $ 300,171 | 10,735 | $ 24.58 | 245 | 1,681 | 92 |
| CHANGE | 36 | -5 | $ 2,689 | -94 | $ 3.87 | -6 | -2 | 15 |

* Permits issued for restoration work are excluded.
** Includes all lakes, ponds, ditches and streams listed on APM permits for 2009.
*** Revenue from the APM database as of 12/23/2009.
**** Data tabulated from 2,313 surveys and commercial applicator reports returned as of 1/26/2010.

## 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, panfish, 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 are 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. Freshwater 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 (lakeshore 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

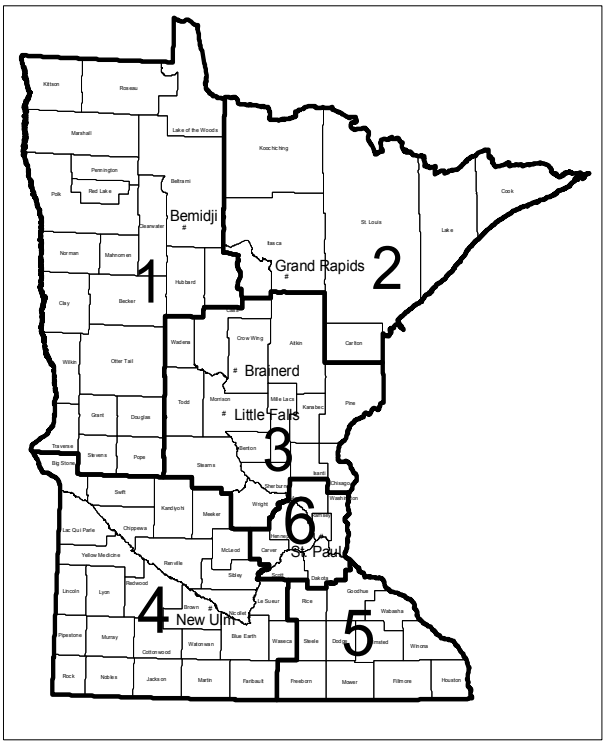
Management Program is to regulate how much aquatic vegetation lakeshore residents can control while preserving the beneficial functions that aquatic plants provide.

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 overabundant. 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. 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.

DNR Administrative Regions Pre-July 2002




DNR Administrative Regions as of October 2006

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 the Regional Fisheries Manager. 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 Table 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 area office (2B) 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 Area 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 River in Southeastern Minnesota. 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 was the responsibility of the Area Fisheries Supervisors. The APM specialist in the South Region is responsible for application review in Big Stone, Swift, Kandiyohi, Meeker, McLeod, Renville, Chippewa, Lac Qui Parle, Yellow Medicine, Lincoln, Lyon, Redwood, Brown, Nicollet, Sibley, Blue Earth, Watonwan, Cottonwood, Murray, Pipestone, Rock, Nobles, Jackson, martin, Faribault, Freeborn, and Mower counties.

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 of the permit decision. 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 Resources. This position is the department's contact with commercial mechanical control businesses, commercial 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 interested in aquatic plant management.

The APM program coordinator supervises staff in the Division of Ecological Resources 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 growing 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.

The rules governing aquatic plant management (M.R. chapter 6280) were recently revised. The revised rules went into effect on April 15, 2009. Significant changes to the rules, which were in effect for the 2009 APM season, include:

- The addition of specific criteria used to evaluate applications for permit. The decision to issue, modify or deny permits is based on these criteria;
- The revised rules specify conditions that can be placed on permits such as limits on amount of control, restrictions on method and timing of control, and restrictions on the species of plant targeted by the control.
- The revised rules reduce the amount of near shore vegetation that can be removed by individuals to 100 feet or one-half their frontage whichever is less.
- The revised rules specify that automated plant control devices may not be used in areas of soft sediment with an average sediment depth of 3 inches.
- Under the revised rules a provision that allowed certain lakes to exceed the 15% littoral zone limit on plant control with herbicides will sunset in 5 yrs. This provision also requires DNR to work with the affected lake associations to develop a lake vegetation management plan (LVMP).
- The revised rule clarifies conditions for "commercial harvest permits" that allow the harvest of aquatic plants, and plant parts from public waters for sale purposes.
- The revised rules specify when variances may be issued, the criteria to be considered, and provides for mitigation of adverse effects on aquatic habitat as a condition of an APM permit that includes a variance.
- The revised rules specify when an LVMP can be used and what the LVMP should contain.

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, to control emergent vegetation such as cattails, wild rice, or bulrush and to control submerged or floating leaf vegetation above specified limits. 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 surface waters must be registered with the Department of Agriculture for sale and use in Minnesota. The product must also be registered for aquatic use by 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 commonly used for aquatic plant control and the amount used under permit in Minnesota in 1981-2009 is found in Appendix A and B.

**Summary of Aquatic Plant Management Program Activities in 2009**

The following summary of Aquatic Plant Management (APM) Program activities in 2009 comes from four sources: permittee survey forms (Appendix Table C and D), commercial aquatic applicator and commercial mechanical control 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, this approach relied 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 1,282 surveys mailed 1,078 (85%) were returned. A separate survey was sent to 1,820 AAPCD permit recipients, with 1,610 (90%) returned**.**

**Permit Issuance**

In 2009, a total of 4,487 permits were issued statewide for APM activities (this includes 55 shoreline habitat restoration permits), 26 more than in 2008 (Appendix Table G provides the county by county distribution of permits and permitted properties). In 2009, there were 1,842

permits issued for the operation of Automated Untended Aquatic Plant Control Devices (AAPCD). The remaining 2,590 aquatic plant control permits were issued to municipalities and lakeshore homeowners for pesticide use (includes algae and swimmer's itch control), mechanical control (cutting, pulling, or harvesting) of aquatic vegetation.

Over the last 16 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 2009 was 920, 5 fewer lakes than in 2008.

**Figure 1. Permits issued, and the number of lakes with permitted aquatic plant control, by region, in 2009.**

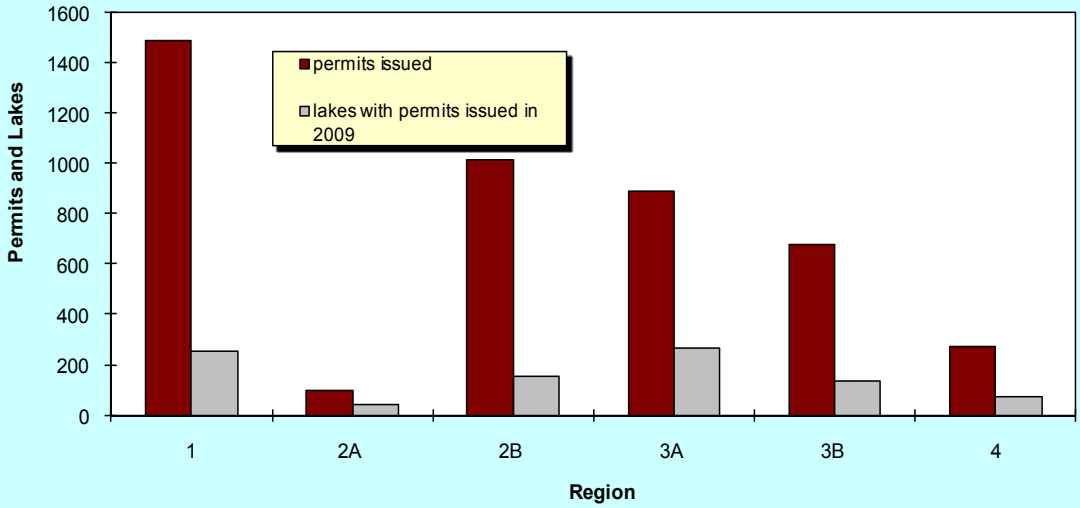
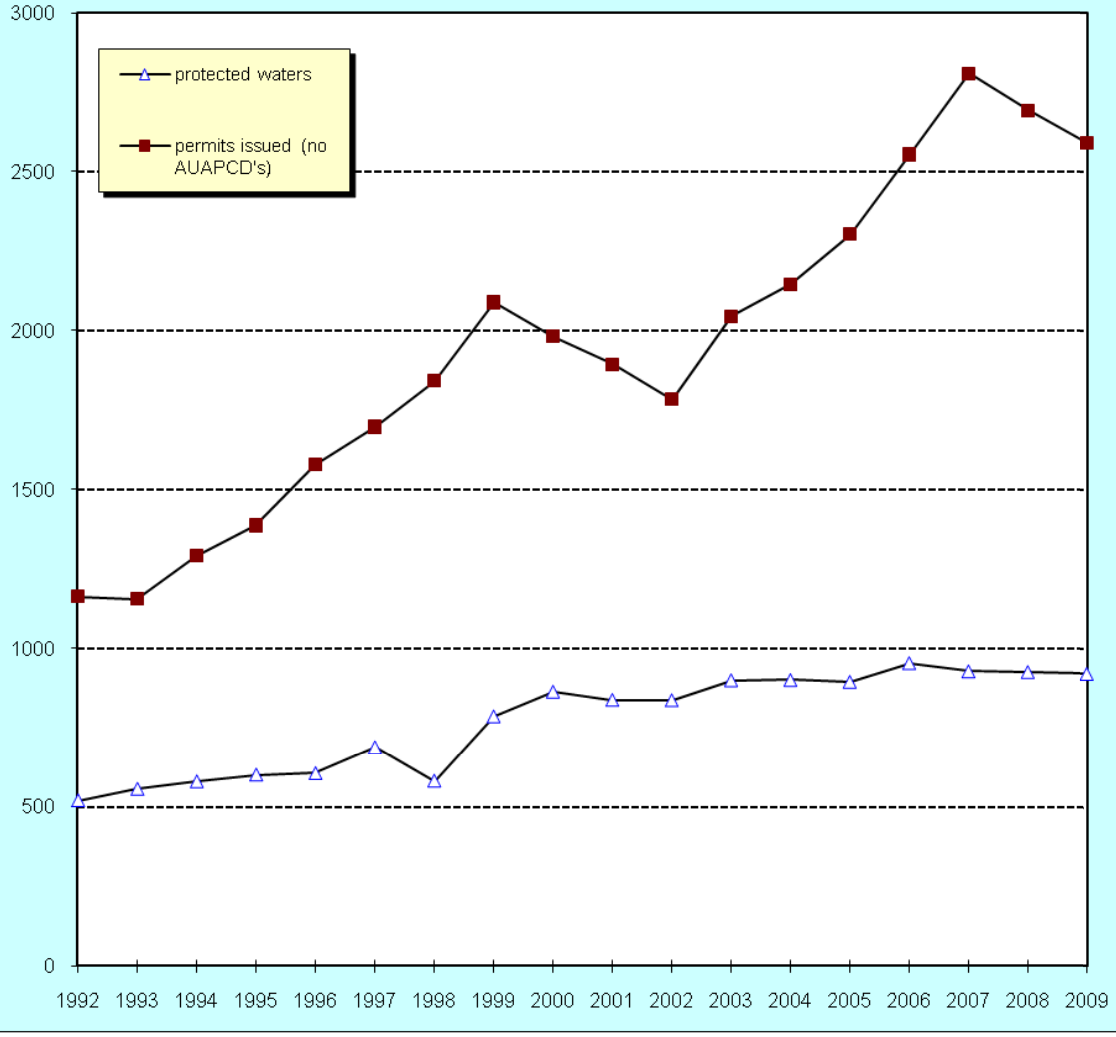
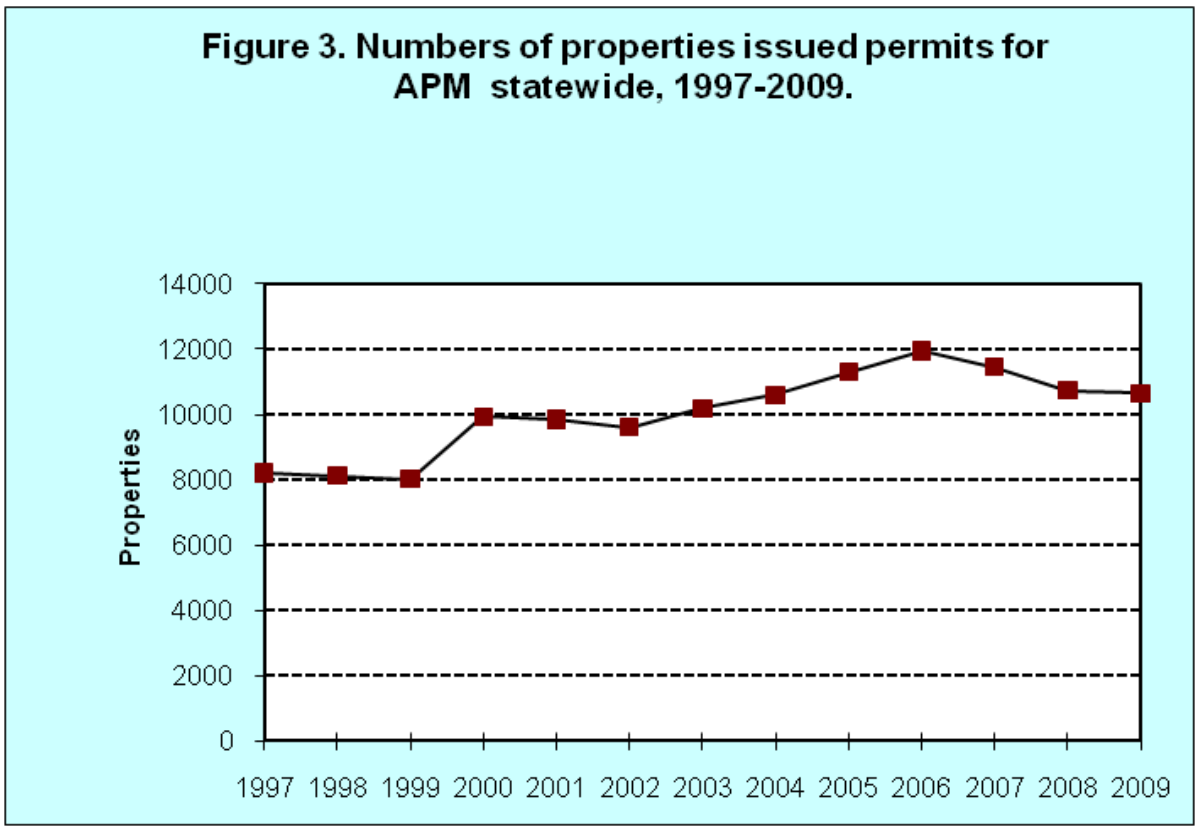


**Figure 2. Numbers of permits issued for mechanical and chemical control (excluding AAPCD) of aquatic vegetation, algae, and swimmer's itch, and numbers of lakes where permits were issued 1992-2009.**






Aquatic plant management permits 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. In 2009 the total number of properties declined for a third year in a row but the number of permits increased slightly from 2008. 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 in the early part of the open water season resulting in slower plant growth and colder water for swimming, may contribute 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. The average number of properties per permit statewide in 2009 was 2.4, unchanged from 2008. 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 ($35.00 per property) begins to decrease for groups larger than 21. A few permits have more than 100 properties listed on a single permit. In 2009 there were 10,644 properties covered by the 4,432 permits issued, excluding shoreline restoration permits.

The Central Region, which includes the Twin Cities metropolitan area, typically has larger group permits than other areas of the state. In 2009, the Central Region averaged 4.3 properties per permit, up a fraction from 2008. The Northwest Region averaged one property per permit; the Northeast Region averaged 1.4 properties per permit. The average number of properties per permit in the Southern Region in 2008 was 3.1, but increased to 3.3 properties per permit in 2009.

Table 1. Permits grouped by the number of properties listed (excluding AAPCD) by Region, 2009.

| Region | | 1 | 2A | 2B | 3A | 3B | 4 |
|---|---|---|---|---|---|---|---|
| Permits/property | >100 | 0 | 0 | 1 | 2 | 0 | 1 |
| | 51-100 | 0 | 0 | 1 | 10 | 4 | 4 |
| | 21-50 | 0 | 0 | 2 | 51 | 15 | 6 |
| | 11-20 | 0 | 0 | 9 | 54 | 18 | 0 |
| | 2-10 | 0 | 0 | 18 | 142 | 43 | 11 |
| | 1 | 489 | 90 | 574 | 496 | 355 | 176 |

The rules regulating aquatic plant removal from public waters require an inspection of the treatment site the first time an application is received or when there are changes in the size of the treatment area, methods used, or the target plant species requested for previously issued permits. Aquatic plant management specialists and area fisheries staff visit these sites to determine if the permit application is consistent with the criteria for permit issuance in APM rules. 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. Approximately 70% of near-shore control permit requests were issued unchanged (Table 2).

Table 2. Percent of permits requesting near-shore control that are issued as requested by region in 2009.

| | Region | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2A | 2B | 3A | 3B | 4 | Statewide |
| number of applications requesting near-shore control | 1,484 | 91 | 985 | 787 | 561 | 224 | 4,132 |
| permits issued as requested* | 1,069 | 70 | 724 | 522 | 401 | 156 | 2,942 |
| % of permits issued as requested | 72.0 | 76.9 | 73.5 | 66.3 | 71.5 | 69.6 | 71.2 |

*Includes permits that allowed more shoreline than requested

**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 permits from $20.00 per property to $35.00 per property. The cap on large group permits to control submersed vegetation was increased from $200 to $750.

Permit fee revenues in 2009 were approximately $303,000 about $3,000 over 2008. The average permit fee per property owner in 2008 was $24.58. In 2009 the average fee per property was $28.45. The slight increase in the average permit fee is likely due to a reduction in the numbers of properties on multi-property permits and an increase in individual property permits issued in 2009.

**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 2009 about 88% 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.

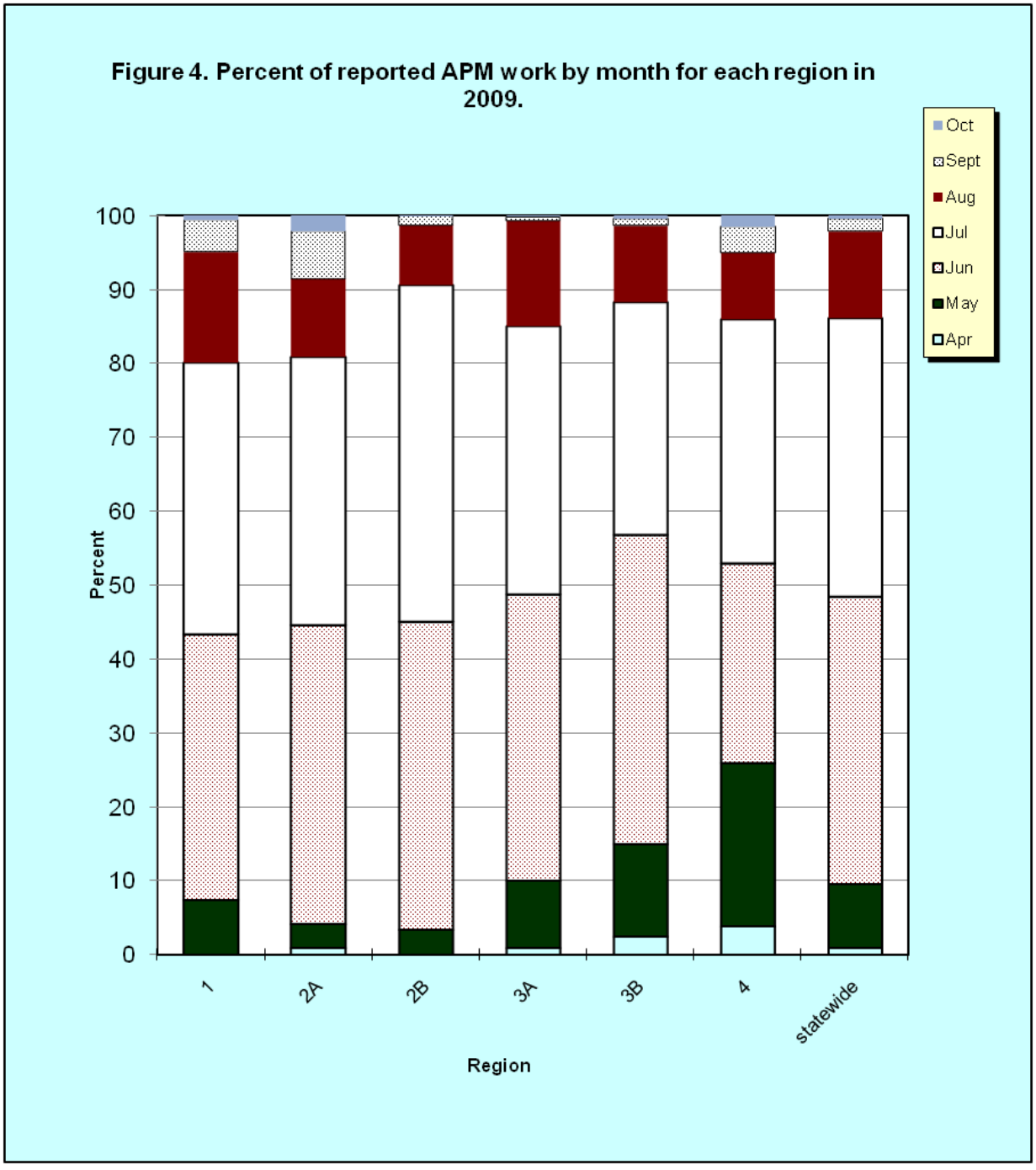
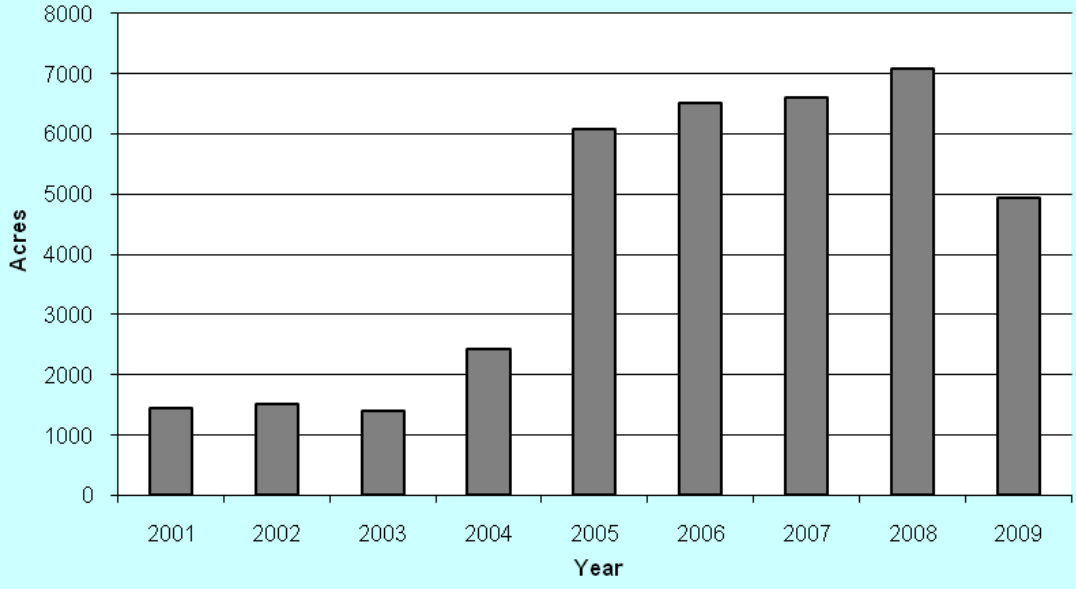



**Figure 4. Percent of reported APM work by month for each region in 2009.**

**Acres of aquatic plant control permitted**

The number of acres permitted for chemical control of submersed aquatic plants has fluctuated annually until 2005 when a sharp increase was recorded followed by continued modest annual increases (Figure 5). One contributing factor is the offshore control of aquatic vegetation 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 between 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, 2007, and 2008 with an aquatic herbicide to manage curly-leaf pondweed. In 2009, only about 254 acres of curly-leaf pondweed in Lake Benton was treated with endothall, resulting in a 2,750 acre decrease from Lake Benton alone.

**Figure 5. Permitted off-shore chemical control acreage of aquatic vegetation statewide from 2001-2009.**




**Aquatic plant control methods**

In 2009, about 42% of all permits issued for aquatic plant control permitted the use of plant removal with AAPCD's, up 3% over 2008. Aquatic plant control using herbicides, plant harvesting, and plant removal by hand, and aquatic plant restoration accounted for the remaining 58% 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 2009 are found in Table 3. Permit holders were asked if they performed the control over the

entire area allowed in their permit. Nearly 32% of those responding indicated that control work done was less than the area permitted, an 8% increase over 2008.

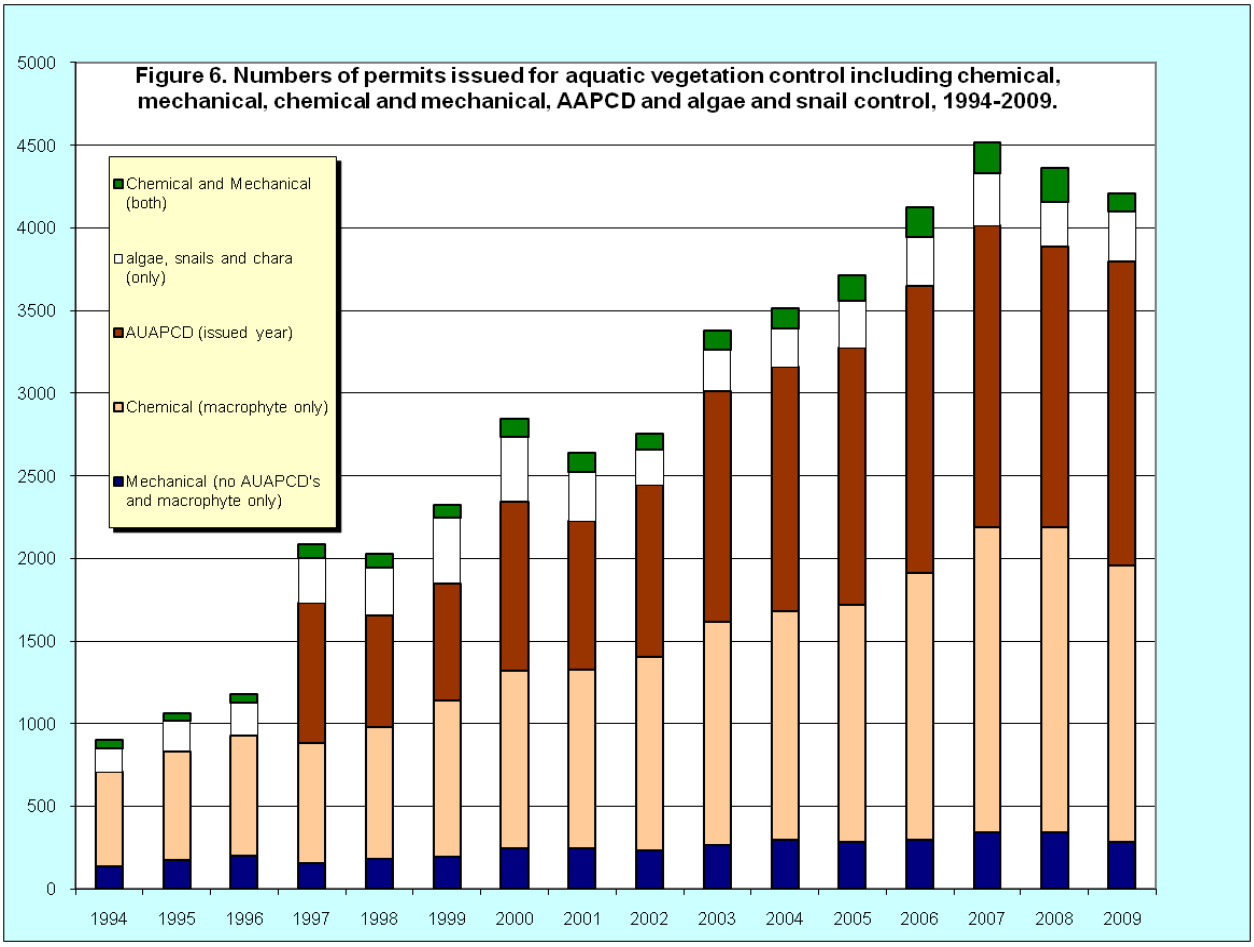



Table 3. Total near-shore area permitted, in acres, by region, for control of submerged vegetation, swimmer's itch and AAPCD use in 2009.

| Control | Region 1 | 2A | 2B | 3A | 3B | 4 | Total number of acres | Props | Ave. Prop. (sq. ft.). |
|---|---|---|---|---|---|---|---|---|---|
| Herbicide control excluding off shore treatment | 41.9 | 4.8 | 71.4 | 482.1 | 122.2 | 157.2 | 879.6 | 5,223 | 7,150 |
| Mechanical control excluding open water removal | 15.4 | 0.1 | 17.0 | 10.8 | 0.8 | 12.3 | 56.4 | 369 | 6,512 |
| Swimmer's itch control * | 37.4 | 6.9 | 67.3 | 431.3 | 121.6 | 81.2 | 845.7 | 4,464 | 7,108 |
| AAPCD | 66.5 | 0.1 | 27.9 | 9.7 | 13.6 | 4.9 | 122.7 | 1,826 | 2,852 |

* includes all permits with swimmers itch control

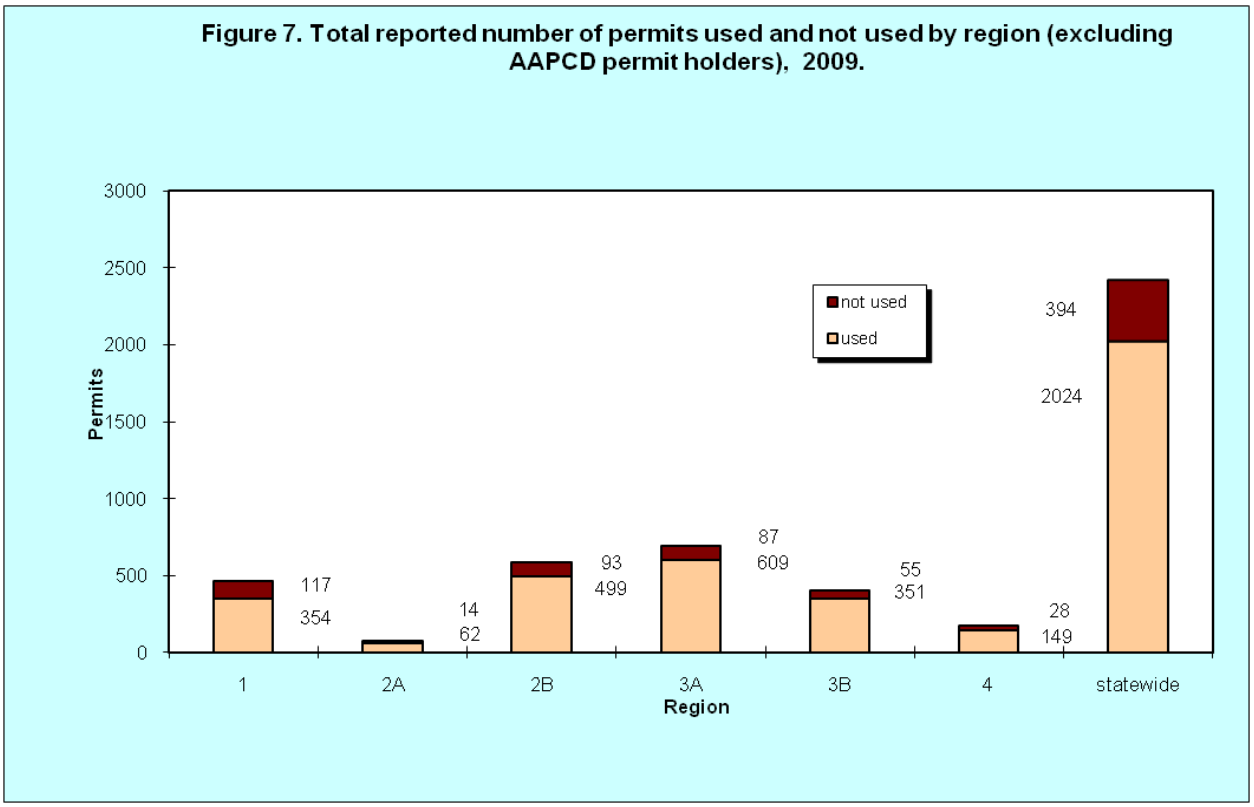
**Percent of Aquatic Plant Removal Permits Used**

Each year some permits issued for aquatic plant management activities are not used (Figure 7). Statewide, 75% of permits issued were reported used by the permittees who did their own control. Commercial applicators/operators reported using 92% of the permits issued for work they did. 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 2009, the reason most frequently given (46%) for not using an APM permit was for unidentified reasons.

Table 4. Response by permit holders to choices indicating that their APM permit was not used, expressed as a percent by region in 2009.

| Region | 1 | 2A | 2B | 3A | 3B | 4 | Statewide |
|---|---|---|---|---|---|---|---|
| nuisance condition did not develop | 13 | 21 | 19 | 4 | 21 | 11 | 14 |
| got permit too late | 10 | 14 | 9 | 6 | 2 | 14 | 8 |
| unable to do the work | 42 | 29 | 34 | 23 | 29 | 29 | 32 |
| other | 34 | 36 | 38 | 68 | 48 | 46 | 46 |
| total | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

2A = Grand Rapids, NE Region; 2B = Brainerd, NE Region; 3A = St. Paul, Central Region; 3B = Little Falls, Central Region



**Who does control**

Lakeshore homeowners perform about 40% of the permitted mechanical and herbicide plant control. Commercial applicators and mechanical control companies performed about 61% of the control work statewide in 2009. This represents a 1% increase over the percent of the work done by commercial applicator and aquatic plant harvesting companies in 2008. Permit holders in the Central Region hire commercial services more frequently than any other region (Figure 8). Commercial aquatic plant control companies perform about 84% of the control in the Metro Area. In 2009, 55% of the control in the Northeast Region was performed by commercial service. However, in the Brainerd Lakes Area (2B), of the NE Region most permitted control was done by commercial service. In the Grand Rapids area (2A) of the NE Region most control is done by the homeowner. Permit holders perform about 72% of the control in the Northwest Region and 60% in the South Region. The amounts of commercial and homeowner conducted control has remained relatively constant since 2002 (Figure 8a).

**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 62% of the respondents were satisfied with the results of herbicide control. About 71% of those responding were satisfied with the results of treatments to control swimmer's itch and 60% 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.

**Reapply for permit**

Permit holders, excluding AAPCD permittees, were asked if they would apply for a permit in 2009. Of the 1,082 responses, 775 (72%) said they would reapply next year, a 6% decrease from 2008. Approximately 17% (183) of the permit holders responding indicated that they were unsure if they would reapply for permit in 2010. The number of permittees reporting that they would not apply (16 or 1.5%) was slightly lower than in 2008**.** Regardless of their response, all 2009 permit holders whose permits expire will receive permit application materials prior to the start of the 2010 open water season.

**Figure 8. Percent of reported permitted APM work done by permittee and by commercial service for each region in 2009.**

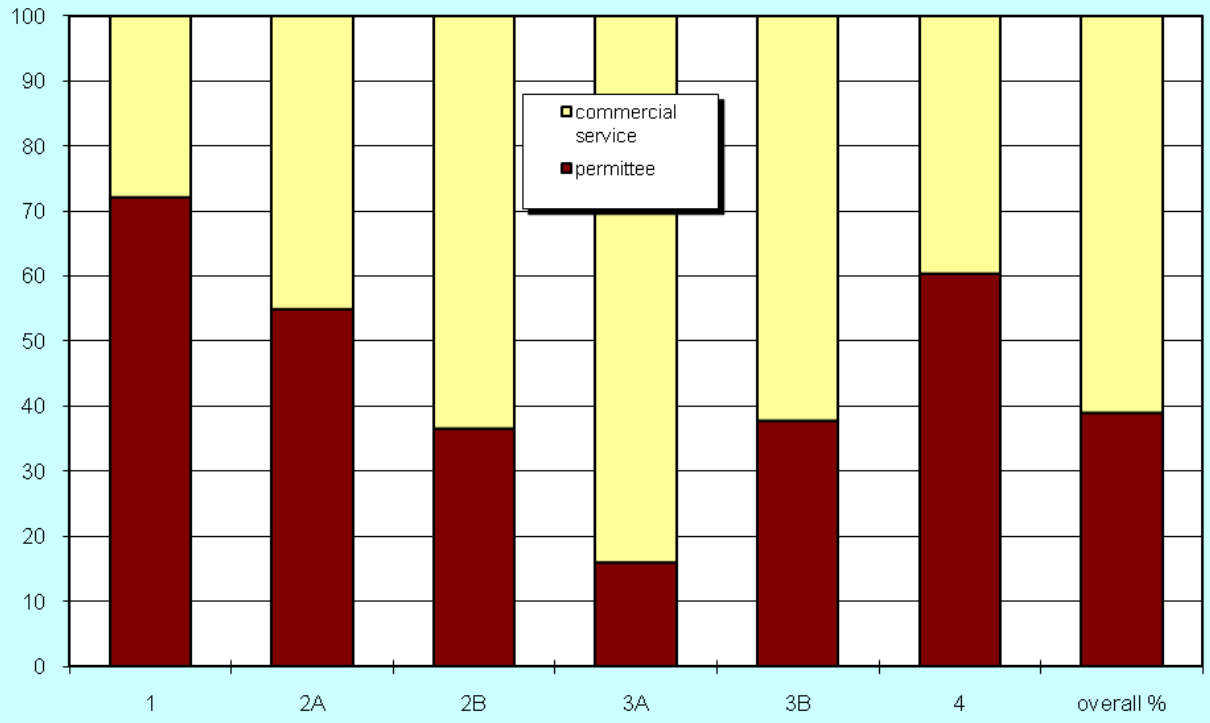
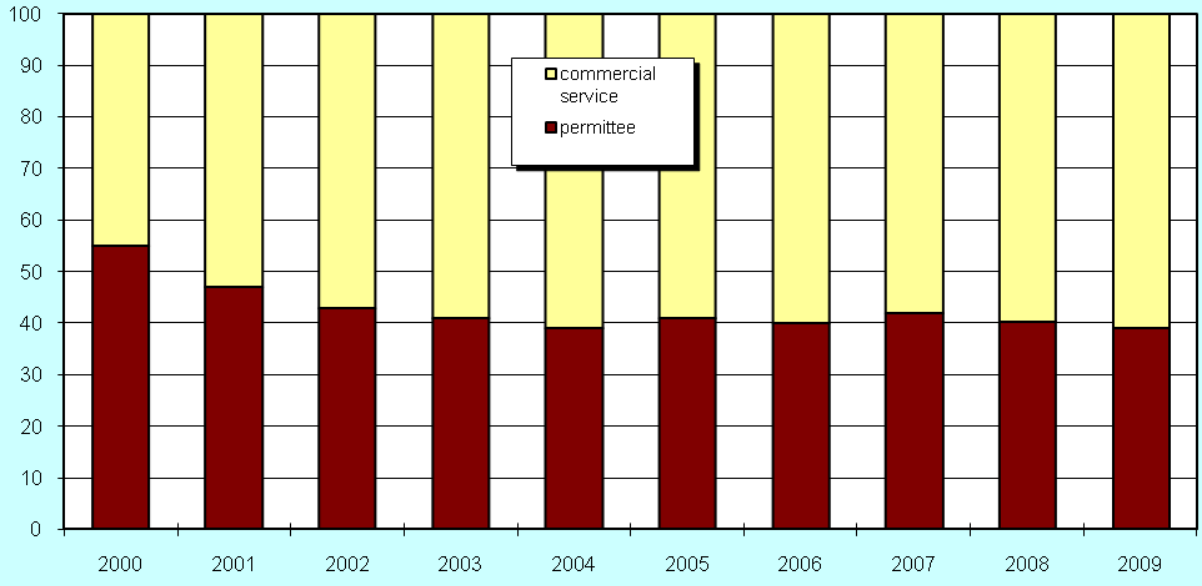



**Figure 8a. Percent of reported permitted APM work done by permittee and by commercial service statewide from 2000-2009.**



**Automated Aquatic Plant Control Devices (AAPCD)**
Before 1997 the operation of an automated aquatic plant control device did not automatically require an APM permit, and few AAPCD permits were issued. The Aquatic Plant Management Rules were revised in 1997 to require a permit for the operation of these devices because of their potential to excavate bottom sediments, and impact spawning habitat. In 2009 there were 1,842 permits issued for these devices statewide. Of those permits 487 were issued for a one-year term and 1,355 were issued for a three-year permit term. More than 76 percent of the AAPCD permits were issued in the Northwest and Northeast Regions; this is unchanged from 2008. In addition to the permits issued in 2009, there are active three-year permits issued in 2007 and 2008 (647 and 520 respectively). Of the 1,820 surveys mailed 1,640 (91%) of the AAPCD permit holders statewide responded to the questionnaire. Three-year AAPCD permit holders issued permits in 2007 and 2008 were not surveyed.

The APM rules provide two permit options for AAPCD operation. A person applying for a permit to operate the device in an area greater than 2,500 square feet is required to obtain an annual permit. However, a three-year permit option is available for persons who limit the size of the area of AAPCD operation to 2,500 square feet or less (*Minnesota Rules*, part 6280.0450, subp.3, item A). In addition, revisions to the APM rules implemented in the 2009 permit season restrict submersed aquatic plant removal to 100 feet of shoreline or one-half the owner's frontage whichever is less (*Minnesota Rules*, part 6280.0350, subp. 1a). Due to this change many more permit holders became eligible for an AAPCD permit of three year duration in 2009.

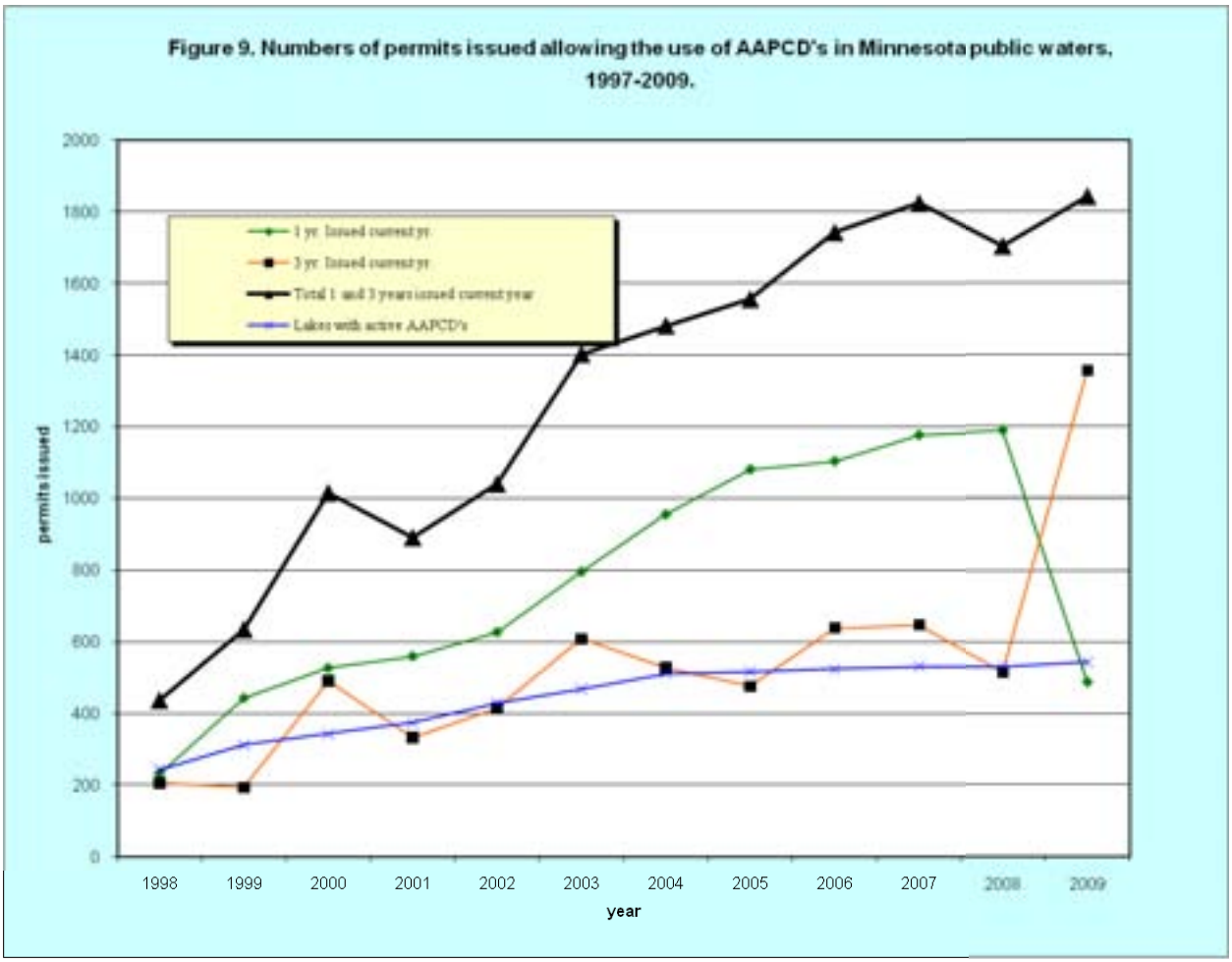
In 2009 there were 700 more three-year AAPCD permits than were issued 2008. The number of single season permits issued in 2009 decreased by the same amount (Figure 9). Persons who obtained a three-year permit in 2009 will not have to reapply again until the year 2012. Automated aquatic plant control device permit issuance was up nearly 8% in 2009 over 2008.

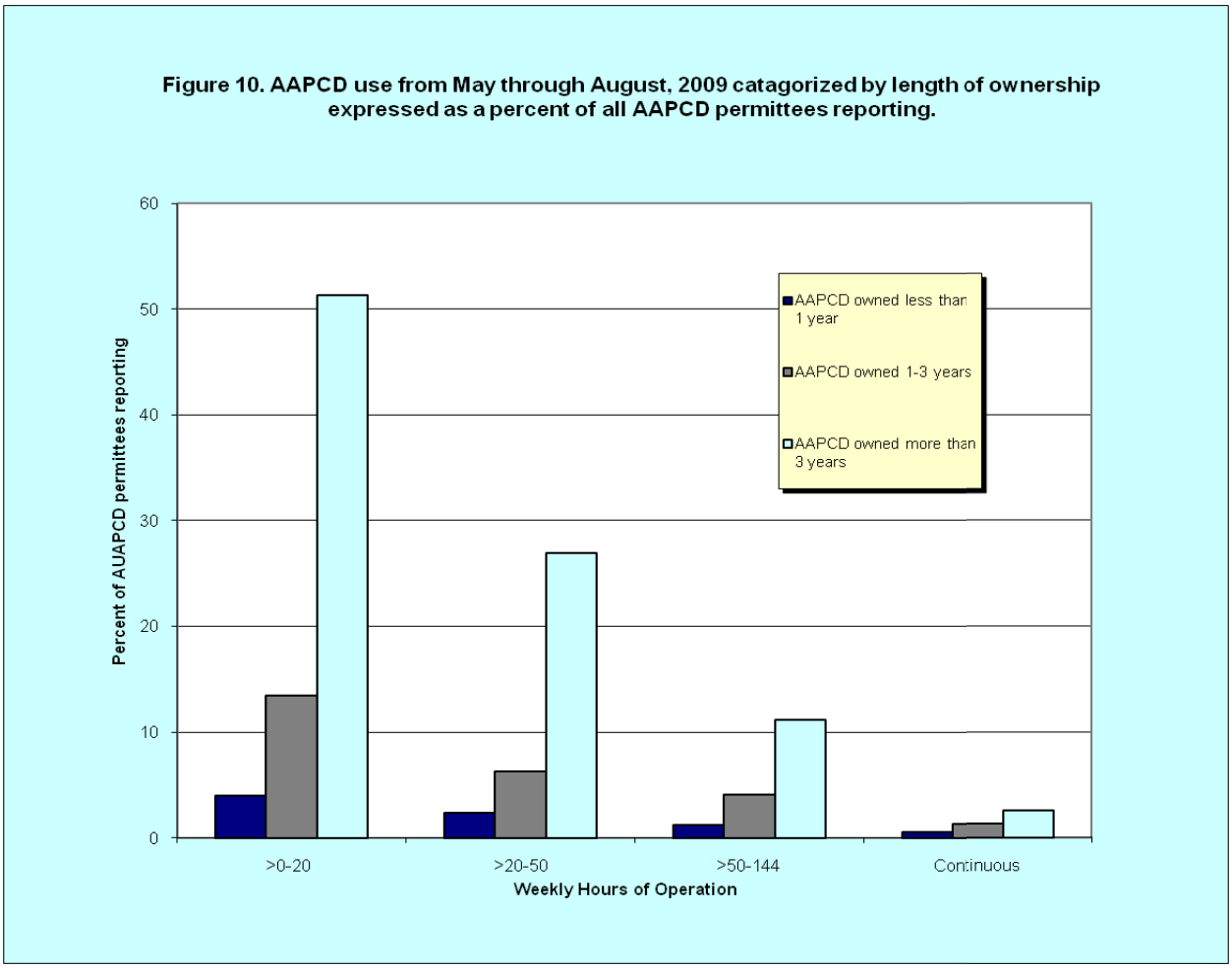
Most of the people responding to our questionnaire (85%) were the sole owner of an AAPCD. Nine permit holders stated that they rented their device in 2009. This was a small increase from those reporting renting in 2008. Some homeowners opt to purchase the device cooperatively and share it during the summer months. Approximately 15% of the people surveyed who used an AAPCD in 2009 either, rented, borrowed, owned and shared, or jointly owned their AAPCD, a 2% decrease from 2008.

There are at least three different companies producing AAPCD's that are used in Minnesota: the Crary Company WeedRoller®, the Colman Beach Groomer® and the Lake Restoration Lake Maid®. Fourteen permit holders reported that they used homemade devices in 2009. Based on survey results, 72% of AAPCD owners in Minnesota have owned their device for more than three years. In contrast, 20% have owned their device from 1 to 3 years and 8% have responded that they have owned their device for less than one year.

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. AAPCD permit holders were asked, how frequently do you operate your AAPCD? These responses were sorted by the length of time people had indicated they had owned the machine. Recent AAPCD owners are more likely to operate the device longer than those people who have owned the device for several years (Figure 10). About 193 persons permitted to operate an AAPCD stated that, for various reasons, they did not operate the device in 2009, up slightly from 2008.

**Figure 9. Numbers of permits issued allowing the use of AAPCD's in Minnesota public waters, 1997-2009.**






**Filamentous algae control**

The aquatic plant management rules allow the control of filamentous algae with copper sulfate. Filamentous algae can become a nuisance by interfering with swimming and wading. Permit issuance for filamentous algae control has increased at about the same rate as permits for submerged vegetation control (Figure 11). Filamentous algae control is commonly requested on applications for control performed by commercial services. Requests for filamentous algae control have declined in the last two years.

**Chara control**

The aquatic plant management rules allow the control of chara with copper sulfate. Chara is a macro-algae that can interfere with recreation in some lakes. In 2009 there were approximately 275 lakes where permits were issued for chara control (Figure 12).

**Figure 11. Numbers of permits issued for filamentous control, and numbers of lakes where permits were issued 1997-2009.**

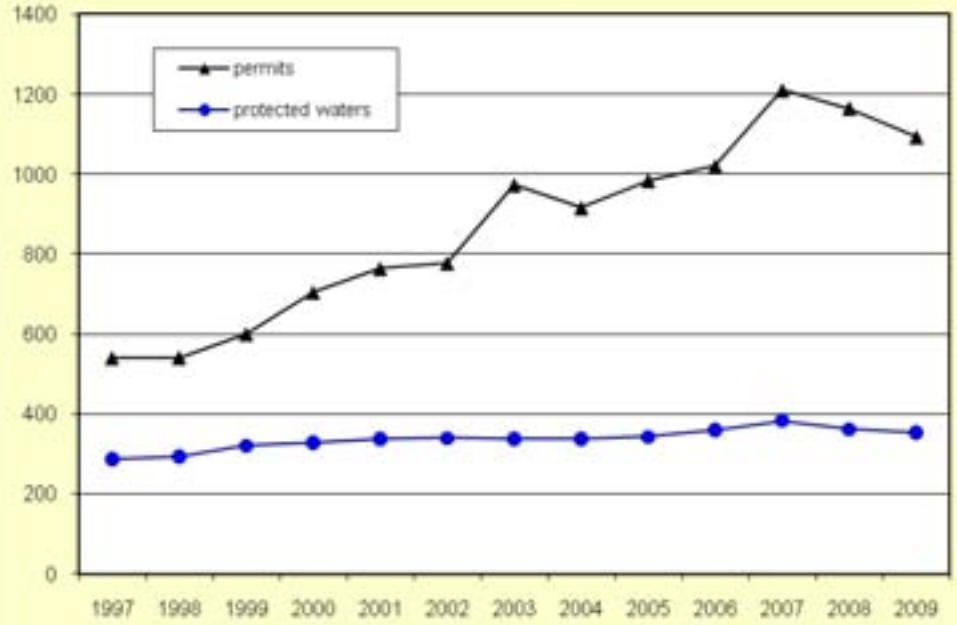
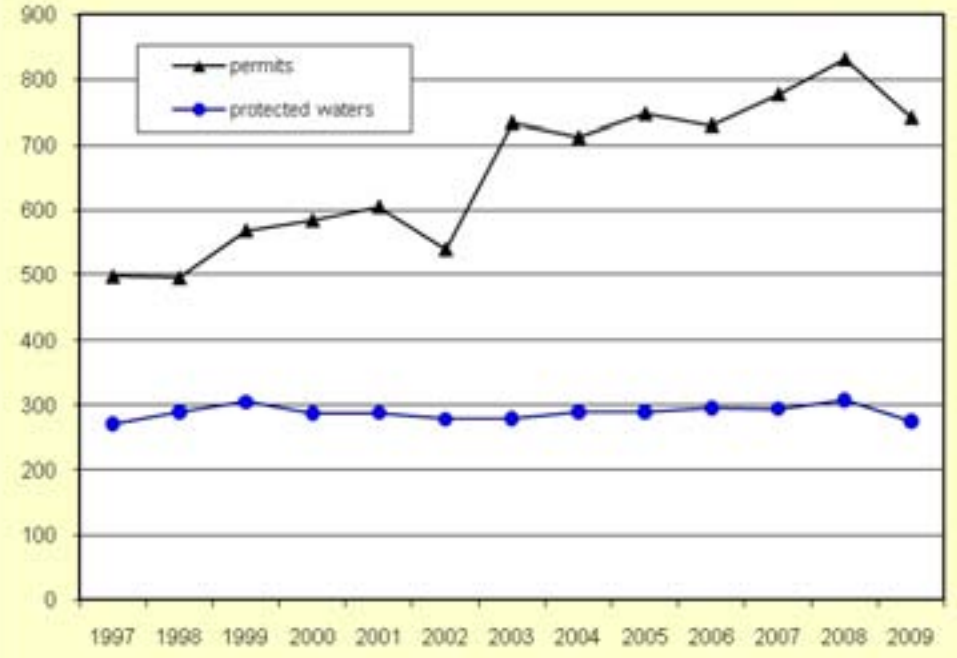



**Figure 12. Numbers of permits issued for chara control, and numbers of lakes where permits were issued 1997-2009.**

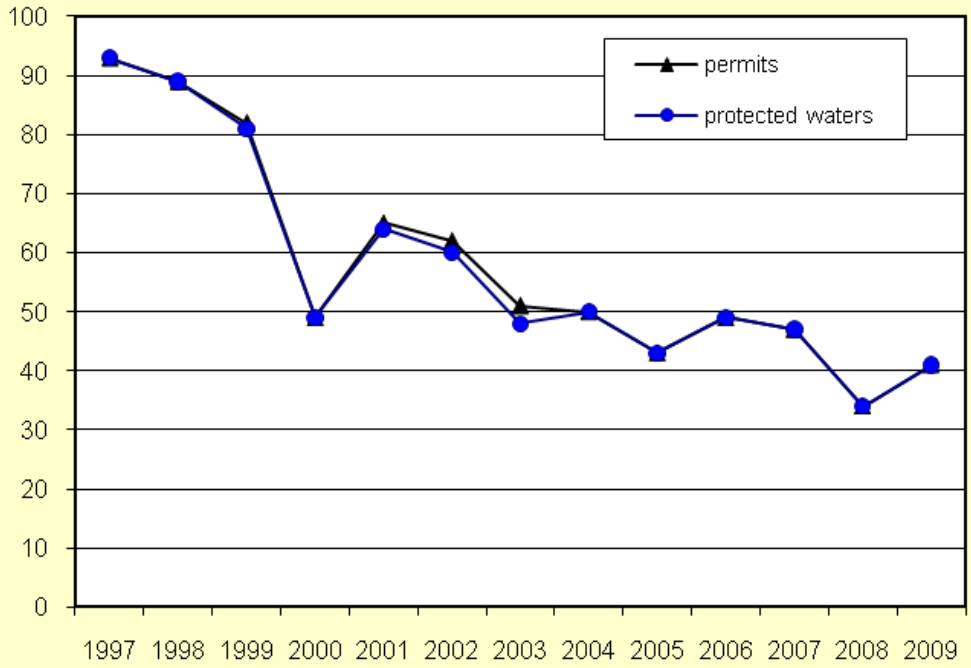


**Plankton algae control**

The aquatic plant management rules allow the control of plankton algae when there is an "excessive algae bloom." The characteristics of an "excessive algae bloom" as defined by the rules are: an algae population dominated by blue green algae, a Secchi disc reading typically 2 feet or less, floating mats or scums of algae have accumulated on the downwind shore, or decomposition of accumulated algae has occurred releasing a blue-green pigment and causing on offensive odor.

The numbers of lakes treated with algaecides to control plankton algae has been decreasing over the last ten years but was up slightly in 2009 (Figure 13). Copper sulfate treatments can cause an increase in water clarity when the turbidity is due to algae, but the increased water clarity is usually temporary and the treatment may need to be repeated. Due to the temporary nature of control, the possibility of a fish kill caused by a dissolved oxygen decline from decomposing algae, the buildup of copper in lake sediments, and the potential for algae to become resistant to copper, lake-wide plankton algae treatments are discouraged.

Figure 13. Numbers of permits issued for lake-wide plankton algae control, and numbers of lakes treated 1997-2009.




**Swimmer's itch control in Minnesota lakes**

A condition known as Swimmer's itch (a.k.a. lake itch, wader's itch) has garnered complaints from swimmers in Minnesota lakes since at least the 1800's and has likely been around for much longer. The cause of this irritating skin condition was discovered by W.W. Cort in 1928 at the University of Michigan Biological Station (Blankespoor and Reimink, 1991). Cort discovered that swimmer's itch (cercarial schistosome dermatitis) is caused by the immature life stage of common non-human schistosome trematodes called the cercaria.

These parasites have a complex life history. The adult fluke lives in the blood vessels lining the intestine of its definitive host where it reproduces and releases eggs. The eggs enter the gut and leave the animal in the feces. The eggs hatch when they enter the water becoming a larvae called a miracidia. The miracidia then infects a snail where it develops into a life stage called the cercaria. The cercaria, upon release from the snail, seeks its definitive host, usually some sort of waterfowl. The cercaria does not feed and will only live for about 24 hours unless they find a proper host. When a proper host is located the cercaria penetrates the skin, finds its way to the blood vessels lining the gut, and becomes an adult completing its life history.

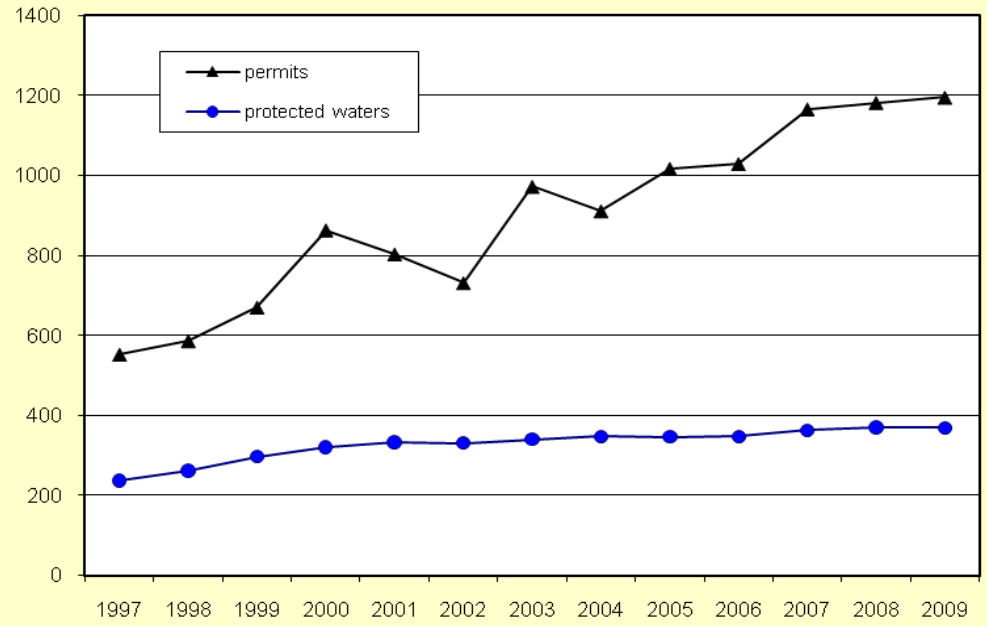
The problem for humans occurs when the cercaria mistakes us for its proper host. When a cercaria penetrates a human's skin it is attacked and killed by the person's immune system. Although the organism cannot complete its life history in humans, individuals sensitive to the infection can suffer from an allergic reaction. The symptoms will appear on areas of the body submersed in the lake and are typified by areas of redness and swelling, similar to a mosquito bite, and are accompanied by a severe itching sensation. These symptoms can last up to two weeks.

Not everyone is bothered by swimmer's itch; about 30 to 40% of the population is sensitive to swimmer's itch infection. This explains why some people swimming in a lake at the same time and place as a person severely affected experience no symptoms. Like other allergic reactions, a person's degree of sensitivity increases with each exposure.

Lakeshore property owners may get a permit from the DNR that allows the application of copper sulfate to the lake for the control of swimmer's itch. The intent of the copper sulfate application is to kill snails that harbor the immature life stage of the fluke that causes swimmer's itch. Individuals receiving a permit to control swimmer's itch with copper sulfate are generally allowed to treat the permitted area 3 times per summer.

The numbers of permits issued for swimmer's itch has increased steadily since 1997. The Brainerd Lakes Region has had more lakes per year with permitted swimmer's itch control than any other area of the state. In 2009 there were nearly 369 lakes statewide that were permitted for swimmer's itch control (Figure 14, Appendix Table H). About 66% of those responding were satisfied with the results of treatments to control swimmer's itch, down slightly from 2008.

**Figure 14. Numbers of permits issued for swimmer's itch control, and numbers of lakes where permits were issued. 1997-2009.**




**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 three, non-native invasive aquatic plants: curly-leaf pondweed, purple loosestrife, and Eurasian watermilfoil. The DNR has recently initiated a pilot project to learn if ecological benefits can be attained from lake-wide control of curly-leaf pondweed or Eurasian watermilfoil or both.

**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 752 Minnesota lakes in 70 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. Before the plants die they form vegetative propagules called turions (hardened stem tips). New plants sprout from turions 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 provide relief to lakeshore property owners from the recreational nuisances caused by surface mats of curly-leaf pondweed, but have 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 should become depleted, resulting in the reduction of overall abundance of the plant, the severity of algae blooms, and give native vegetation a competitive advantage.

Figure 15 shows how interest, reflected by the numbers of permits issued, in curly-leaf pondweed control has increased since the completion of the Army Corp of Engineers research on early season cold-water control.

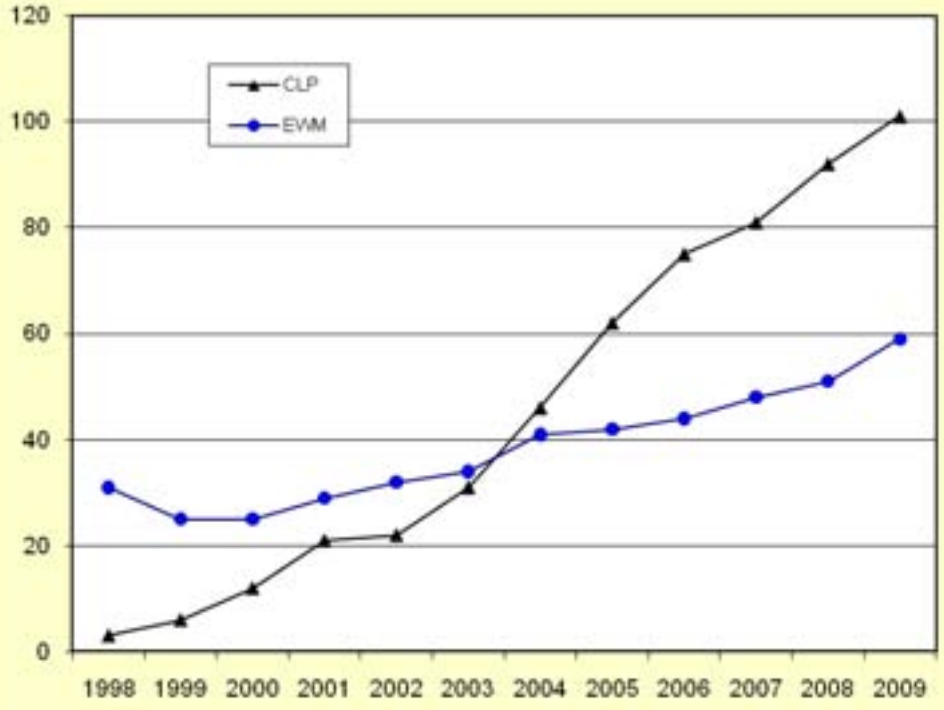
The Department of Natural Resources is conducting early season curly-leaf pondweed treatments in cooperation with several lake associations on a trial basis to determine the effectiveness of this strategy. In 2009, 18 pilot project lakes were treated with Endothall to control curly-leaf pondweed. Four others were treated with triclopyr and endothall to control both curly-leaf pondweed and Eurasian watermilfoil. These lakes will be treated and monitored for at least three successive years to determine if it is possible to produce ecological benefits such as:

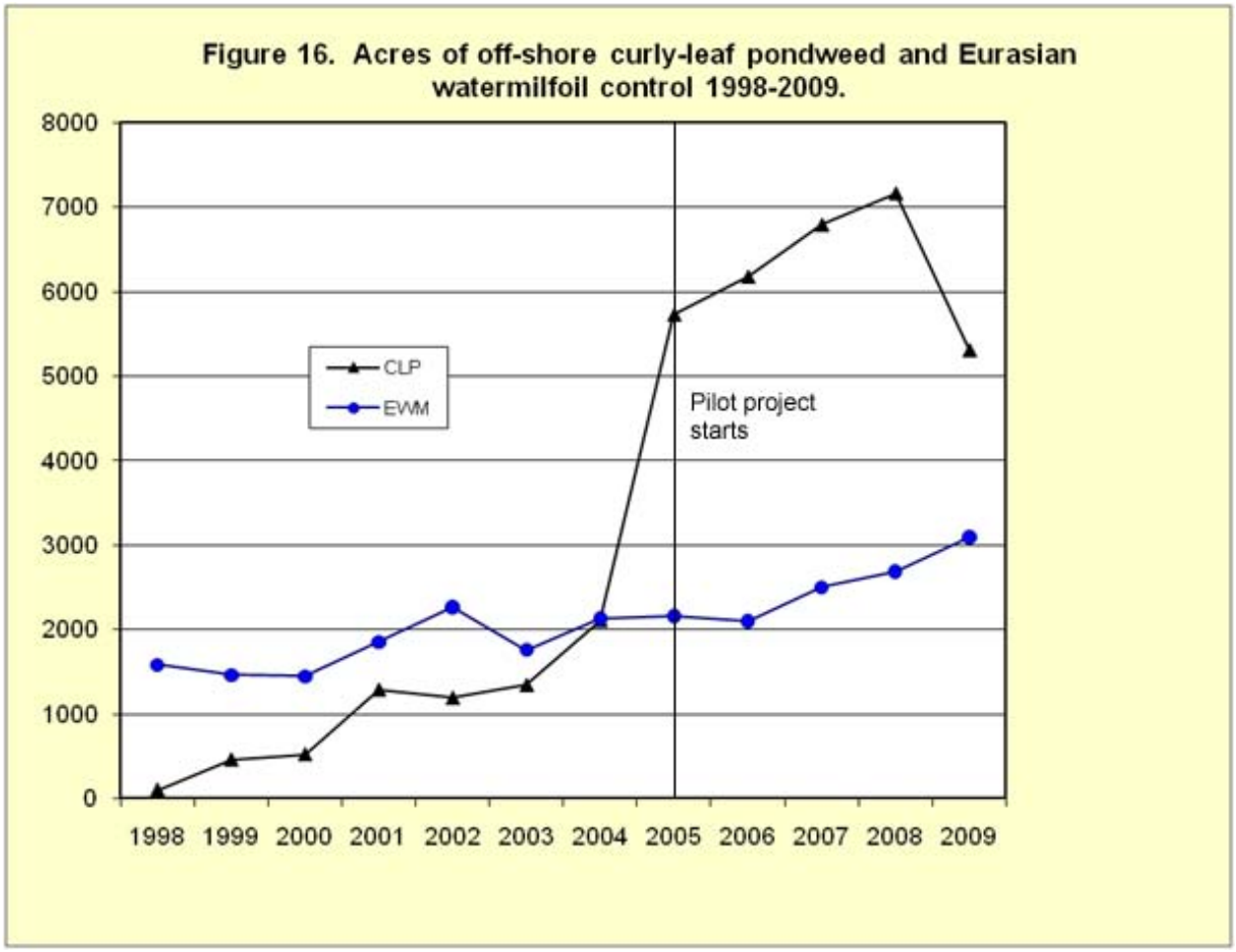
1. Reduce peaks in concentrations of phosphorous and associated algal blooms.
2. Reduce the abundance of curly-leaf pondweed for long periods of time.
3. Increase the abundance of native, submersed aquatic plants.
4. Reduce the interference with use of the lake caused by curly-leaf pondweed.

The development of the pilot project program has significantly influenced the numbers of acres of curly-leaf pondweed and Eurasian watermilfoil treated since the programs beginning in 2005 (Fig. 16). The large decrease in curly-leaf pondweed treated in 2009 is due to the change in treatment strategy for 3,000 acre lake Benton. Prior to 2009, Lake Benton was subjected to whole lake treatments with fluridone herbicide. In 2009, only about 254 acres were treated for control of curly-leaf pondweed in Lake Benton with the contact herbicide endothall.

More detailed information on this project can be found in the 2009 Invasive Species Program Annual report for (http://files.dnr.state.mn.us/ecological_services/invasives/annualreport.pdf).

**Figure 15. Numbers of permit issued for curly-leaf pondweed and Eurasian watermilfoil control 1998-2009.**






**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. Minnesota has designated purple loosestrife as a noxious weed, which makes it illegal to import, buy, sell, propagate and transport.

The main components of the purple loosestrife program are:

- Inventory purple loosestrife sites to prioritize control efforts.
- Carry out management activities including chemical and biological control.
- Support research to evaluate and improve 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. The highest priority stands for herbicide treatment are small, recently established stands, located near the top 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 2009, DNR staff treated a total of 57 purple loosestrife sites with 0.35 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 2009 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:

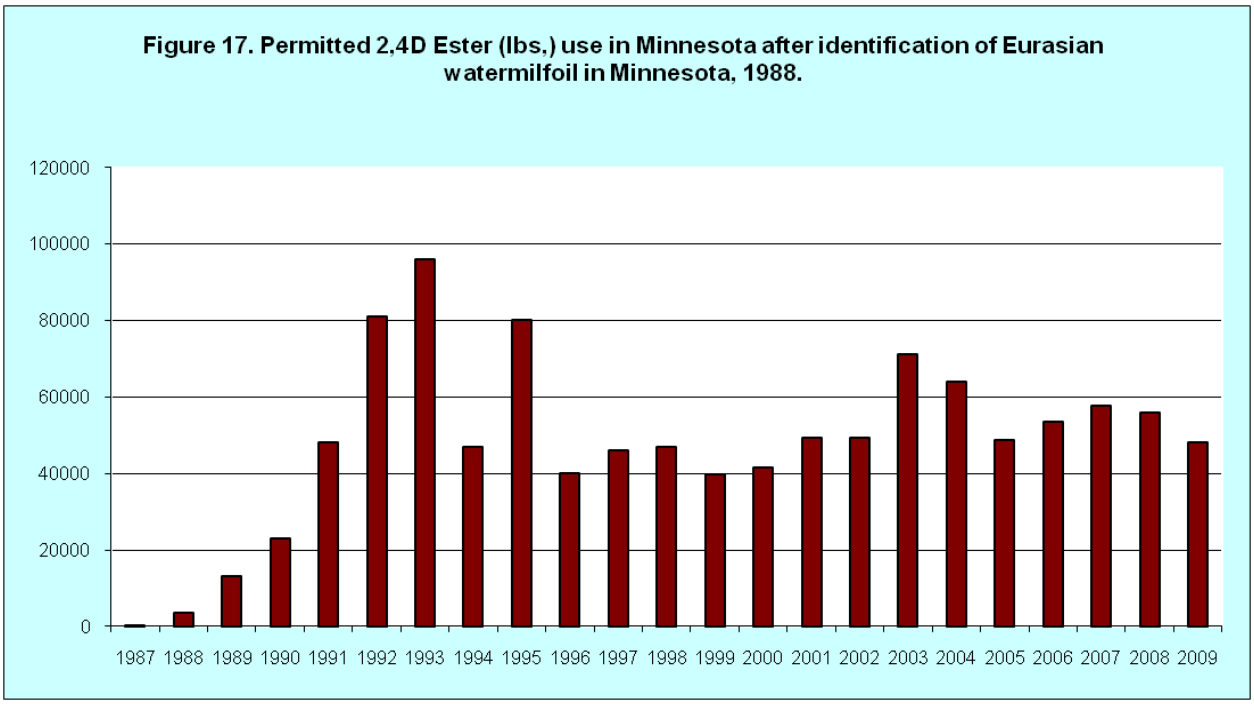
- Slow the spread of the plant through public education and awareness activities.
- Support management by lake associations and local units of government of problems caused by milfoil.
- Maintain an accurate inventory of populations.
- Investigate new control methods and the biology of the plant.

Eurasian watermilfoil was discovered in 12 additional water bodies in 2009. There are now 232 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 2009 for milfoil was 48,000 pounds. The total reported annual use of 2,4-D ester products since 1987 is provided in Figure 17.

For more detailed information on the management of invasive species see the 2009 Invasive Species Program Annual Report. The report may be reviewed on line at http://www.dnr.state.mn.us/ecological_services/invasives/index.html.

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Catling, P.M. and I. Dobson. 1985. The biology of Canadian weeds. 69. Potamogeton crispus L. Canadian Journal of Plant Science 65:655-668.

# APPENDIX

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) |
|---|---|---|---|
| Part 1. Aquatically labeled systemic herbicides. | | | |
| Aquacide (Pellet) | X | | 2,4 Dichlorophenoxyacetic Acid (Sodium Salt) |
| Navigate (Granular) | X | | 2,4 Dichlorophenoxyacetic (Butoxyethyl Ester) |
| Riverdaletm (Granular) | X | | 2,4 Dichlorophenoxyacetic (Isooctyl Ester) |
| SEE 2,4-D (Liquid) | X | | 2,4 Dichlorophenoxyacetic (Isooctyl Ester) |
| Weedtrine II (Granular) | X | | 2,4 Dichlorophenoxyacetic (Isooctyl Ester) |
| Sonar™ (Liquid or Granular) | | X | Fluridone |
| Rodeo (Liquid) | | X | Isopropylamine salt of Glyphosate |
| Pondmaster (Liquid) | | X | Isopropylamine salt of Glyphosate |
| Renovate | | X | Triclopyr |
| Kraken | | X | Triclopyr |
| Part 2. Contact Herbicides. | | | |
| Aquathol (Liquid or Granular) | | X | Dipotassium salt of endothall |
| Hydrothol 191 (Liquid or Granular) | | X | Mono-amine salt of endothall (*liquid by licensed applicator only)* |
| Reward (Liquid) | | X | Diquat dibromide *(licensed applicator only)* |
| Part 3. Copper Compounds (Algaecides and Herbicides). | | | |
| Cutrine Plus (Liquid or Granular) | X (A) | | Copper-Ethonalamine complex |
| Komeen (Liquid) | X (H) | | Copper-Ethylenediamine complex |
| Symmetry | X (A) | | Copper-Triethanolamine complex |
| Part 4. Other. | | | |
| Copper sulfate | X (A) | X | CuSO4 (wide variety of registered brands) |
| Aquashade (Liquid) | | | Acid Blue 9 / Acid Yellow 23 (Filters light in wavelengths required for plant growth) |

Table B. Reported aquatic herbicide use under DNR permit, 1981-2009.

| 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 | 40 | 0 | 830 | 1,000 | 1,600 | 5,000 | 240 | 34,600 |
| 1994 | 45,000 | 70 | 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 | 47,000 |
| 2007 | 57,700 | 971 | 85 | 1,320 | 9,838 | 3,685 | 10,105 | 782 | 46,000 |
| 2008 | 56,000 | 655 | 7.4 | 2,462 | 13,208 | 2,643 | 10,693 | 550 | 32,290 |
| 2009 | 48,250 | 655 | 939 | 725 | 13,801 | 1,791 | 7,963 | 1,758 | 25,234 |

* Data not available

Table C.

## 2009 AQUATIC PLANT MANAGEMENT SURVEY

Please check the appropriate circle.

1. Was your 2009 permit used? ○ Yes, permitted work was done.

   ○ No, because: The nuisance conditions did not develop.
   ○ No, because: I got the permit too late.
   ○ No, because: I was unable to get the work done.
   ○ No, because: Thanks! Please use the back for comment

2. When my permit expires: ○ I will reapply for a permit. ○ I have a permanent and non-transferable permit.
   ○ I will not apply for a permit.
   ○ I am undecided at this time.

3. The method of control wa ○ cutting or pulling.
   ○ chemical treatment.
   ○ cutting or pulling and chemical treatment.

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

   ○ YES ○ NO ○ wasn't as good as expecte

   B. If you treated for Swimmers Itch were you satisfied with the contr

   ○ YES ○ NO ○ wasn't as good as expecte

5. When was the work done?

   ○ April ○ May ○ June ○ July ○ August ○ Septembe ○ October ○ November ○ uncertain

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

   ○ Yes, control work was done on the entire area permitt
   ○ No, less control work was done than the permit allow

7. If you used herbicide, please indicate what you used and how muc

| What Did You Use? | How much concentrated product did you use before mixing? circle the mea: | | |
|---|---|---|---|
| Copper sulphate _____ lbs. | | Aquakleen/Navigate _____ lbs. | |
| gran.Hydrothol 191 _____ lbs. | | Aquacide _____ lbs. | |
| liq. Aquathol K _____ gal., qts., oz | | liq. Cutrine Plus _____ gal., qts., oz. | |
| gran.Aquathol _____ lbs. | | gran. Cutrine Plus _____ lbs. | |
| liq. Hydrothol 191 _____ gal., qts., oz | | Rodeo _____ gal., qts., oz. | |
| Reward _____ gal., qts., oz | | other: _____ lbs., gal., qts., oz | |
| | | other: _____ lbs., gal., qts., oz | |

**We value your comments. Please use the back side. Thanks!**

**Note**: Please return this survey as soon as possible.

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<<FIRSTNAME>><<LASTNAME>>
<<ADDRESS>>
<<CITY>>, <<STATE><<ZIPCODE>>

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Table D.

## 2009 AQUATIC PLANT MANAGEMENT SURVEY

Automated Untended Aquatic Plant Control Device (AUAPCD)

**Please check the appropriate circle.**

1. **The type of AUAPCD device I have a permit for is a:**
   - ○ WeedRoller
   - ○ Beach Groomer
   - ○ Lake Maid
   - ○ home made

2. **I used an AUAPCD this year.**
   - ○ Yes
   - ○ No, I did not use an AUAPCD this yea
   - ○ I'll explain on the back side

3. **The AUAPCD I used in 2009-**

| I have owned for: | Is jointly owned and shared with the other co-owners and has been for: | |
|---|---|---|
| ○ **less than 1 year** | ○ **less than 1 year** | ○ **was rented.** |
| ○ **1 - 3 years** | ○ **1 - 3 years** | ○ **was borrowed.** |
| ○ **more than 3 years** | ○ **more than 3 years** | |

4. **How long each month (in hours) did you operate your AUAPCD ?**

| | not used | few hours >0-20 | several hours >20-50 | many hours >50-14< | continuous |
|---|---|---|---|---|---|
| In May: | ○ | ○ | ○ | ○ | ○ |
| In June: | ○ | ○ | ○ | ○ | ○ |
| In July: | ○ | ○ | ○ | ○ | ○ |
| In August: | ○ | ○ | ○ | ○ | ○ |

**We value your comments. Please use the back side. Thanks!**

**Note**: Please return this survey as soon as possible.

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<<FIRSTNAME>><<LASTNAME>>
<<ADDRESS>>
<<CITY>> <<STATEPCODE>>

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Table E. Aquatic Pesticide Enforcement Citizen Complaint Investigations, 2009.

| Date | Complaint | Lake Name | County | Observation | Action | Result |
|---|---|---|---|---|---|---|
| June 18 | Unauthorized commercial herbicide treatment | Rush Lake | Chisago | Not observed | Interviewed complainant and applicator | No evidence of wrong doing. |
| May 29 | Unauthorized commercial herbicide treatment. | South Center | Chisago | Not observed | Interviewed applicator | No unauthorized property treated. |
| August 29 | Copper sulfate spill | Marion Lake | Scott | Not observed | Site application made on Sept. 1 | No evidence of copper sulfate. Some bays had a rich blue-green algae bloom. |
| August 31 | Unauthorized herbicide treatment. | Martin Lake | Anoka | Personal observation | Referred to area APM Specialist | Unknown |

Table F. Aquatic Pesticide Enforcement Use Inspections, 2009.

| Treatment Date | County | Lake | Applicator | Number of Treatments Inspected |
|---|---|---|---|---|
| 4/27 | Scott | O'Dowd | Midwest AquaCare | 1 |
| 4/27 | Sherburne | Julia | Lake Management | 1 |
| 4/27 | Sherburne | Rush | Lake Management | 1 |
| 4/28 | Stearns | Schneider | Professional Lake Management | 1 |
| 4/28 | Hennepin | Weaver | Lake Restoration | 1 |
| 5/4 | Morrison | Stearns | Professional Lake Management | 1 |
| 5/5 | Hennepin | Schmidt | Professional Lake Management | 1 |
| 5/11 | Crow Wing | Lower Mission | Professional Lake Management | 1 |
| 5/14 | Hennepin | Libbs Mtka | Midwest AquaCare | 2 |
| 5/14 | Chisago | Green | Green Lake Association | 1 |
| 5/19 | Wright | Sugar | Lake Restoration | 1 |
| 5/21 | Crow Wing | Lower Cullen | Professional Lake Management | 1 |
| 5/21 | Washington | Sunset | Maki (private party)1 | 1 |
| 5/27 | Chisago | North Center | Lake Restoration | 2 |
| 5/28 | Hennepin | Bass | Lake Management | 2 |
| 6/1 | Chisago | Rush (West) | Lake Restoration | 2 |
| 6/3 | Ramsey | Gervais | Lake Improvement Consulting | 2 |
| 6/3 | Wright | Clearwater | Clearwater Lake Property Owners | 1 |
| 6/5 | Hennepin | Sarah | Professional Lake Management | 2 |
| 6/9 | Hennepin | Parkers | Lake Restoration | 2 |
| 6/10 | Wright | Augusta | Lake Augusta Imp. | 1 |
| 6/11 | Hennepin | Carsons Mtka | Lake Management | 2 |
| 6/13 | Scott | Prior | Kneafsy's Cove Homeowners | 1 |

Table F. (Continued)

| Treatment Date | County | Lake | Applicator | Number of Treatments Inspected |
|---|---|---|---|---|
| 6/15 | Hennepin | Forest Mtka | Lake Restoration | 2 |
| 6/16 | Washington | White Bear | White Bear Yacht Club | 1 |
| 6/18 | Wright | Sylvia | Greater Lake Sylvia Homeowners | 1 |
| 6/19 | Hennepin | Fish | Jacobson Environmental | 1 |
| 6/22 | Dakota | Rogers | Midwest AquaCare | 1 |
| 7/7 | Isanti | Blue | Lake Management | 2 |
| 7/22 | Todd | Little Birch | Professional Lake Management | 1 |
| 8/5 | Mille Lacs | Mille Lacs | Midwest AquaCare | 1 |

Table G. Statewide numbers of permits and properties by county, 2009.

| County | Properties | Permits |
|---|---|---|
| Aitkin | 189 | 158 |
| Anoka | 189 | 57 |
| Becker | 294 | 294 |
| Beltrami | 21 | 21 |
| Benton | 1 | 1 |
| Blue Earth | 3 | 3 |
| Brown | 3 | 3 |
| Carlton | 26 | 26 |
| Carver | 352 | 79 |
| Cass | 284 | 262 |
| Chisago | 326 | 78 |
| Clay | 11 | 11 |
| Clearwater | 11 | 11 |
| Cottonwood | 2 | 2 |
| Crow Wing | 1,084 | 686 |
| Dakota | 395 | 636 |
| Douglas | 220 | 220 |
| Faribault | 53 | 3 |
| Freeborn | 24 | 24 |
| Grant | 7 | 7 |
| Hennepin | 1,964 | 385 |
| Houston | 1 | 1 |
| Hubbard | 77 | 77 |
| Isanti | 113 | 39 |
| Itasca | 36 | 36 |
| Jackson | 1 | 1 |
| Kanabec | 34 | 14 |
| Kandiyohi | 110 | 103 |
| Kittson | 1 | 1 |
| Koochiching | 1 | 1 |
| Lake of the Woods | 1 | 1 |
| LeSueur | 312 | 58 |
| Lincoln | 3 | 3 |
| McLeod | 30 | 4 |
| Mahnomen | 4 | 4 |
| Martin | 4 | 4 |

Table G. (Continued)

| County | Properties | Permits |
|---|---|---|
| Meeker | 176 | 33 |
| Mille Lacs | 37 | 20 |
| Morrison | 211 | 96 |
| Murray | 4 | 4 |
| Nicollet | 3 | 3 |
| Nobles | 2 | 2 |
| Olmsted | 2 | 2 |
| Ottertail | 646 | 646 |
| Pine | 152 | 51 |
| Pipestone | 1 | 1 |
| Polk | 3 | 3 |
| Pope | 71 | 71 |
| Ramsey | 795 | 74 |
| Rice | 132 | 15 |
| Rock | 3 | 3 |
| Roseau | 1 | 1 |
| St. Louis | 34 | 34 |
| Scott | 337 | 47 |
| Sherburne | 202 | 58 |
| Stearns | 263 | 102 |
| Steele | 3 | 3 |
| Todd | 166 | 137 |
| Wabasha | 1 | 1 |
| Wadena | 11 | 11 |
| Waseca | 4 | 4 |
| Washington | 468 | 117 |
| Watonwan | 1 | 1 |
| Wright | 805 | 235 |

Table H. Lakes with nine or more total permits issued for swimmer's itch from 1997 through 2009.

| Region | County | Lake | Total permits issued |
|---|---|---|---|
| 1 | Becker | Detroit | 33 |
| 1 | Becker | Height of Land | 11 |
| 1 | Becker | Sallie | 13 |
| 1 | Beltrami | Julia | 11 |
| 1 | Clay | Blue Eagle | 12 |
| 1 | Douglas | Carlos | 23 |
| 1 | Douglas | Darling | 28 |
| 1 | Douglas | Geneva | 14 |
| 1 | Douglas | Ida | 47 |
| 1 | Douglas | Irene | 75 |
| 1 | Douglas | Le Homme Dieu | 52 |
| 1 | Douglas | Miltona | 46 |
| 1 | Grant | Pelican | 17 |
| 1 | Grant | Pomme De Terre | 12 |
| 1 | Hubbard | Alice | 11 |
| 1 | Hubbard | Big Sand | 21 |
| 1 | Hubbard | Fishhook | 11 |
| 1 | Hubbard | Long (South) | 2 |
| 1 | Otter Tail | East Battle | 19 |
| 1 | Otter Tail | Jewett | 18 |
| 1 | Otter Tail | Marion | 26 |
| 1 | Otter Tail | Rush | 23 |
| 1 | Otter Tail | Stalker | 12 |
| 1 | Otter Tail | Wall | 25 |
| 1 | Pope | Amelia | 25 |
| 1 | Pope | Linka | 49 |
| 1 | Pope | Minnewaska | 28 |
| 1 | Pope | Scandinavian | 12 |
| 2a | Carlton | Eagle | 52 |
| 2a | Carlton | Tamarack | 13 |
| 2a | Itasca | Bowstring | 11 |
| 2a | Itasca | Jessie | 16 |
| 2a | Itasca | Sand | 17 |
| 2a | Itasca | Swan | 92 |
| 2a | St. Louis | Big Sturgeon | 16 |
| 2a | St. Louis | Long | 22 |
| 2b | Aitkin | Big Sandy | 33 |
| 2b | Aitkin | Farm Island | 109 |
| 2b | Aitkin | Gun | 38 |

Table H. Continued.

| Region | County | Lake | Total permits issued |
|---|---|---|---|
| 2b | Aitkin | Hanging Kettle | 10 |
| 2b | Aitkin | Little Pine | 16 |
| 2b | Aitkin | Minnewawa | 30 |
| 2b | Aitkin | Round | 23 |
| 2b | Aitkin | Spirit | 22 |
| 2b | Cass | Birch | 15 |
| 2b | Cass | Gull | 313 |
| 2b | Cass | Margaret | 14 |
| 2b | Cass | Roosevelt | 60 |
| 2b | Cass | Sylvan | 31 |
| 2b | Cass | Upper Gull | 22 |
| 2b | Crow Wing | Bay | 51 |
| 2b | Crow Wing | Bertha | 74 |
| 2b | Crow Wing | Big Pine | 20 |
| 2b | Crow Wing | Big Trout | 59 |
| 2b | Crow Wing | Blackhoof | 9 |
| 2b | Crow Wing | Cedar | 13 |
| 2b | Crow Wing | Clamshell | 15 |
| 2b | Crow Wing | Clark | 14 |
| 2b | Crow Wing | Clearwater | 5 |
| 2b | Crow Wing | Crooked | 15 |
| 2b | Crow Wing | Cross | 65 |
| 2b | Crow Wing | Crow Wing | 49 |
| 2b | Crow Wing | Daggett | 45 |
| 2b | Crow Wing | Eagle | 9 |
| 2b | Crow Wing | Edward | 15 |
| 2b | Crow Wing | Gilbert | 76 |
| 2b | Crow Wing | Gladstone | 16 |
| 2b | Crow Wing | Hubert | 20 |
| 2b | Crow Wing | Island | 18 |
| 2b | Crow Wing | Little Hubert | 21 |
| 2b | Crow Wing | Little Pine | 42 |
| 2b | Crow Wing | Love | 22 |
| 2b | Crow Wing | Lower Cullen | 39 |
| 2b | Crow Wing | Lower Hay | 32 |
| 2b | Crow Wing | Lower Mission | 29 |
| 2b | Crow Wing | Middle Cullen | 17 |
| 2b | Crow Wing | Nisswa | 30 |
| 2b | Crow Wing | North Long | 102 |

Table H. Continued.

| Region | County | Lake | Total permits issued |
|---|---|---|---|
| 2b | Crow Wing | O'Brien | 41 |
| 2b | Crow Wing | Ossawinnamakee | 42 |
| 2b | Crow Wing | Pelican | 46 |
| 2b | Crow Wing | Perch | 53 |
| 2b | Crow Wing | Pig | 18 |
| 2b | Crow Wing | Portage | 18 |
| 2b | Crow Wing | Red Sand | 20 |
| 2b | Crow Wing | Round | 138 |
| 2b | Crow Wing | Roy | 57 |
| 2b | Crow Wing | Rush | 79 |
| 2b | Crow Wing | Serpent | 114 |
| 2b | Crow Wing | Sibley | 21 |
| 2b | Crow Wing | South Long | 106 |
| 2b | Crow Wing | Upper Cullen | 16 |
| 2b | Crow Wing | Upper Hay | 70 |
| 2b | Crow Wing | Upper Mission | 26 |
| 2b | Crow Wing | Upper South Long | 57 |
| 2b | Crow Wing | Web | 28 |
| 2b | Crow Wing | West Fox | 16 |
| 2b | Crow Wing | White Sand | 45 |
| 2b | Crow Wing | Whitefish | 142 |
| 2b | Mille Lacs | Mille Lacs | 40 |
| 3a | Anoka | Centerville | 12 |
| 3a | Anoka | Coon | 72 |
| 3a | Anoka | George | 21 |
| 3a | Anoka | Golden | 26 |
| 3a | Anoka | Ham | 21 |
| 3a | Anoka | Linwood | 31 |
| 3a | Anoka | Otter | 28 |
| 3a | Carver | Bavaria | 14 |
| 3a | Carver | Burandt | 25 |
| 3a | Carver | Eagle | 12 |
| 3a | Carver | Firemans | 12 |
| 3a | Carver | Grace | 12 |
| 3a | Carver | Lotus | 78 |
| 3a | Carver | Lucy | 12 |
| 3a | Carver | Minnewashta | 83 |
| 3a | Carver | Pierson | 52 |

Table H. Continued.

| Region | County | Lake | Total permits issued |
|---|---|---|---|
| 3a | Carver | Riley | 48 |
| 3a | Carver | Virginia | 32 |
| 3a | Carver | Waconia | 33 |
| 3a | Carver | Wassermann | 10 |
| 3a | Carver | Zumbra | 15 |
| 3a | Chisago | Big Green | 71 |
| 3a | Chisago | Chisago | 36 |
| 3a | Chisago | Fish | 18 |
| 3a | Chisago | Goose | 18 |
| 3a | Chisago | Horseshoe | 11 |
| 3a | Chisago | Kroon | 14 |
| 3a | Chisago | Little Comfort | 9 |
| 3a | Chisago | North Center | 56 |
| 3a | Chisago | North Lindstrom | 11 |
| 3a | Chisago | Rush | 59 |
| 3a | Chisago | South Center | 76 |
| 3a | Chisago | South Lindstrom | 32 |
| 3a | Dakota | Crystal | 81 |
| 3a | Dakota | Marion | 32 |
| 3a | Dakota | Orchard | 24 |
| 3a | Dakota | Salem | 15 |
| 3a | Hennepin | Bass | 13 |
| 3a | Hennepin | Bryant | 35 |
| 3a | Hennepin | Bush | 13 |
| 3a | Hennepin | Castle Ridge | 13 |
| 3a | Hennepin | Christmas | 31 |
| 3a | Hennepin | Duck | 22 |
| 3a | Hennepin | Dutch | 15 |
| 3a | Hennepin | Eagle | 49 |
| 3a | Hennepin | Fish | 43 |
| 3a | Hennepin | Gleason | 28 |
| 3a | Hennepin | Greentree Pond | 12 |
| 3a | Hennepin | Hadley | 15 |
| 3a | Hennepin | Independence | 58 |
| 3a | Hennepin | Long | 17 |
| 3a | Hennepin | Lower Twin | 15 |
| 3a | Hennepin | Medicine | 75 |
| 3a | Hennepin | Melody | 13 |
| 3a | Hennepin | Mtnka – Black | 45 |

Table H. Continued.

| Region | County | Lake | Total permits issued |
|---|---|---|---|
| 3a | Hennepin | Mtka – Browns | 28 |
| 3a | Hennepin | Mtka – Carmans | 69 |
| 3a | Hennepin | Mtka – Carsons | 50 |
| 3a | Hennepin | Mtka – Cooks | 74 |
| 3a | Hennepin | Mtka – Crystal | 62 |
| 3a | Hennepin | Mtka – E. Upper Lake | 59 |
| 3a | Hennepin | Mtka – East Upper | 26 |
| 3a | Hennepin | Mtka – Emerald | 34 |
| 3a | Hennepin | Mtka – Excelsior | 38 |
| 3a | Hennepin | Mtka – Forest | 23 |
| 3a | Hennepin | Mtka – Gideons | 68 |
| 3a | Hennepin | Mtka – Grays Bay | 30 |
| 3a | Hennepin | Mtka – Halsteds | 75 |
| 3a | Hennepin | Mtka – Harrisons Bay | 75 |
| 3a | Hennepin | Mtka Jennings | 45 |
| 3a | Hennepin | Mtka Lafayette | 75 |
| 3a | Hennepin | Mtka Lower Lake N | 28 |
| 3a | Hennepin | Mtka Lower Lake S | 50 |
| 3a | Hennepin | Mtka Maxwell | 50 |
| 3a | Hennepin | Mtka North Arm | 76 |
| 3a | Hennepin | Mtka Phelps | 65 |
| 3a | Hennepin | Mtka Priests | 57 |
| 3a | Hennepin | Mtka Robinsons | 28 |
| 3a | Hennepin | Mtka Upper Lake | 63 |
| 3a | Hennepin | Mtka Seton | 18 |
| 3a | Hennepin | Mtka Smiths | 15 |
| 3a | Hennepin | Mtka Smithtown | 51 |
| 3a | Hennepin | Mtka Spring Park | 38 |
| 3a | Hennepin | Mtka St. Albans | 66 |
| 3a | Hennepin | Mtka St. Louis | 20 |
| 3a | Hennepin | Mtka Stubbs | 32 |
| 3a | Hennepin | Mtka Wayzata | 48 |
| 3a | Hennepin | Mtka West Arm | 48 |
| 3a | Hennepin | Parkers | 30 |
| 3a | Hennepin | Rebecca | 12 |
| 3a | Hennepin | Red Rock | 48 |
| 3a | Hennepin | Round | 11 |
| 3a | Hennepin | Sarah | 74 |
| 3a | Hennepin | Schmidt | 18 |

Table H. Continued.

| Region | County | Lake | Total permits issued |
|---|---|---|---|
| 3a | Hennepin | Shady Oak | 12 |
| 3a | Hennepin | Weaver | 25 |
| 3a | Hennepin | Wrestling (Unnamed) | 12 |
| 3a | Ramsey | Bald Eagle | 66 |
| 3a | Ramsey | Gervais | 31 |
| 3a | Ramsey | Gilfillan | 19 |
| 3a | Ramsey | Island | 13 |
| 3a | Ramsey | Johanna | 27 |
| 3a | Ramsey | Josephine | 32 |
| 3a | Ramsey | Keller | 12 |
| 3a | Ramsey | Kerry Pond | 13 |
| 3a | Scott | Cedar | 43 |
| 3a | Scott | Fish | 16 |
| 3a | Scott | O'Dowd | 34 |
| 3a | Scott | Prior, Lower | 143 |
| 3a | Scott | Prior, Upper | 69 |
| 3a | Scott | Spring | 33 |
| 3a | Scott | Thole | 30 |
| 3a | Washington | Big Carnelian | 57 |
| 3a | Washington | Big Marine | 37 |
| 3a | Washington | Demontreville | 13 |
| 3a | Washington | Forest | 179 |
| 3a | Washington | Jane | 18 |
| 3a | Washington | Lily | 13 |
| 3a | Washington | Long | 2 |
| 3a | Washington | Mary | 11 |
| 3a | Washington | Olson | 13 |
| 3a | Washington | Pine Tree | 10 |
| 3a | Washington | Tanners | 19 |
| 3b | Isanti | Blue | 32 |
| 3b | Isanti | Fannie | 28 |
| 3b | Isanti | Long | 16 |
| 3b | Isanti | Paul | 22 |
| 3b | Isanti | Spectacle | 14 |
| 3b | Kanabec | Fish | 26 |
| 3b | Kanabec | Mud (Quamba) | 14 |
| 3b | Morrison | Alexander | 69 |
| 3b | Morrison | Crookneck | 58 |
| 3b | Morrison | Fish Trap | 35 |

Table H. Continued.

| Region | County | Lake | Total permits issued |
|---|---|---|---|
| 3b | Morrison | Platte | 127 |
| 3b | Morrison | Shamineau | 17 |
| 3b | Morrison | Sullivan | 18 |
| 3b | Pine | Cross | 36 |
| 3b | Pine | Sand | 12 |
| 3b | Pine | South Big Pine | 22 |
| 3b | Pine | Upper Pine | 14 |
| 3b | Pine/Aitkin | Big Pine | 64 |
| 3b | Sherburne | Big | 38 |
| 3b | Sherburne | Briggs | 18 |
| 3b | Sherburne | Eagle | 12 |
| 3b | Sherburne | Fremont | 18 |
| 3b | Sherburne | Julia | 17 |
| 3b | Sherburne | Mitchell | 19 |
| 3b | Sherburne | Rush | 12 |
| 3b | Wright | Charlotte | 25 |
| 3b | Wright | Clearwater | 1 |
| 3b | Wright | Crawford | 12 |
| 3b | Wright | Deer | 18 |
| 3b | Wright | Eagle | 10 |
| 3b | Wright | Fish | 11 |
| 3b | Wright | French | 26 |
| 3b | Wright | Maple | 52 |
| 3b | Wright | Mink | 13 |
| 3b | Wright | Pleasant | 37 |
| 3b | Wright | Pulaski | 41 |
| 3b | Wright | Rock | 20 |
| 3b | Wright | Sugar | 78 |
| 3b | Wright | Sylvia | 54 |
| 3b | Wright | Waverly | 37 |
| 4 | Benton | Little Rock | 12 |
| 4 | Faribault | Bass | 16 |
| 4 | Kandiyohi | Eagle | 27 |
| 4 | Kandiyohi | Elkhorn | 12 |
| 4 | Kandiyohi | Tetonka | 32 |
| 4 | LeSueur | Washington | 54 |
| 4 | Meeker | Long | 2 |
| 4 | Rice | Mazaska | 12 |
| 4 | Rice | Roberds | 18 |

Table H. Continued.

| Region | County | Lake | Total permits issued |
|---|---|---|---|
| 4 | Stearns | Big Fish | 16 |
| 4 | Stearns | Big Spunk | 23 |
| 4 | Stearns | Clearwater | 126 |
| 4 | Stearns | Grand | 26 |
| 4 | Stearns | Koronis | 21 |
| 4 | Stearns | North Browns | 14 |
| 4 | Stearns | Pearl | 27 |
| 4 | Stearns | Pelican | 32 |
| 4 | Stearns | Rice | 39 |
| 4 | Waseca | Clear | 16 |

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