

**Management of Rooted Aquatic Vegetation,
Algae, Leeches, and Swimmer's Itch, 2013**

By

**Steve Enger
Aquatic Plant Management Program Coordinator**

and

**Emily Bartusek
Aquatic Pesticide Enforcement Specialist**

Minnesota Department of Natural Resources

Division of Fish and Wildlife

Section of Fisheries

May 2014

1 Prior to 2013 this report series was published yearly by the Division of Ecological and Water Resources to monitor permitted aquatic plant management activities in Minnesota public waters.

This report should be cited as follows:

Enger, S. M. and E. Bartusek. 2014. Management of Rooted Aquatic Vegetation, Algae, Leeches, Swimmer's Itch, 2013. Staff Report, MN DNR, Division of Fish and Wildlife, Section of Fisheries, 500 Lafayette Road, Saint Paul, Minnesota, 55155.

Executive Summary 2013 Aquatic Plant Management Program

In Minnesota the state is the owner of wild rice and other aquatic vegetation growing in public waters (*Minnesota Statutes* 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 (*Minnesota Statutes* 103G.615). The purpose of the aquatic plant management (APM) permit program is to protect the beneficial functions that aquatic plants provide to lakes, while allowing riparian property owners to obtain reasonable access to public waters.

The 2012 legislature amended *Minnesota Statutes* 103G.615 to include a definition for invasive aquatic plant management permits. The amendment defined an invasive aquatic plant management permit as an APM permit that authorizes the selective control of invasive aquatic plants at a scale to cause a significant lake or bay-wide reduction in the abundance of the invasive aquatic plant. The legislature also added a provision to statute to allow the DNR to waive the requirement for dated signatures of approval by landowners for invasive aquatic plant management permits.

In 2012 the coordinator of the APM program was moved from the Division of Ecological and Water Resources to the Section of Fisheries where the APM program specialists are located. This was a consequence of a reorganization of the program in the fall of 2011. In addition, the responsibility for the issuance of permits for the lake or bay-wide management of invasive aquatic plants was transferred from the Section of Fisheries to the Division of Ecological and Water Resources, invasive species program (ISP).

In 2013 the ISP received 263 applications for invasive aquatic plant management permits. Of the 263 applications received 16 applications were withdrawn, four applications were denied, and 243 permits were issued for the selective management of invasive aquatic plants on a lake or bay-wide basis.

Public Waters/Permits/Properties/Fees

In 2013 there were 2,039 public waters with active APM permits. Of the 2,039 public waters with active permits, 843 public waters had permits that were issued during 2013. The number of public waters where aquatic plant management is permitted increased gradually from 1953 until 2000. In recent years the number of lakes with permitted APM activity stabilized at around 900 per year. In 2013 there were 32 fewer lakes with permitted APM activity than in 2012.

The number of APM permits issued statewide reached its peak in 2007 at 4,633 permits. In 2013 permit issuance increased in DNR regions 3 and 4 compared to permit numbers in 2012. In 2013 the Central Region issued 12 more permits than in 2012. The largest regional increase in the number of permits issued in 2013 was in the South Region, where they issued 61 more permits than in 2012. Statewide permit numbers have decreased from 2008 through 2013. In 2013 there were 3,697 permits issued, 480 fewer permits than in 2012.

The number of property owners applying for APM permits statewide continued to decline in 2013. The number of properties with permitted aquatic plant management activities decreased in regions 1, 2, and 3 and increased slightly in Region 4 the Southern Region. There were 764 fewer properties participating in the APM program in 2013 than in 2012.

In 2012 it was also determined that invasive aquatic plant management permits would be issued without an application fee. This new determination, in addition to the decrease in the number of properties applying for permit, and the decrease in the permit fee for property owners living on lakes that are 20 acres or less, are responsible for the decline in permit revenue. In 2012 permit fees generated \$223,000 in revenue and in 2013 permit fees generated approximately \$213,000 a reduction of \$10,000.

Automated Aquatic Plant Control Devices

The Department first began issuing permits for Automated Aquatic Plant Control Device's (AAPCD's) in 1997. In 2013 permits for AAPCD's accounted for about 32% of the total number of APM permits issued. The remaining 67% of APM permits issued allowed treatment with pesticides or 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). As a result of this change many more permit holders became eligible for an AAPCD permit of three year duration in 2009.

In 2013 there were 789 three-year AAPCD permits issued, 511 fewer than in 2012. The number of single season AAPCD permits issued in 2013 (414) increased by 141 from 2012. The total number of AAPCD permits issued in 2013 was down by 381 permits when compared to 2012. Persons who obtained a three-year permit in 2013 will not have to apply for a permit again until the year 2016.

Most AAPCD permits are issued to a single property owner. In 2013 AAPCD's made up 32% of the permits issued and accounted for 15% of the total number of properties permitted.

Summary of Aquatic Plant Management permits issued by type in 2013 and active permits.

Region	Mechanical Chemical***	2013 Issued Channel*	<2012 Active Channel**	AAPCD's with chemical control	AAPCD			All Active Permits	Restoration Permits Issued	
					Issued 2013		Issued 2012			
					1 year	3 year	3 year			
Reg 1	436	41	-	88	220	323	718	186	1924	19
Reg 2A	60	12	-	1	0	8	10	6	96	4
Reg 2B	553	14	-	47	86	205	296	205	1359	10
Reg 3A	825	15	-	9	57	45	49	19	1010	11
Reg 3B	330	4	-	16	37	149	169	79	768	8
Reg 4	203	1	-	3	14	59	58	35	370	4
All	2407	87	1,205	164	414	789	1,300	530	6,732	56

- * Channel permits are of unlimited duration and issued to the property owner to mechanically maintain a channel no more than 15 shoreline feet wide in emergent vegetation.
- ** All active permits as of 12/28/2012. Total by Region cannot be calculated because Region boundaries were changed in 2003. *All Active Permits* = Permits issued in 2010 and all active AAPCD and channel permits excluding restoration permits.
- *** Excludes permits for AAPCD's and channel permits.

It is important to note that the numbers of permits and applicants in a single year is only part of the story. In addition to AAPCD permits that can be issued for up to 3-years, a lakeshore property owner can obtain a permit of unlimited duration to mechanically maintain a channel 15 feet wide through emergent vegetation. Multi-year AAPCD permits account for roughly 39% of the total number of active permits in 2013. In 2012 there were 1,205 active channel permits (permits of unlimited duration allow maintenance of a 15 foot wide channel through emergent aquatic plants), about 18% of the total number of active permits. The total number of active permits in 2013 was 6,732 including 2,821 annual permits. This does not include 243 permits issued by the Division of Ecological and Water Resources for lake or bay-wide management of invasive aquatic plants.

Summary of all APM permits issued for control of aquatic plants and nuisances, numbers of public waters and participating properties in 2013.

Region	All Permits Issued in 2013*	Public waters permitted in 2013.**	Public waters permitted in 2012.	Change in public water permitted	Properties Permitted in 2013	Properties Permitted in 2012	Change in properties permitted by Region
Reg 1	1,020	239	257	-18	1,087	1423	-336
Reg 2A	80	38	46	-8	78	98	-20
Reg 2B	858	130	135	-5	1,145	1335	-190
Reg 2 total	938				1,223	1433	-210
Reg 3A	942	235	233	+2	3,531	3843	-312
Reg 3B	520	121	128	-7	1,482	1512	-30
Reg 3 total	1,462				5,013	5355	-342
Reg 4	277	80	76	+4	596	472	+124
2013 TOTAL	3,697	843	875	-32	7,919	8,683	-764
2012 TOTAL	4,177						
CHANGE	-480						

* Permits issued for restoration work are excluded.

** Includes all lakes, ponds, ditches and streams listed on APM permits for 2013.

Trends and Observations

Aquatic plant control in Minnesota is highly seasonal. Most aquatic plant control in Minnesota takes place in the months of June, July and August. This trend has been consistent for many years because much of the aquatic plant control is recreationally motivated.

Lakeshore residents often hire commercial services to perform aquatic plant control. Statewide commercial services performed approximately 54% of permitted aquatic plant control. However, in the Central Region commercial services perform about 70% of permitted aquatic plant control.

Many APM permits are issued on an annual basis. Approximately 74% of 2013 permit holders responding to the survey indicated that they would reapply for a permit in 2014. Of the APM permit holders that did their own control in 2013 79% reported using their permit. Permits that were issued to property owners that hired a commercial service were more likely to be used (94% of these permits were used).

Lakeshore property owners may apply for a permit to control filamentous algae and chara (a form of macro-algae) with copper sulfate. Applications requesting filamentous algae control were up slightly (3%) over 2012; while the control of chara decreased by a small margin (3%) from 2012.

Blue green algae blooms are a common nuisance in eutrophic Minnesota lakes. Copper sulfate, a common algaecide, can provide temporary relief from nuisances caused by blue green algae. However, the control obtained by lake-wide application of copper sulfate is usually temporary and treatment is often required at least twice per season. In addition, there is the threat of fish kill from oxygen depletion caused by the decomposition of dead algae. The numbers of lakes where the residents seek a permit to control blue green algae with copper sulfate has been declining since 1997 but increased moderately in 2013.

Swimmer's itch, an infection caused by an immature life stage of flukes common in waterfowl, is present in many Minnesota lakes. Lakeshore property owners can get a permit to use copper sulfate to control snails that harbor the immature life stage. The numbers of permits requesting swimmer's itch control has been increasing steadily since 1997 and was up slightly in 2013 compared to 2012.

INTRODUCTION

Value of Aquatic Plants

Aquatic plants are essential components of most freshwater ecosystems. 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 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 food sources 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 they provide 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 for 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.

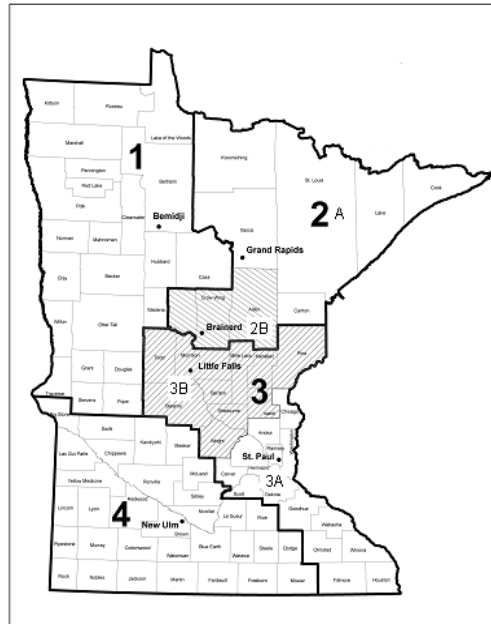
The Aquatic Plant Management Program (APM)

Riparian property owners (lakeshore property owners) in Minnesota have a 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 APM program is to regulate how much aquatic vegetation lakeshore residents can control to ensure that the beneficial functions aquatic plants provide are preserved.

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 APM permit.

Administrative Regions

DNR Administrative Regions by county as of October 2006



NW Region 1

Bemidji
Kittson
Roseau
Lake of the Woods
Marshall
Polk
Pennington
Red Lake
Beltrami
Norman
Mahnommen
Clearwater
Hubbard
Cass
Clay
Becker
Wadena
Wilkin
Otter Tail
Traverse
Grant
Douglas
Stevens
Pope

NE Region 2

Grand Rapids (2A)
Koochiching
Itasca
St. Louis
Lake
Cook
Carlton

Brainerd (2B)
Crow Wing
Aitkin
Cass

Central Region 3

St. Paul (3A)
Anoka
Carver
Chisago
Dakota
Hennepin
Ramsey
Scott
Washington
Goodhue
Wabasha
Olmstead
Winona
Fillmore
Houston

Little Falls (3B)
Benton
Isanti
Kanabec
Pine
Mille Lacs
Morrison
Sherburne
Stearns
Todd
Wright

South Region 4

Big Stone
Swift
Kandiyohi
Meeker
McLeod
Renville
Chippewa
Lac Qui Parle
Yellow Medicine
Lincoln
Lyon
Redwood
Nobles
Jackson
Martin
Faribault
Freeborn
Mower

The DNR's Division of Fish and Wildlife is responsible for the administration of the APM permit program. Riparian property owners apply for an aquatic plant control permit to the Regional Fisheries Manager in the region where their lake property is located. APM specialists in each region conduct application review, site inspections when necessary, and make permit recommendations.

The recommendation for the decision on 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 APM 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.

In 2012 the coordinator of the APM program was located in the Section of Fisheries where the APM program specialists are also located. This was a consequence of a reorganization of the program in the fall of 2011 when the coordinator was moved from the Division of Ecological and Water Resources to the Section of Fisheries. In addition, the responsibility for the issuance of permits for the lake or bay-wide management of invasive aquatic plants was transferred from the Section of Fisheries to the Division of Ecological and Water Resources, invasive species program (ISP).

The APM program coordinator is the Department's contact with commercial mechanical control businesses, commercial aquatic pesticide 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 mechanical control companies. This person also reviews appeals of permit decisions for the Commissioner. The program coordinator 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 whose job responsibilities include enforcement of aquatic pesticide rules and pesticide label requirements. The Aquatic Pesticide Enforcement Specialist conducts inspections of herbicide treatments in public waters to monitor compliance with state and federal pesticide law and responds to reports of pesticide misuse (Appendix Table A). 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 APM 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 and M.S. 103G.615 which 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 2012 legislature amended *Minnesota Statutes* 103G.615 to include a definition for invasive aquatic plant management permits. The amendment defined an invasive aquatic plant management permit as a permit that authorizes the selective control of invasive aquatic plants at a scale to cause a significant lake or bay-wide reduction in the abundance of the invasive aquatic plant. Invasive aquatic plant management permit applications are reviewed, and permits issued, by invasive species program staff within the Division of Ecological and Water Resources.

The invasive species program received 263 applications for invasive aquatic plant management permit in 2013. Of the 263 applications received 16 applications were withdrawn, four applications were denied and 243 permits were issued for selective management of invasive aquatic plants on a lake or bay-wide basis. Invasive aquatic plant management permits are issued without fee.

The rules governing aquatic plant management (M.R. chapter 6280) were revised in 2009. Significant changes to the APM rules included:

- 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 under permit 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 or greater.
- 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 (2014). 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 purposes of sale.

- The revised rules specify when variances may be issued, the criteria to be considered, and allows for mitigation for adverse effects on aquatic habitat caused by an APM permit that includes a variance.
- The revised rules specify when an LVMP can be used and what information the LVMP should contain.

A permit from the DNR is required to use pesticides for aquatic plant and nuisance control 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, *Minnesota Statutes* 103G.005, subd. 15 and 15a), 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. Aquatic plants that are 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, pesticides 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, irrigation, household, and other uses. The DNR provides these signs to permit holders and commercial applicators at no cost. A list of herbicides commonly used for aquatic plant control and the amounts used under permit in Minnesota from 1987-2013 is found in Appendix Tables B and C.

NPDES/SDS permit

In November of 2011 the Minnesota Pollution Control Agency (MPCA) published the National Pollution Discharge Elimination System (NPDES) permit for the application of pesticides to water. This is the MNG87D000 Vegetative Pests and Algae Control Pesticide General Permit. Because the DNR's aquatic plant management rules are

more restrictive in many ways than the NPDES permit requirements, the DNR and the MPCA entered into an interagency agreement that allows DNR's aquatic plant management permit to satisfy requirements of the NPDES/SDS permit. The threshold for a notice of intent (NOI) is for treatment of greater than 15% of the littoral zone of lakes that are 20 acres or larger in size. DNR rules require a permit for all aquatic pesticide applications for aquatic plant and nuisance control in Minnesota public waters. Persons who obtain an aquatic plant management permit do not need to apply for an NPDES permit for pesticide control of aquatic plants or nuisances in public water.

Summary of APM Program Activities in 2013

The following summary of APM program activities in 2013 comes from four sources: permittee survey forms (Appendix Tables D and E), commercial aquatic applicator and commercial mechanical control reports, and the APM permit database. When we describe information taken from permit holder or commercial company surveys in a table or figure in the report, the term "*reported*" is used. When we discuss data in the report taken from the APM permit database the term "*permitted*" is used.

Commercial applicators, mechanical control companies, 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. Nevertheless, 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 lakeshore property owners. 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 in 2013. Of the 1,056 surveys mailed 882 (83%) were returned. A separate survey was sent to 1,201 AAPCD permit recipients and 689 (57%) were returned.

Permit Issuance

In 2013, a total of 3,697 permits were issued statewide for APM activities (this excludes 56 shoreline habitat restoration permits), 480 fewer than in 2012 (Appendix Table F provides the county by county distribution of permits and permitted properties). Figure 1 provides the regional breakdown of permit issuance, including the number of lakes in each region with permitted APM activity.

In 2013, there were 1,203 permits issued for the operation of Automated Aquatic Plant Control Devices (AAPCD). The remaining 2,494 aquatic plant control permits were issued to municipalities and lakeshore homeowners for pesticide use (includes algae and swimmer's itch control), and 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 and 3). The number of public waters permitted in 2013 for APM activity was 843, a decrease of 32 lakes from 2012.

There were 157 lakes with APM permits in 2012 where APM permits were not issued in 2013. In addition, 682 lakes had permitted APM activity in both 2012 and 2013. These numbers exclude lakes with multiple year permits (3-year AAPCD and channel permits of unlimited duration).

In 2013, 270 of the APM permits issued were reported not used for various reasons, and 83 of these were for AAPCD use. The remaining 187 permit holders (excluding the AAPCD permit holders) permit holders that did not use their permit 101 indicated that they would reapply for APM permit in 2014.

Figure 1. All APM permits issued, and the number of lakes with permitted aquatic plant control, by region, in 2013.

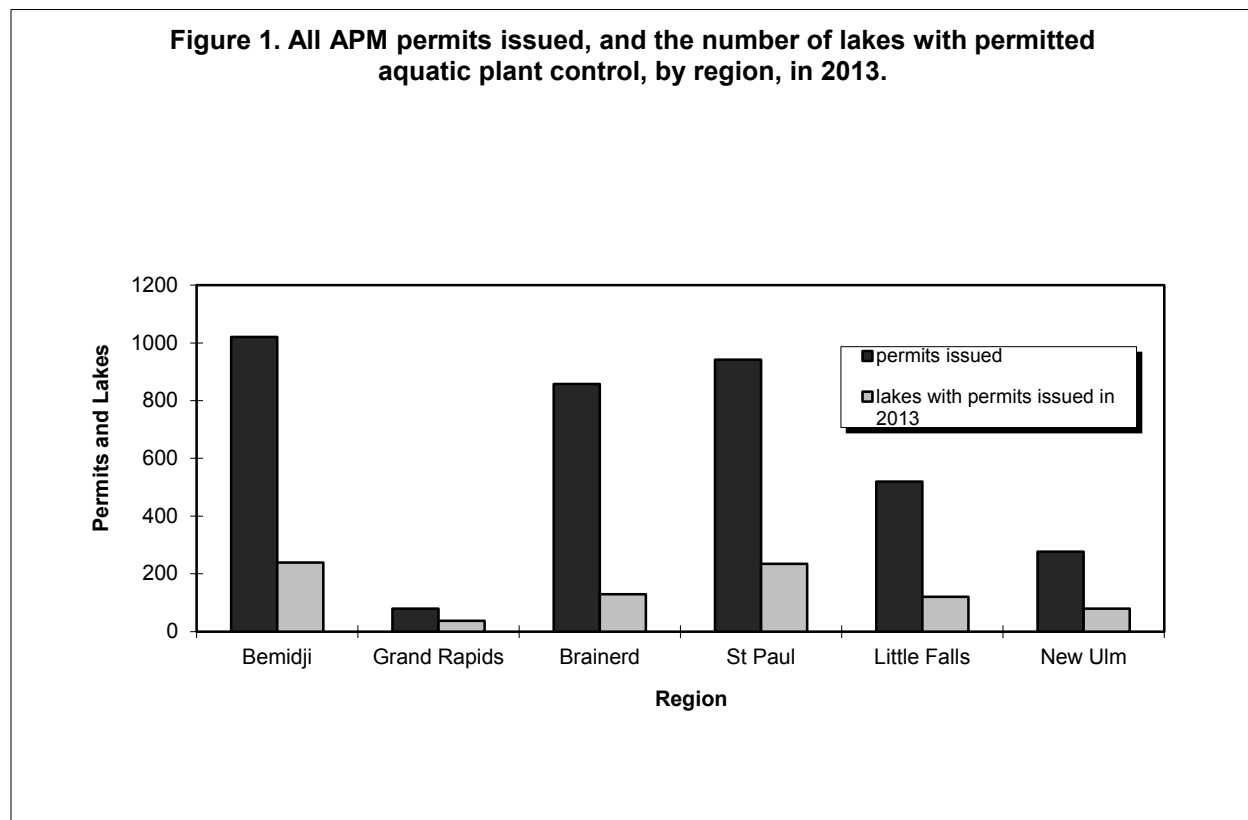
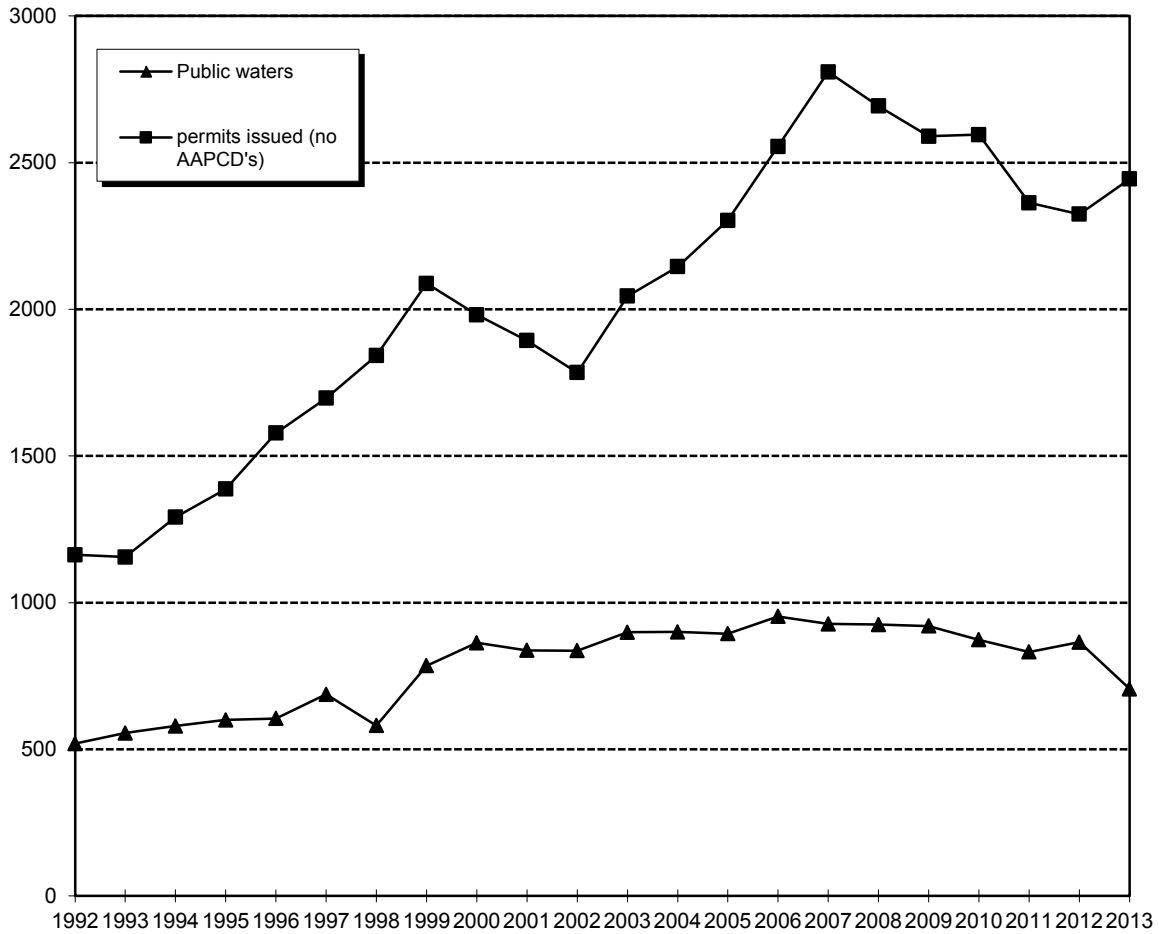
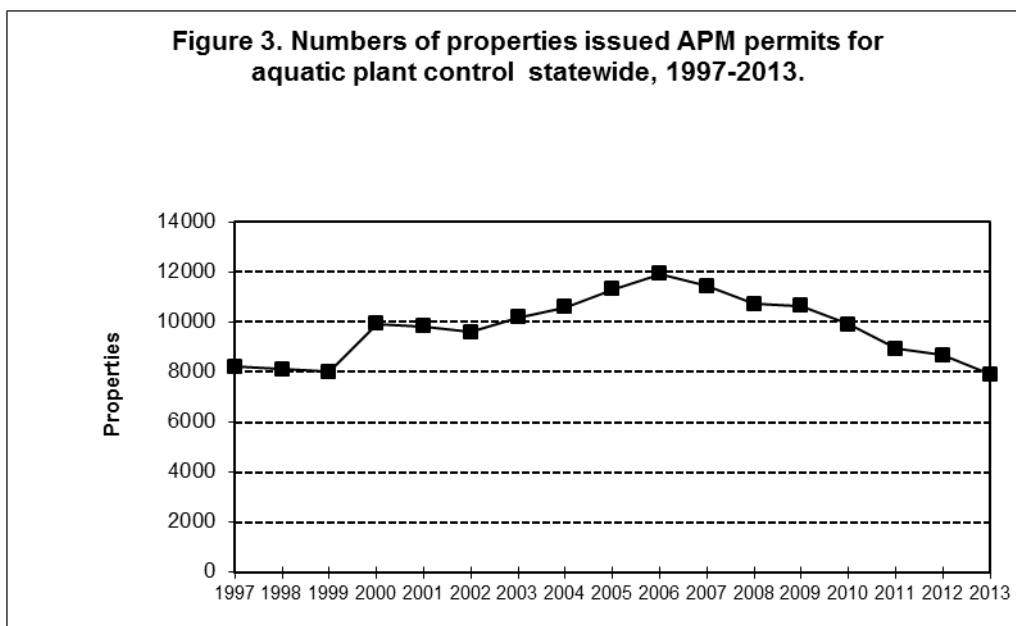


Figure 2. Numbers of APM permits issued for mechanical and chemical control (excluding AAPCD) of aquatic vegetation, algae, and swimmer's itch, and numbers of lakes where permits were issued 1992-2013.





APM permit issuance increased annually from 1992 until about 1999. 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 2013 the total number of property owners participating in the aquatic plant management program decreased for the seventh year in a row. Cooler temperatures in the early part of the open water season resulting in slower plant growth, and colder water for swimming may have contributed to the decline in lakeshore property owners participating in the APM program in 2013.

Lakeshore homeowners can apply for an APM permit as a group. The average number of properties per permit statewide in 2013 was 2.1, the same as in 2012. 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 multiparty permits with more than 21 applicants. There are a few permits with more than 100 applicants, or properties, participating on a single permit. In 2013 there were 7,919 properties on 3,697 permits. This number excludes the 56 permits issued to lake shore property owners for restoration of aquatic habitat.

The Central Region, which includes the Twin Cities metropolitan area, typically has larger group permits than other areas of the state. In 2013, the Central Region averaged 3.4 properties per permit, down by one property per permit from 2012. The Northwest averaged one property per permit. The Northeast Region averaged 1.3 properties per permit. The average number of properties per permit in the Southern Region in 2012 was 2.2, decreased slightly in 2013 to 2.1 properties per permit.

Table 1. APM Permits grouped by the number of properties listed (excluding AAPCD) by Region, 2013.

Region		1	2A	2B	3A	3B	4
Permits/property	>100	0	0	2	1	1	0
	51-100	0	0	0	4	1	1
	21-50	0	0	1	33	14	4
	11-20	0	0	2	50	11	4
	2-10	1	0	6	127	34	26
	1	476	72	557	625	273	168

1 = Bemidji, 2A = Grand Rapids, 2B = Brainerd, 3A = St. Paul, 3B = Little Falls, 4 = New Ulm

The rules regulating aquatic plant removal from public waters require an inspection of the treatment site for properties with no previous permit history, or when there are changes in the size of the treatment area, methods used, or the target plant species, requested from the previously issued permit. APM 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. In 2013 there were about 1300 site inspections conducted. The site inspection provides an opportunity to determine what kinds of plants and habitat are present in the proposed treatment area. During the inspection, the size of the area may be reduced to protect important habitat based on the observations and professional judgment of the APM specialist. Approximately 80% of all 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 2013.

	1	2A	2B	Region			Statewide
				3A	3B	4	
number of applications requesting near-shore control	990	66	829	845	435	205	3,371
permits issued as requested*	792	54	800	644	346	176	2694
% of permits issued as requested	80	81	96	76	79	85	80

1 = Bemidji, 2A = Grand Rapids, 2B = Brainerd, 3A = St. Paul, 3B = Little Falls, 4 = New Ulm

*Includes permits that allowed more shoreline than requested

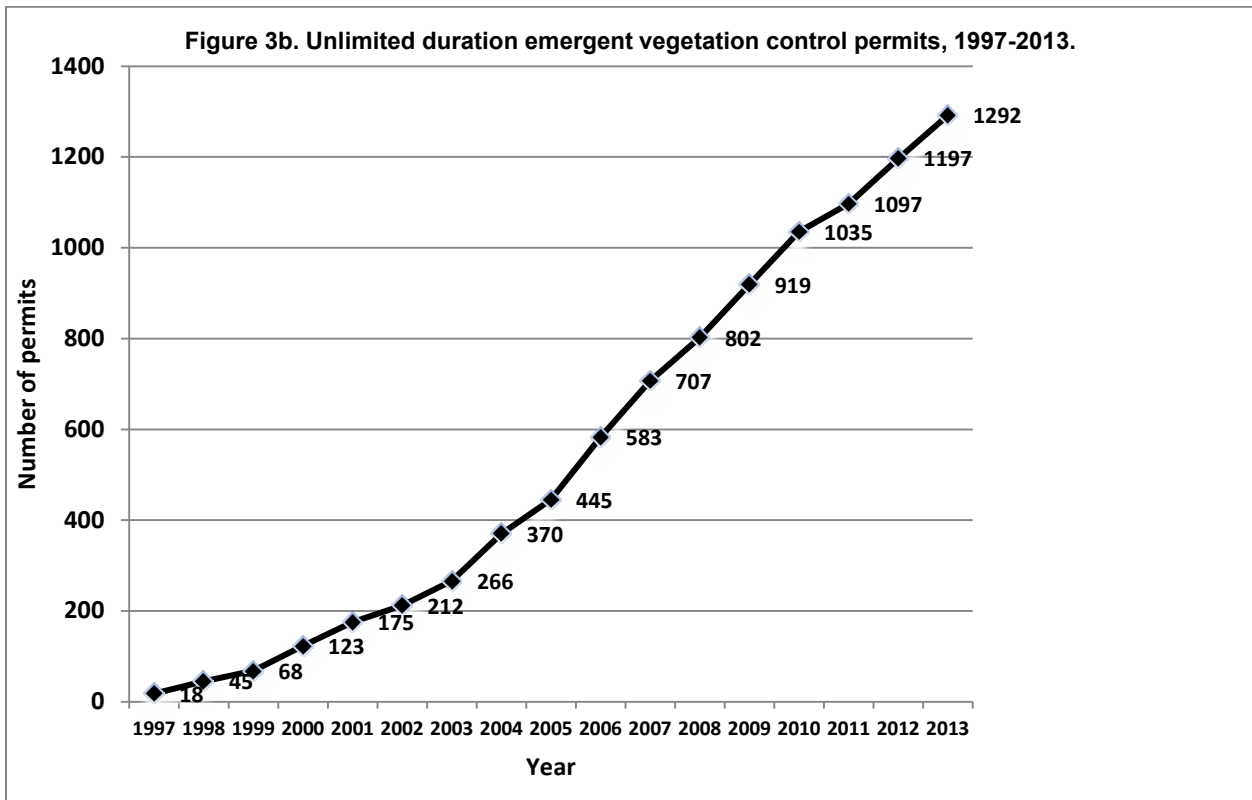
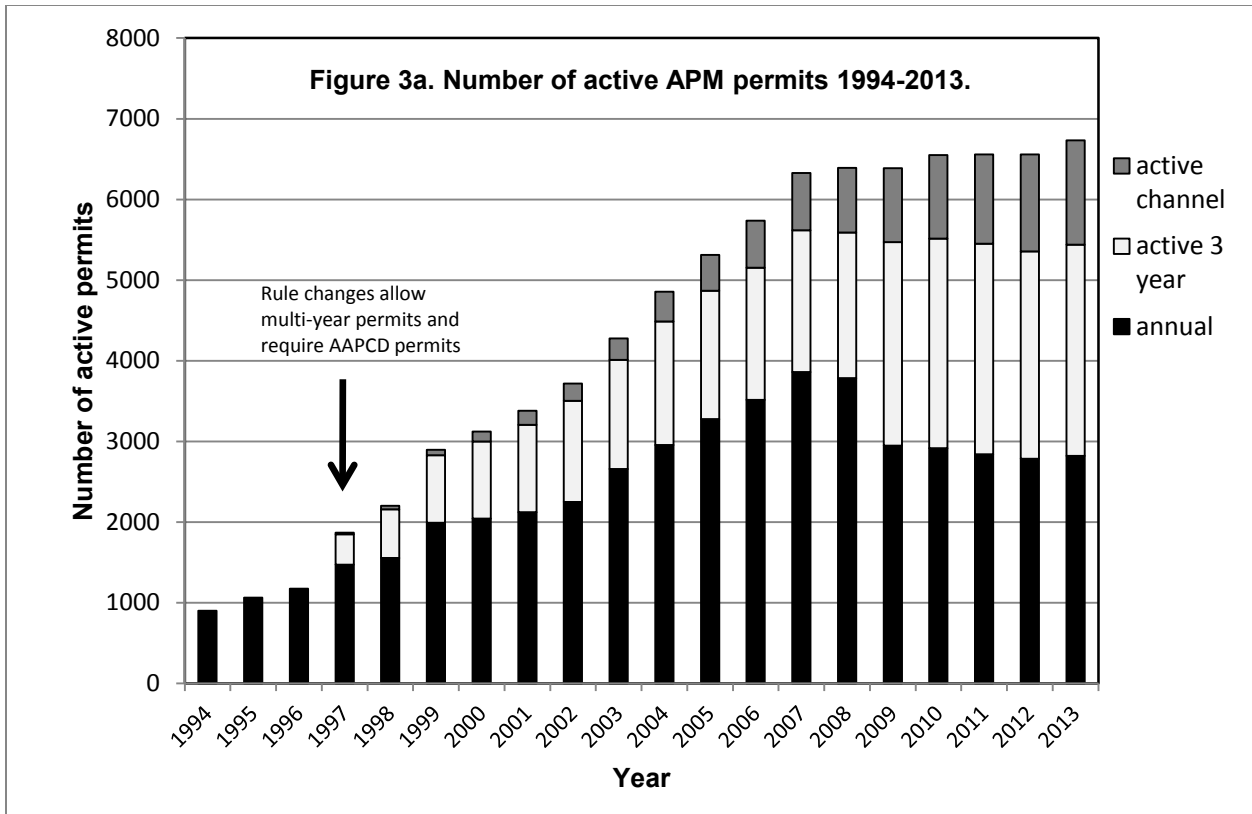
Permit Duration

Until 1997 aquatic plant management permits were issued for a one year term. However, in 1997 the APM rules were revised allowing two types of permits to be issued for longer than a single season. Emergent vegetation control permits can be issued for a period of unlimited duration if the control is limited to a channel not more than 15 feet wide, that remains in the same location each year, and is maintained mechanically after the first year. A person requesting a permit to use an automated

aquatic plant control device can obtain a permit of three years duration if they agree to operate the device in an area not to exceed 2,500 square feet and the device remains in the same location each year. The permit fee for the longer term permits is the same as the permit fee for annual permits.

These longer term permits are intended to offer an incentive to the property owner to remove less aquatic vegetation. In exchange for the smaller area of control the property owner does not have to make an application for a permit on an annual basis and they receive a permit of extended duration at the same cost as a permit issued for a single year. The extended duration permit also benefits the DNR by reducing the annual permit work load for program staff.

As shown in Figure 3a the number of permits of more than annual duration (active permits) is greater than the number of annual permits issued in 2013. Permits issued for more than one year are most often issued to individuals. The number of emergent vegetation permits of continuous duration and the number of three year duration AAPCD permits represents an additional estimated 3,911 properties under DNR APM permit in 2013. Figure 3b shows the number of emergent vegetation channel permits issued annually since 1997. The difference in the total number of permits between years is the number of permits issued that year. For example the total number of active emergent vegetation channel permits in 2012 was 1,205. The total number of active emergent vegetation channel permits in 2013 was 1292, therefore 87, the difference between the two totals, is the number of emergent vegetation unlimited duration permits issued in 2013.



Permit Fees

Fees for APM permit were last increased during the 2003 legislative session. The fee increased applications for most aquatic plant control permits from \$20.00 per property to \$35.00 per property. The cap on group permits to control submersed vegetation was increased from \$200 to \$750.

During the 2010 legislative session some permit fees were reduced. The fee for aquatic plant control on water bodies 20 acres or less was reduced to half of the permit fee for larger lakes. The fee for aquatic plant control on water bodies 20 acres or less in size for an individual is \$17.50 and the cap on permit fees for group permits is \$375.00. The reduction went into effect after most permits had been issued for 2010, therefore the reduction was not evident until 2011.

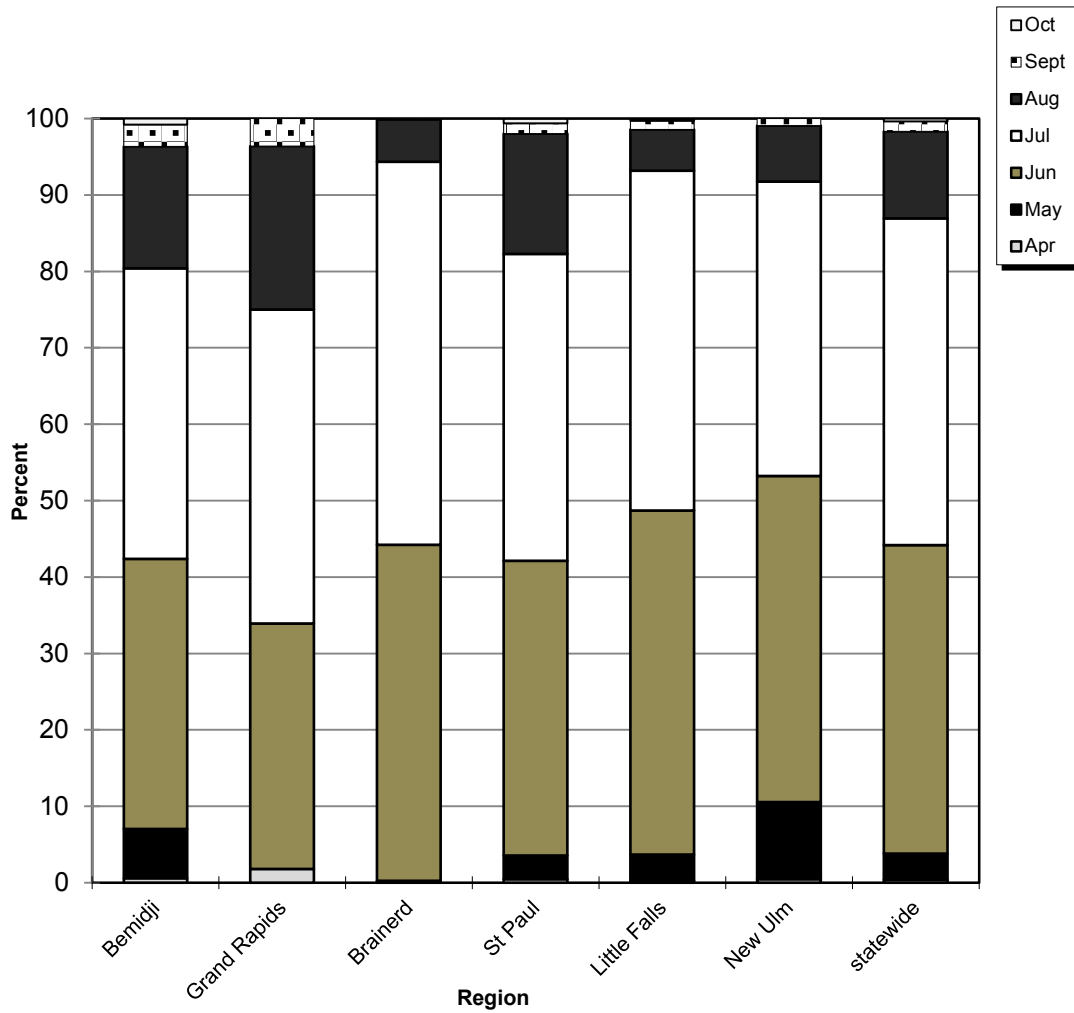
In 2009, prior to the fee change enacted by the 2010 Legislature, there were 71 permits issued for rooted aquatic plant control on lakes less than 20 acres in size. In 2013, there were 87 permits issued for aquatic plant control on 75 lakes 20 acres or less in size.

Permit fee revenues in 2013 were lower than 2012 or 2011. In 2013 permit fees were approximately \$213,000, about \$10,000 less than 2012. Prior to the legislative change during the 2011 session that defined an invasive aquatic plant management permit (IAPM), these permits were issued with fee. Issuing the IAPM permit free of charge also contributes to the reduction in permit fee revenues.

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 2013 94% of the permitted work, reported statewide, was completed in June, July, and August (Figure 4).

Figure 4. Percent of reported APM work by month for each region in 2013.

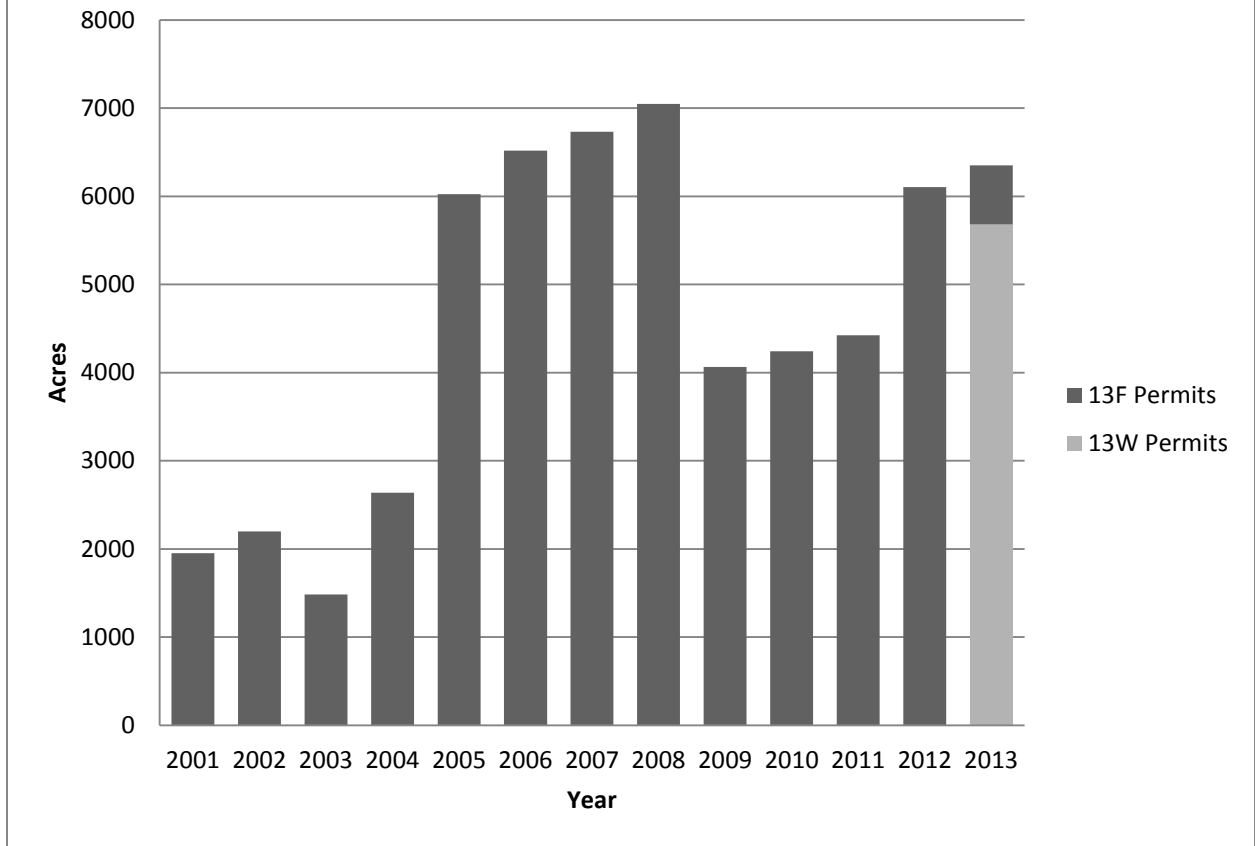


Permitted off-shore acres of herbicide control of aquatic plants

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 2005, 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, the curly leaf-pondweed treatment in Lake Benton was reduced to 254 acres. In 2010 approximately 120 acres of curly-leaf pondweed was treated in Lake Benton, resulting in a 2,630 acre decrease from Lake Benton alone.

In 2012, permits issued for the management of invasive aquatic plants were separated from the APM program and issued by the invasive species program staff in the Division of Ecological and Water Resources. In Figure 5, which shows the acres of offshore control with herbicides, the bar representing offshore control for 2013 is separated into two segments. The bottom segment represents the acres permitted for offshore herbicide control of invasive aquatic plants (5,683 acres) and the top portion represents the acres permitted for the offshore herbicide control for native species (667 acres).

Figure 5. Permitted off-shore chemical control acreage of aquatic vegetation statewide from 2001-2013.



* Acreage reported prior to 2013 did not distinguish between permits issued for the control of invasive aquatic plants (13W permits) and permits issued for native aquatic plant control (13F permits). Therefore, it should not be concluded that there were no permits issued for invasive species management prior to 2013.

Aquatic plant control methods

In 2013, about 32% of all permits issued for aquatic plant control allowed plant removal with AAPCD’s, down 5% from 2012. Aquatic plant control using herbicides, commercial mechanical control, and plant removal by hand, accounted for the remaining 68% of the APM permits issued (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 2013 are found in Table 3. Permit holders were asked if they performed the control over the entire area allowed in their permit. Nearly 25% of those responding indicated that they treated less than the area permitted; slightly less than was reported in 2012.

Figure 6. Numbers of APM permits issued for aquatic vegetation control including chemical, mechanical, chemical and mechanical, AAPCD and algae and snail control, 1994-2013.

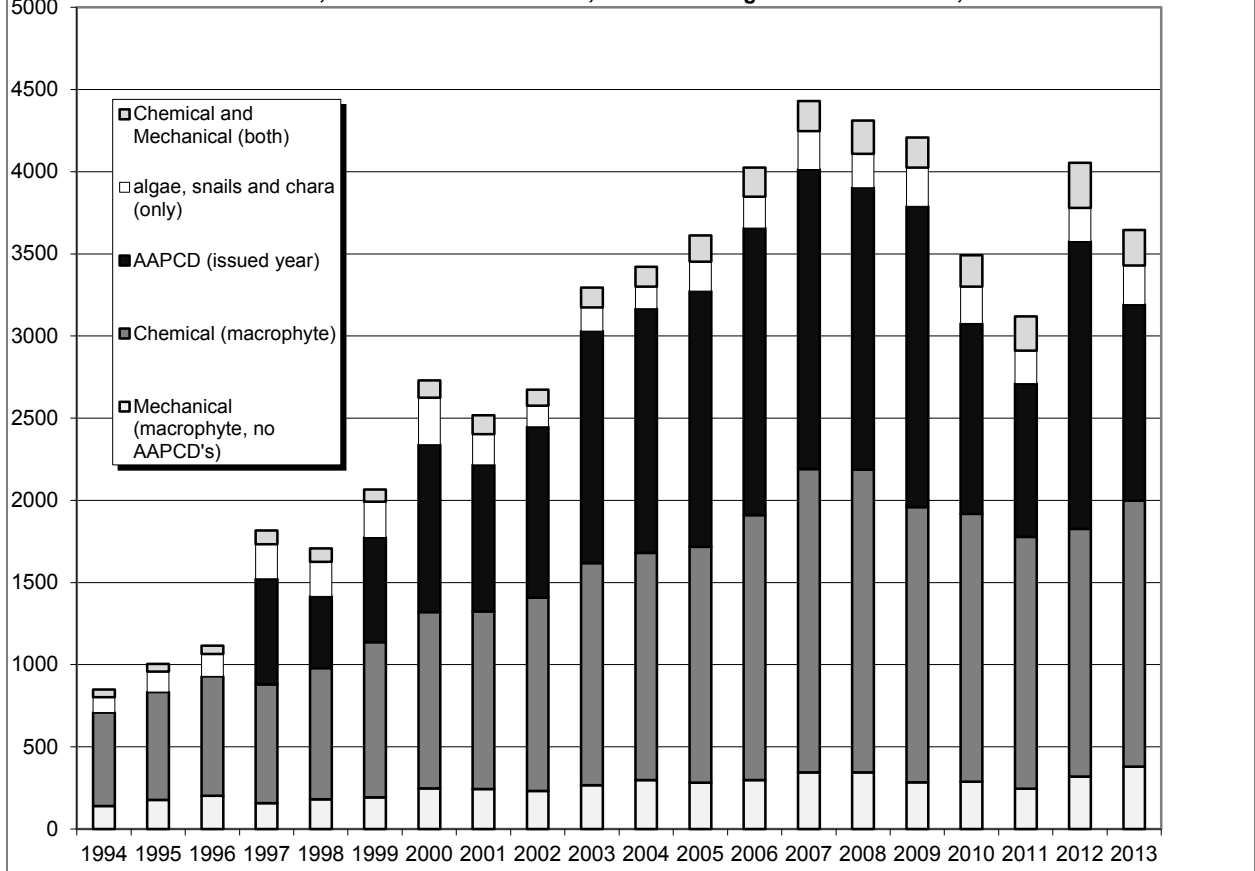


Table 3. Total near-shore area permitted, in acres, by region, for control of submerged vegetation, swimmer's itch, and AAPCD use in 2013.

Control	Region						Total number of acres	Props	Avg. Per Prop. (sq. ft.).
	1	2A	2B	3A	3B	4			
Herbicide control excluding open water treatment	55	3	62	432	117	66	735	5347	5,987
Mechanical control excluding open water removal	33	1	13	59	1.5	11	118	589	8,726
Swimmer's itch control *	47	4	79	366	102	63	661	3,993	7,210
AAPCD 2012issued	45	0.33	20	8	19	4	96	1203	3,476

* includes all permits with swimmers itch control

1 = Bemidji, 2A = Grand Rapids, 2B = Brainerd, 3A = St. Paul, 3B = Little Falls, 4 = New Ulm

Percent of Aquatic Plant Removal Permits Used

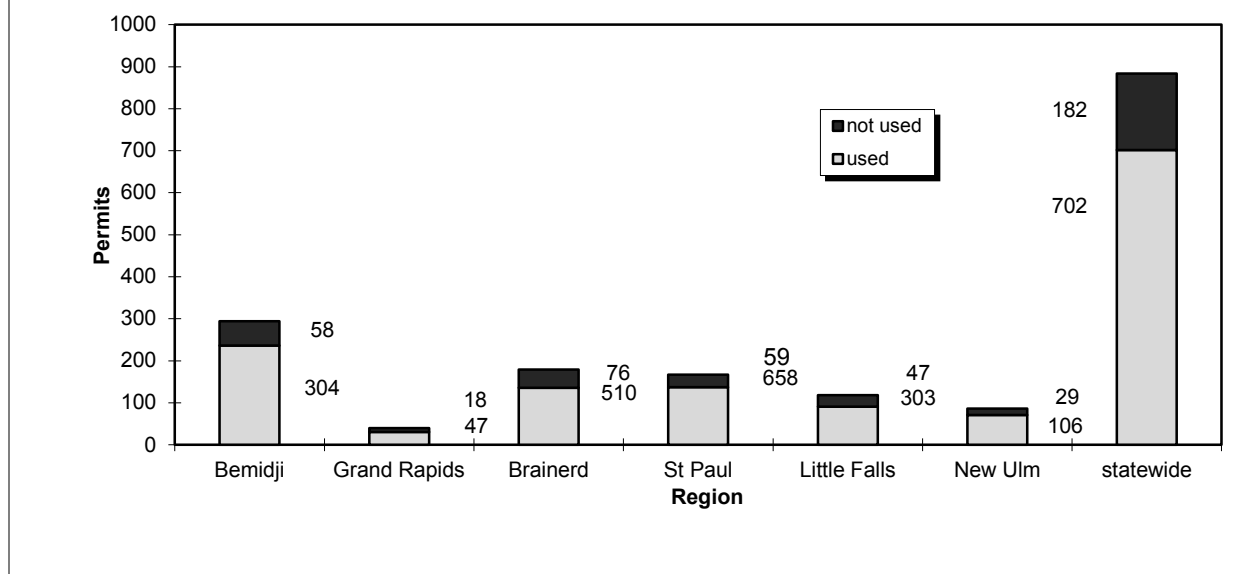
Each year some permits issued for aquatic plant management activities are not used (Figure 7). Statewide, 79% of permits issued were reported used by permittees who did their own control. Commercial applicators/operators reported using 99% of the permits issued for work they did. Permittees indicating 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 2013, the reason most frequently given (46%) for not using an APM permit was because the permittee was unable to do the work for any given reason.

Table 4. Response by permit holders to choices indicating that their APM permit was not used, expressed as a percent by region in 2013.

Region	1	2A	2B	3A	3B	4	Statewide
nuisance condition did not develop	16	0	7	7	22	47	15
got permit too late	7	22	19	17	7	7	12
unable to do the work	52	67	42	43	52	20	46
other	26	11	33	33	19	27	27

1 = Bemidji, 2A = Grand Rapids, 2B = Brainerd, 3A = St. Paul, 3B = Little Falls, 4 = New Ulm

Figure 7. Total reported number of permits used and not used by region (excluding AAPCD permit holders), 2013.



Who does control

Commercial applicators and mechanical control companies performed about 55% of the permitted control statewide in 2013. This represents a 4% decrease from the percent of the permitted control done by commercial applicator and commercial mechanical control companies in 2012. Permit holders in the Central Region hire commercial services more frequently than any other region (Figure 8a). In 2013 commercial aquatic plant control companies performed about 74% of the permitted control in the Metro Area. In 2013, 53% of the permitted control in the Northeast Region was performed by commercial service. Most of this control is in the Brainerd Lakes Area of the NE Region. In the Grand Rapids area (2A) of the NE Region most permitted control (79%) is done by the homeowner. Permit holders perform about 73% of the permitted control in the Northwest Region and 53% in the South Region. Property owner conducted control increased in 2012 and 2013(Figure 8b).

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 59% of the respondents were satisfied with the results of herbicide control. About 66% of those responding were satisfied with the results of treatments to control swimmer's itch and 58% 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.

Figure 8a. Percent of reported permitted APM work done by permittee and by commercial service for each region in 2013.

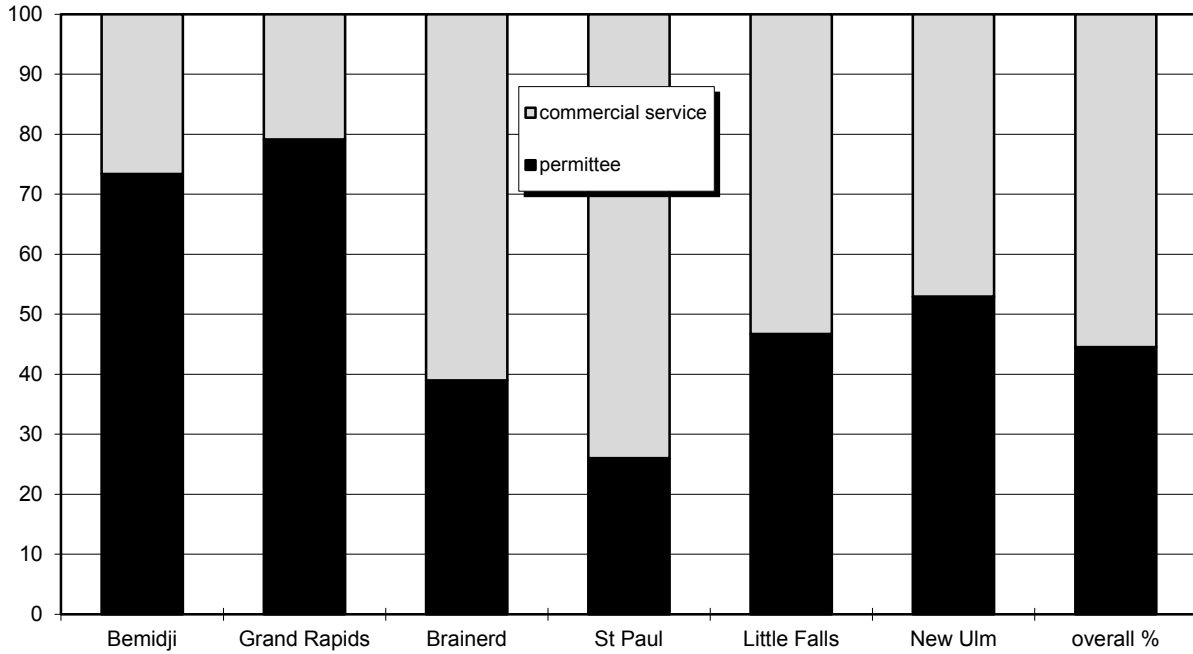
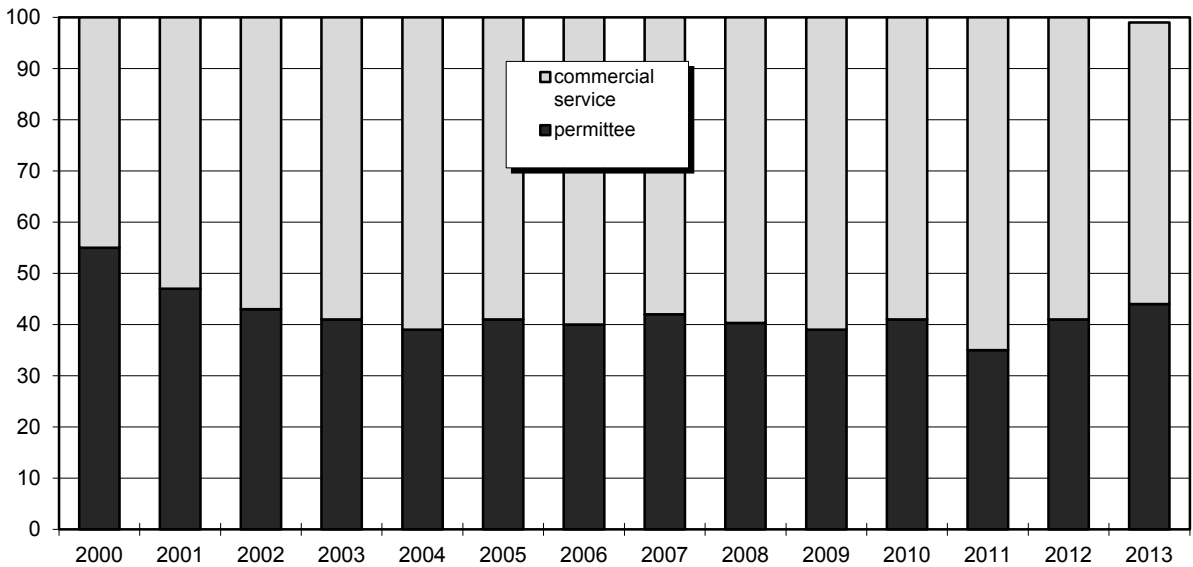


Figure 8b. Percent of reported permitted APM work done by permittee and by commercial service statewide from 2000-2013.



Reapply for permit

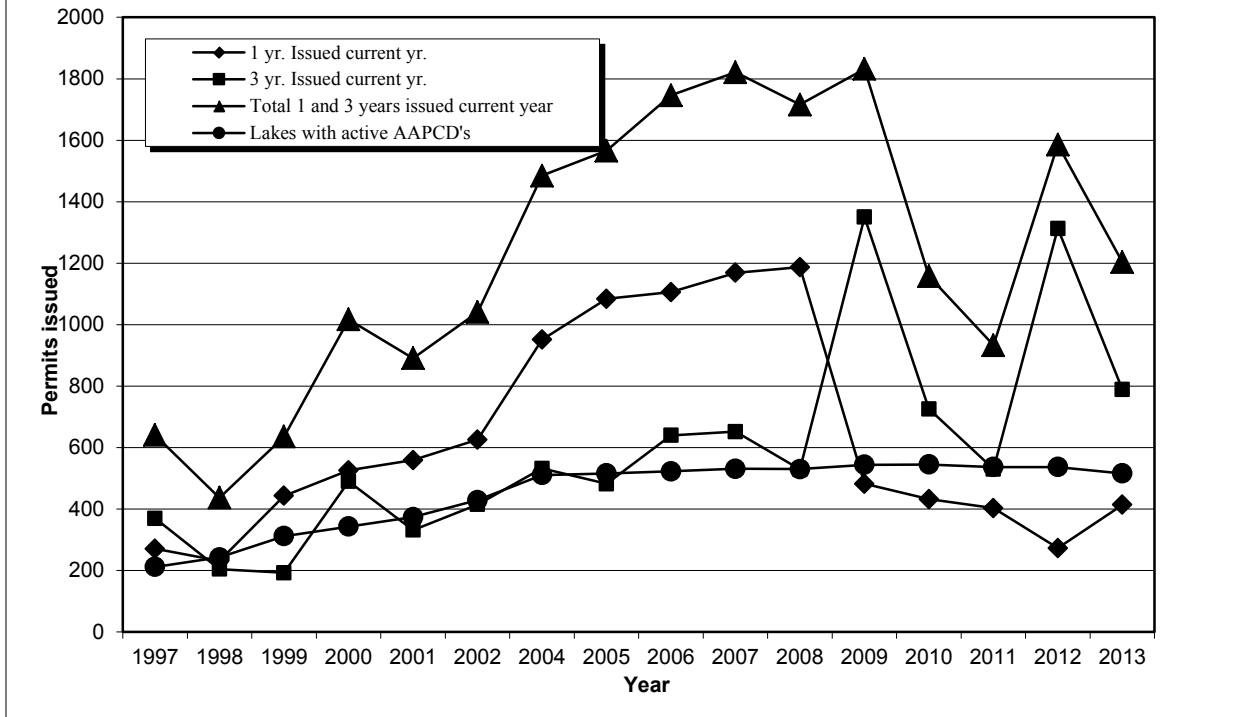
Permit holders, excluding AAPCD permittees, were asked if they would apply for a permit in 2013. Of the 884 responses, 654 (73%) said they would reapply for an APM permit next year, down slightly from 2012. Approximately 12% (103) of the permit holders responding indicated that they were unsure if they would reapply for a permit in 2014. The number of permittees reporting that they would not apply (32 or 3.6%) was slightly higher than in 2012. Regardless of their response, all 2013 permit holders, whose permits expire, will receive permit application materials prior to the start of the 2014 open water season.

Automated Aquatic Plant Control Devices (AAPCD)

Before 1997 the operation of an AAPCD did not automatically require an APM permit, and few AAPCD permits were issued. The APM 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 2013 there were 1,203 permits issued for these devices statewide. Of those permits 414 were issued for a one-year term and 789 were issued for a three-year permit term. About 60 percent of the AAPCD permits were issued in the Northwest and Northeast Regions. In addition to the permits issued in 2013, there are active three-year permits issued in 2011 and 2012 (530 and 1,300 respectively). Of the 1,201 surveys mailed to AAPCD permit holders, 689 (57%) responded to the survey. Three-year AAPCD permit holders issued permits in 2011 and 2012 were not surveyed.

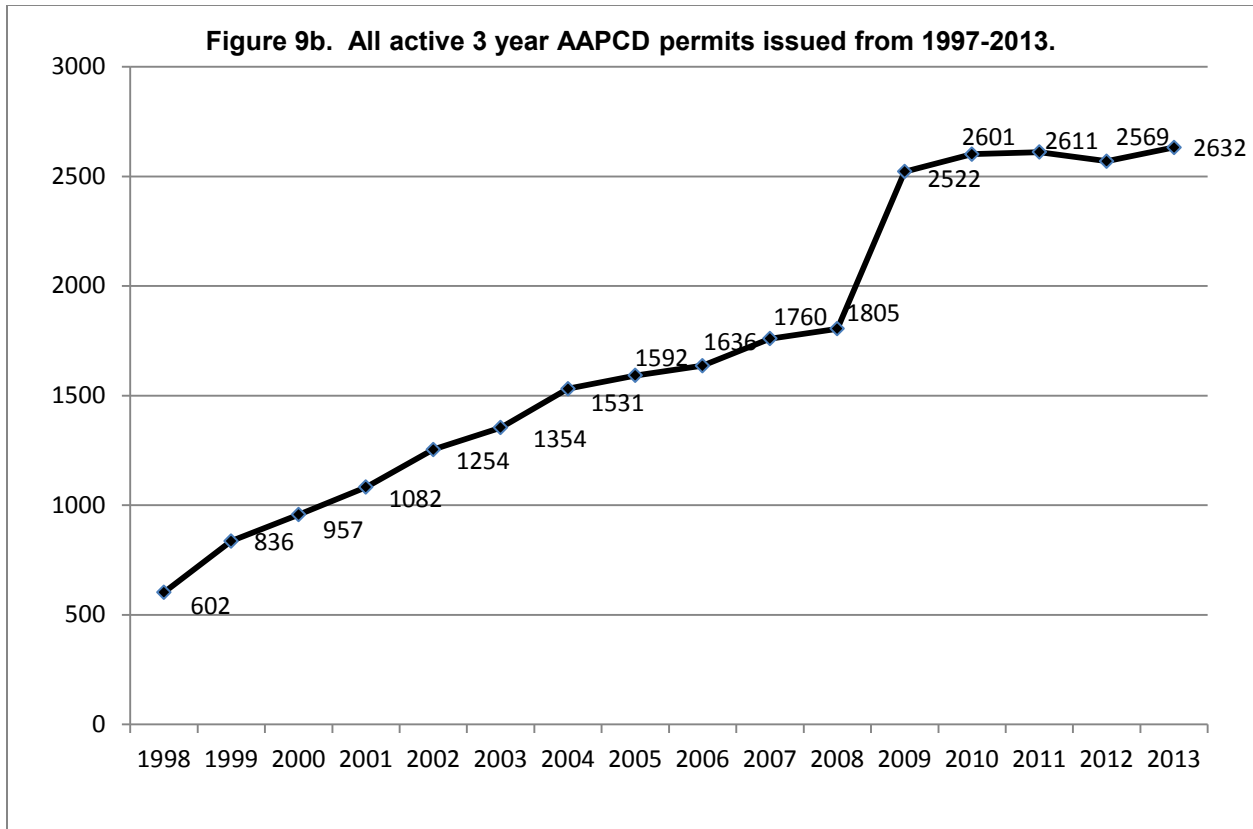
The APM rules provide two permit options for AAPCD operation. A person applying for a permit to operate the device in an area greater than 2,500 square feet is required to obtain an annual permit. However, a three-year permit option is available for persons who limit the size of the area of AAPCD operation 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 rule change many more permit holders became eligible for an AAPCD permit of three year duration in 2009. In 2013, 789 three year AAPCD permits were issued. Three year AAPCD permit issuance in 2013 decreased by 511 permits over 2012.

Figure 9a. Numbers of permits issued allowing the use of AAPCD's in Minnesota public waters, 1997-2013.



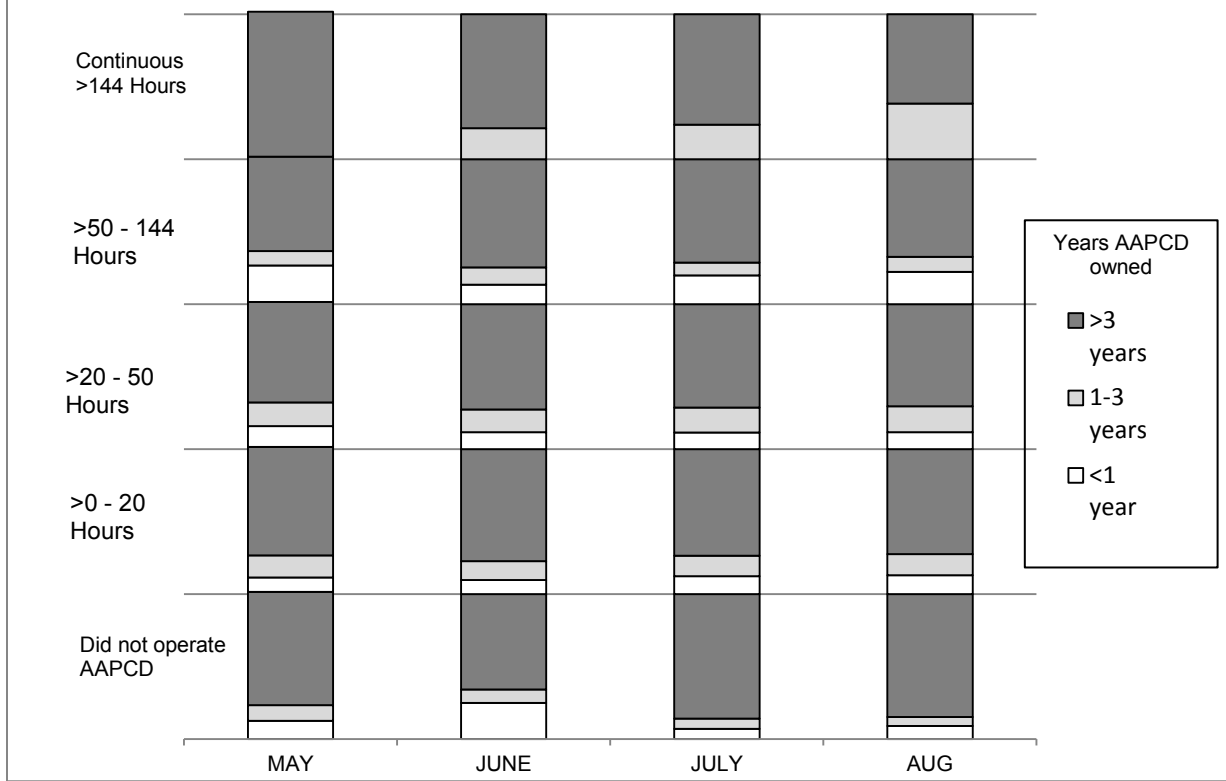
There were 1,203 total AAPCD permits issued in 2013, 370 fewer than in 2012. The number of single season permits issued in 2013 increased by 141 over 2012 (Figure 9a).

The numbers of permits issued for AAPCD use decreased overall in 2013. Figure 9b compares annual AAPCD permit issuance from 1997 to 2013. In 2013 there were approximately 2,632 active 3-year AAPCD permits authorized to operate in 516 Minnesota public waters. There were about 63 more active 3-year AAPCD permits in 2013 than in 2012. The numbers of permits issued for AAPCD use decreased overall in 2013.



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. AAPCD owners that have owned the device for three or more years are at least as likely to operate their device longer and more frequently than those people who are recent owners (Figure 10). However, permit holders that have owned the device for three or more years are more likely not to operate the device than more recent permit holders. There are also many more permit holders that have had their device for three or more years. About 89 persons permitted to operate an AAPCD stated that, for various reasons, they did not operate the device in 2013, down from 2012.

Figure 10. AAPCD use from May through August, 2013 categorized by length of ownership expressed as a percent of all AAPCD permittees reporting.



Filamentous algae control

The APM 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 mirrors permit issuance 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 been increasing slightly since 2011. Compared to 2012, there was an increase of about 37 permits requesting filamentous algae control in 2013.

Chara control

The APM rules allow the control of chara with copper sulfate. As a result of revisions to the APM rule in 2009, the limits on submersed aquatic plant control (lake shore property owners may receive a permit to control submersed aquatic plants on up to 100 ft, or one-half their frontage whichever less) now apply to the management of Chara. Chara is a macro-algae that can interfere with recreation in some lakes. In 2013 there were approximately 238 lakes where permits were issued for chara control (Figure 12). This was a slight decrease from 2012.

Figure 11. Numbers of permits issued for filamentous control, and numbers of lakes where permits were issued 1997-2013.

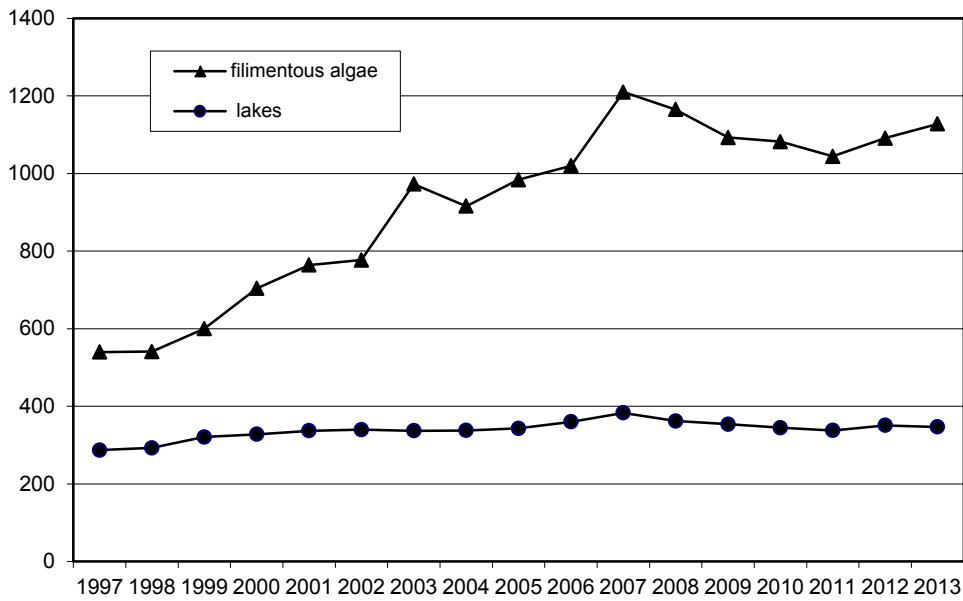
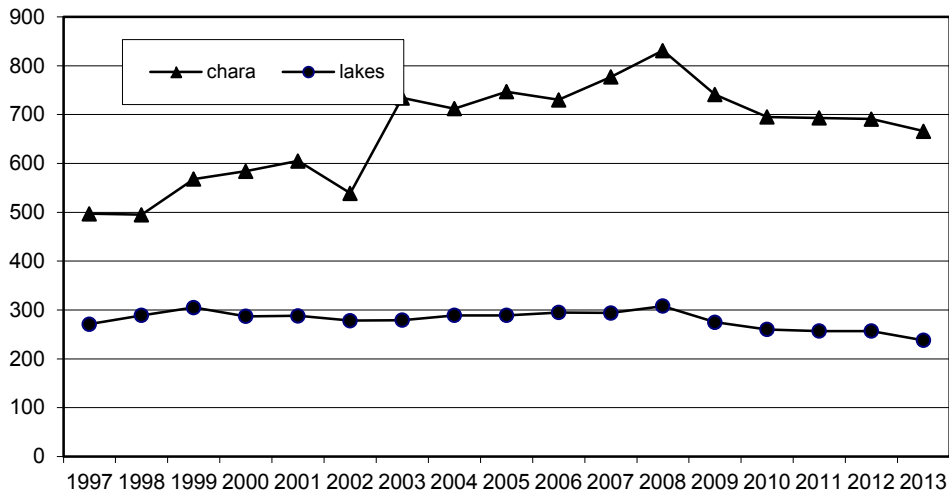


Figure 12. Numbers of permits issued for chara control, and numbers of lakes where permits were issued 1997-2013.

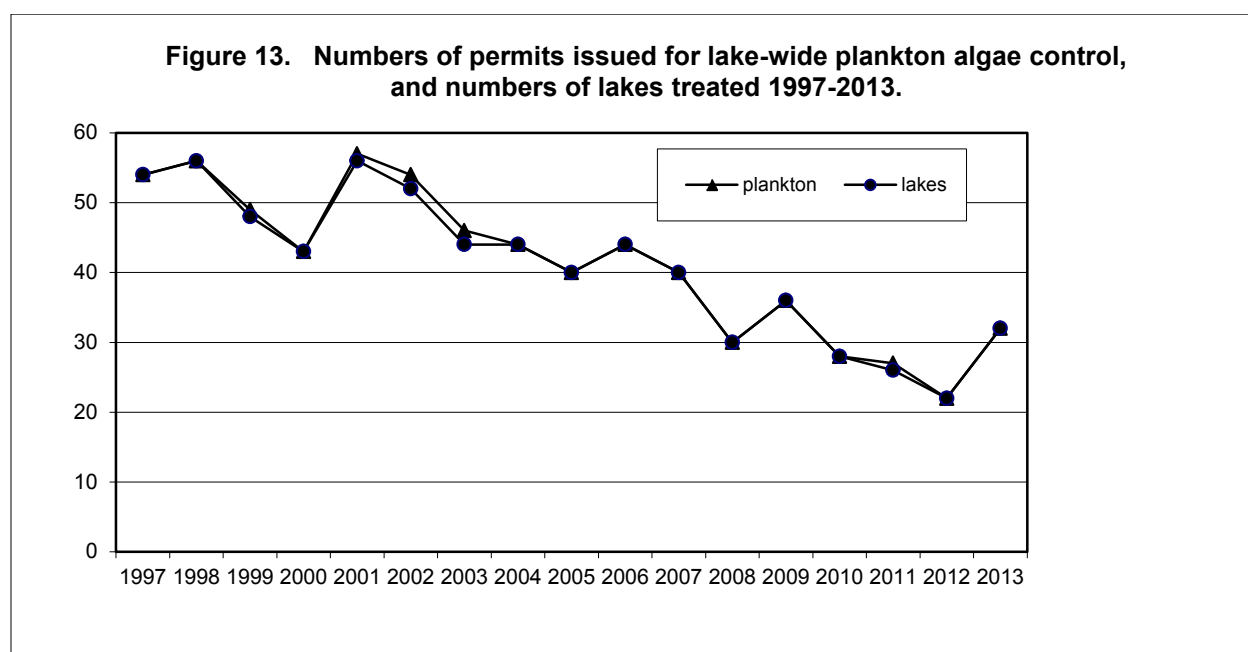


Plankton algae control

The APM 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 accumulating on the downwind shore, or decomposition of accumulated algae has occurred releasing a blue-green pigment and causing an offensive odor.

The numbers of lakes treated with algacides to control plankton algae has been decreasing over the last ten years (Figure 13). In 2013, there was an increase of 10 permits issued for lakewide plankton algae control. 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.



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

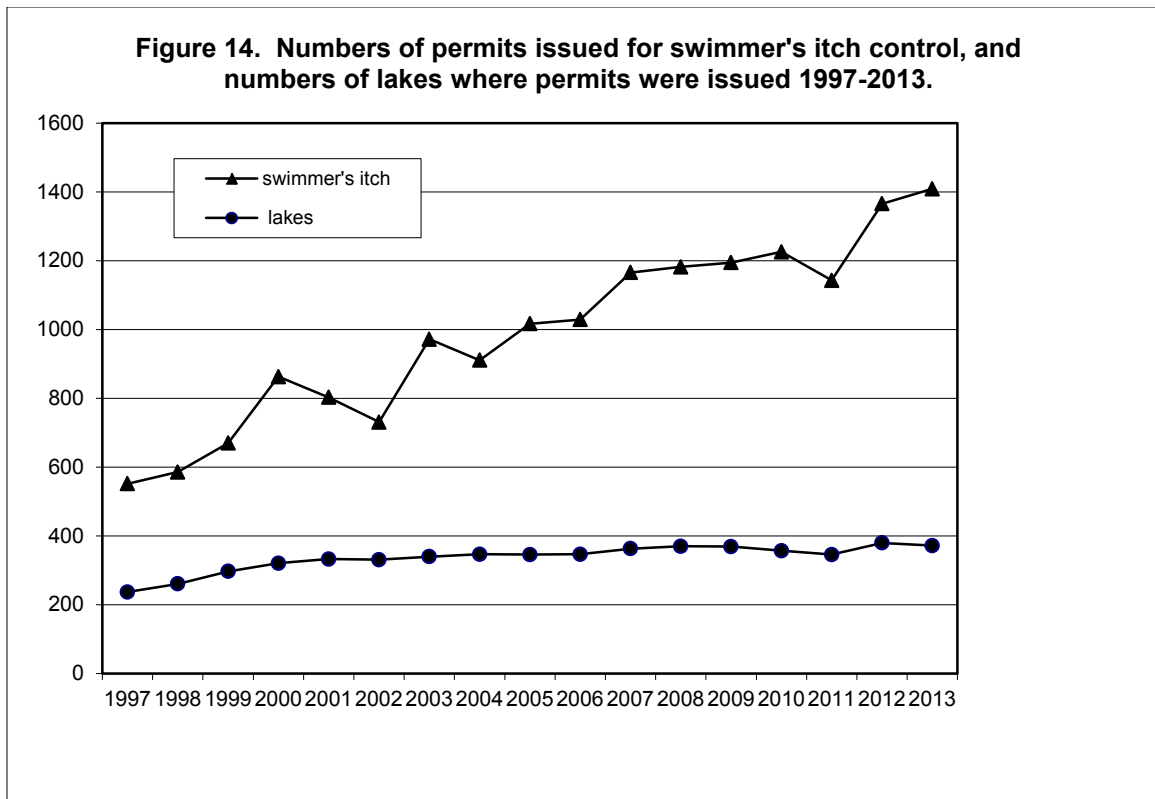
it develops into a life stage called the cercaria. The cercaria, upon release from the snail, seeks its definitive host, usually some sort of waterfowl. The cercaria does not feed and will only live for about 24 hours unless it finds a proper host. When a proper host is located the cercaria penetrates 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 2 times per summer if allowed by the products label.

The numbers of permits issued for swimmer's itch has increased steadily since 1997. In 2013 there were 374 lakes statewide where 1,409 permits were issued that allowed swimmer's itch control (Figure 14, Appendix Table G). About 66% of those responding were satisfied with the results of treatments to control swimmer's itch in 2013 (Appendix Table D).



Management of invasive aquatic plants

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 four, non-native invasive aquatic plants: curly-leaf pondweed, purple loosestrife, flowering rush, and Eurasian watermilfoil.

In 2011, the Invasive Aquatic Plant Management (IAPM) permit was defined in *Minnesota Statutes* 103G.615, subd. 3a. The purpose of this new type of aquatic plant management (APM) permit is to authorize “the selective control of invasive aquatic plants at a scale to cause a significant lake or bay-wide reduction in the abundance of the invasive aquatic plant.” The IAPM permit was first implemented in 2012.

Prior to 2012, APM permits authorizing lake or bay wide control of invasive aquatic plants were issued by the DNR’s Division of Fish and Wildlife, aquatic plant management program. After a series of stakeholder meetings in the fall of 2011 it was determined that permits for lake or bay wide control of invasive aquatic plants would be issued by the Division of Ecological and Water Resources, where the invasive species program is located. Other changes made in 2012 to facilitate the management of invasive aquatic plants include; lake or bay-wide control of invasive aquatic plants may include significant near-shore areas and numerous property owners; the commissioner may waive the property owner signature requirement in rule, where obtaining signatures from all property owners would create a hardship (M.S. 103G.615, Subd. 3a.,(c)); the

new statutory provision requires the notification of property owners near treated areas; and IAPM permits are issued without fee.

In 2012 there were approximately 204 permits issued for the lake or bay-wide treatment of invasive aquatic plants. In 2013 there was a total 242 IAPM permits issued. The increase in invasive aquatic plant management permits issued for control of curly-leaf pondweed and Eurasian watermilfoil (Figure 15) is likely due to the addition of regional invasive species program staff, plus the expanded availability of grants for control of these plants. Table 5 below provides a breakdown of IAPM permits issued in 2013 by DNR region.

Table 5. Numbers of Invasive Aquatic Plant Management Permits issued in 2013 classified by district and type.

Region	District	Curly-leaf pondweed	Milfoil	Curly & milfoil	Sum
1	N	3	3	0	6
	S	11	2	0	13
2	-	29	9	0	38
3	N	56	26	0	82
	S	38	24	12	74
4	N	4	8	0	12
	S	3	13	1	17
Total		144	85	13	242

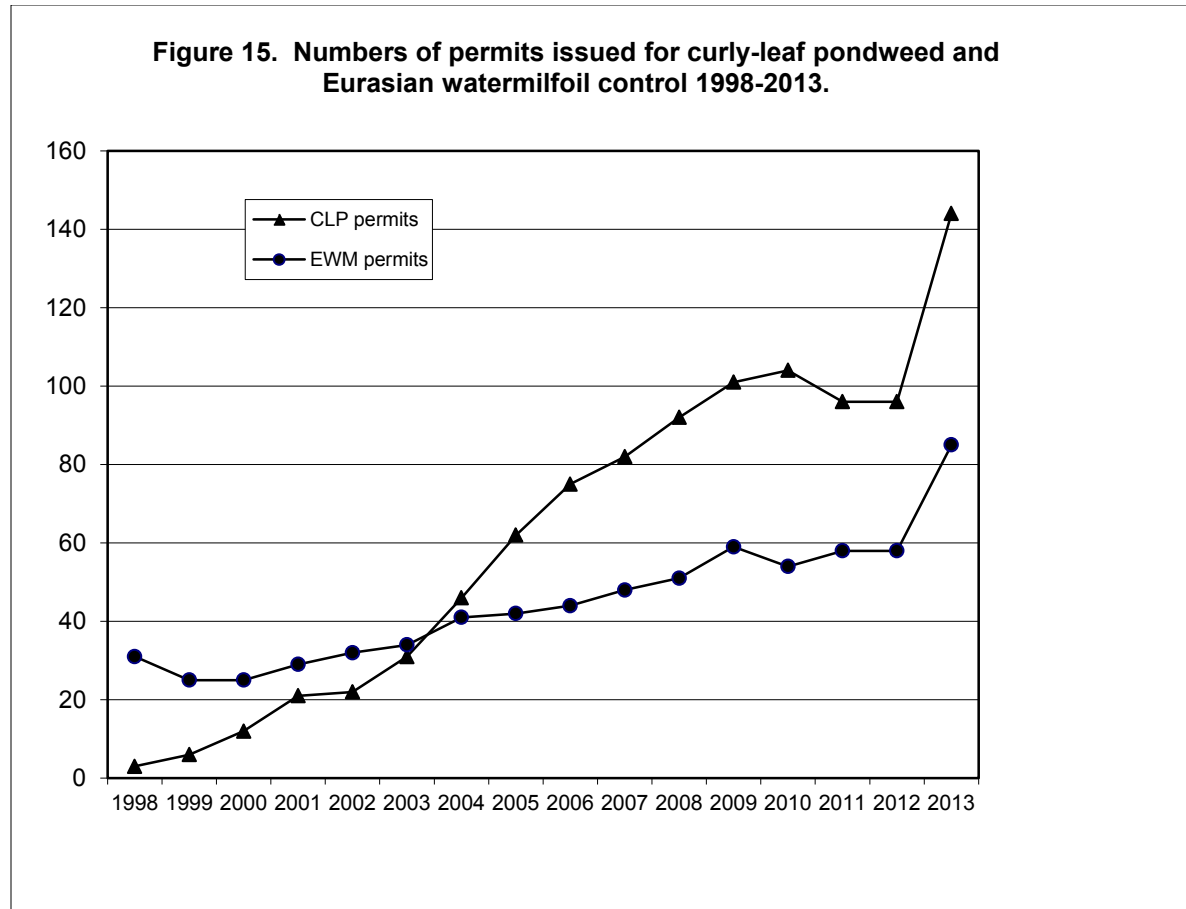
Invasive species specialist are located in: Northwest Region: Park Rapids and Fergus Falls; Northeast Region; Grand Rapids and Brainerd; Central Region: St. Cloud and St. Paul; Southern Region: New Ulm and Hutchinson

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 more than 750 Minnesota lakes in 70 of the 87 counties in Minnesota. In many lakes this plant causes significant recreational nuisances.

Curly-leaf pondweed thrives in lake environments with moderate to high total phosphorous concentrations (Heiskary and Valley 2012). Curly-leaf pondweed's life cycle is considerably different than native aquatic plants. New plants sprout from vegetative propagules called turions (hardened stem tips) in the fall (Catling and Dobson, 1985). When native aquatic plants are just beginning to grow (mid to late May) curly-leaf pondweed may already be forming dense mats on the lakes surface that can interfere with recreation and the growth of native aquatic plants. By midsummer, (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 turions (hardened stem tips) which will be the source of next year's growth. The die back may also be 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 little or no long-term effect on the abundance of the plant.



Following the establishment of an Invasive Species Program at the Minnesota Department of Natural Resources, interest in possible management of curly-leaf pondweed increased in the 1990s. In the late 1990s, researchers with the Army Corps of Engineers learned that there is potential to selectively control curly-leaf growing during early spring by treatment with endothall or diquat herbicides. Not only did these treatments reduce growth of the plant, they also appeared to have the potential to disrupt reproduction. Production of turions can be prevented by early season treatment with herbicide.

Following the early work by the Army Corps on control of curly-leaf, the MnDNR initiated a number of lake-wide, pilot projects in Minnesota. These efforts were called pilot projects because it was not known whether the goals of the projects could be met. To determine whether ecological benefits such as increases in native submersed plants and water clarity could be obtained by repeated lake-wide treatment, the DNR supported a limited number of well-planned and well-monitored projects. Some of these

lakes were monitored by the University of Minnesota under a contract with the MnDNR. In 2012, researchers at the University published results of their efforts (Johnson et al. 2012 and Jones et al. 2012). It is important to note that they reported results for eight (Jones et al. 2012) or nine (Johnson et al. 2012) treated lakes. Of these, six were eutrophic or hypereutrophic, i.e. Secchi depth less than 1.6 m for the lakes studied, and the other two or three were mesotrophic, i.e. Secchi depth greater than 2 m. As a consequence, the conclusions based on this research probably are more helpful in understanding effects of management in eutrophic lakes as compared to mesotrophic lakes. Additional analysis of observations from mesotrophic lakes would be useful. Based on these publications and review of results from additional lakes, it is evident that:

- Lake-wide treatments with herbicides can reduce curly-leaf pondweed during the year of treatment.
- Lake-wide treatments with herbicides may or may not reduce curly-leaf pondweed beyond the year of treatment.
- Although treatment can reduce or prevent production of turions, significant numbers of turions can remain in the lakes after as many as five years of lake-wide treatment.
- Overall, most native aquatic plants were not harmed by lake-wide treatments of curly-leaf pondweed with endothall.
- Overall, there did not appear to be a consistent trend of increasing water clarity following lake-wide treatments to control curly-leaf pondweed. The plant does not appear to be a significant driver of water quality in these lakes.
- Three to five years of successive lake-wide treatment generally were not followed by a number of years when lake-wide monitoring or large treatment would not be necessary.

Additional information on this project can be found in the 2013 Invasive Species Program Annual report: http://files.dnr.state.mn.us/natural_resources/invasives/2013-ais-annual-report.pdf

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:

1. Inventory purple loosestrife sites to prioritize control efforts.
2. Carry out management activities including chemical and biological control.
3. Support research to evaluate and improve control efforts.
4. Monitor and evaluate the success of biological control and other management efforts.
5. Public education/awareness efforts to involve the public in the management of this plant.

Purple loosestrife management is performed using herbicides as well as biological control. Large stands of purple loosestrife are extremely difficult to control using herbicides because of their enormous seed bank. These stands are candidates for biological control using introduced beetles. Minnesota's herbicide control effort has been reduced dramatically since the introduction of bio-control agents began in 1992.

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. In 2013, DNR staff visited a total of 29 purple loosestrife sites for treatment with 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 2013 Invasive Species Annual Program Report. http://files.dnr.state.mn.us/natural_resources/invasives/2013-ais-annual-report.pdf

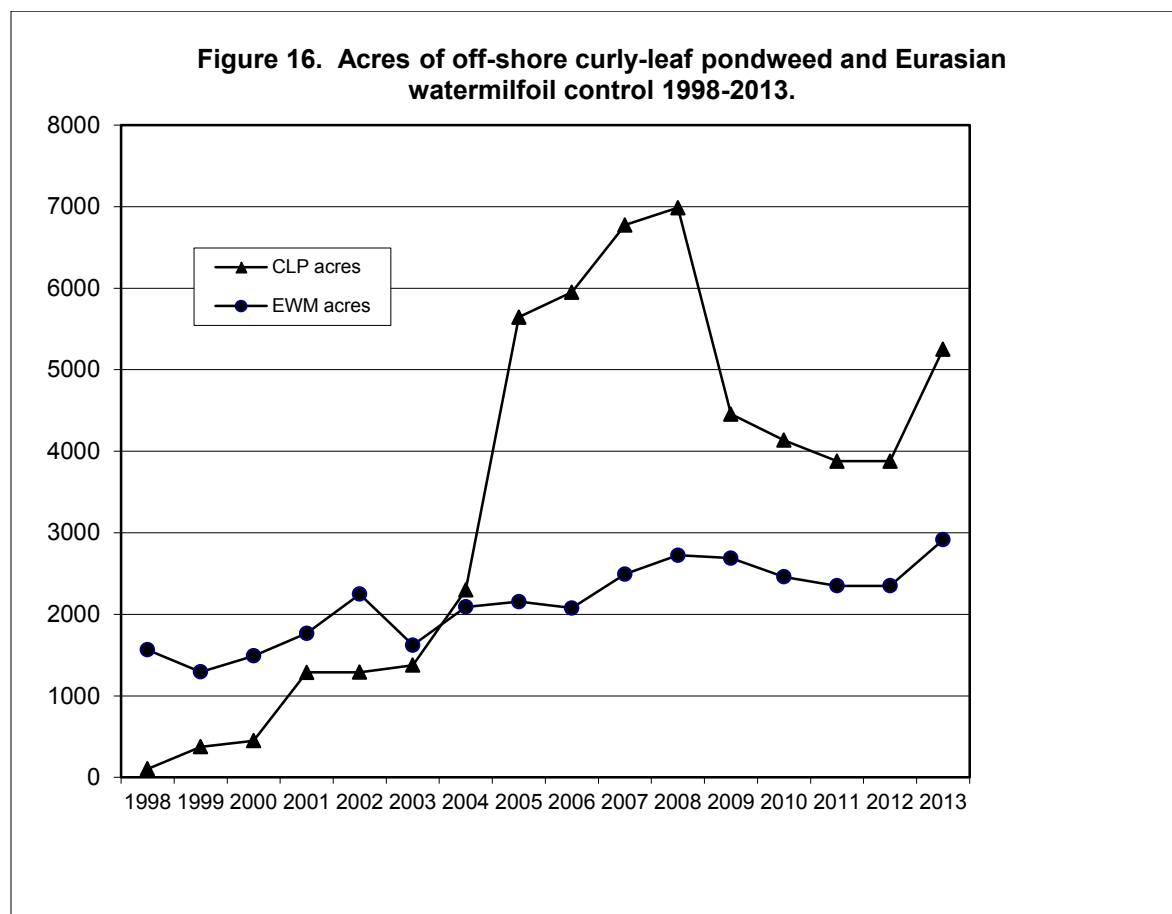
Eurasian Watermilfoil

Eurasian watermilfoil, hereafter called milfoil, is an invasive, 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:

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

Eurasian watermilfoil was discovered in 7 additional water bodies in 2013. There are now 280 water bodies in Minnesota known to have populations of this invasive

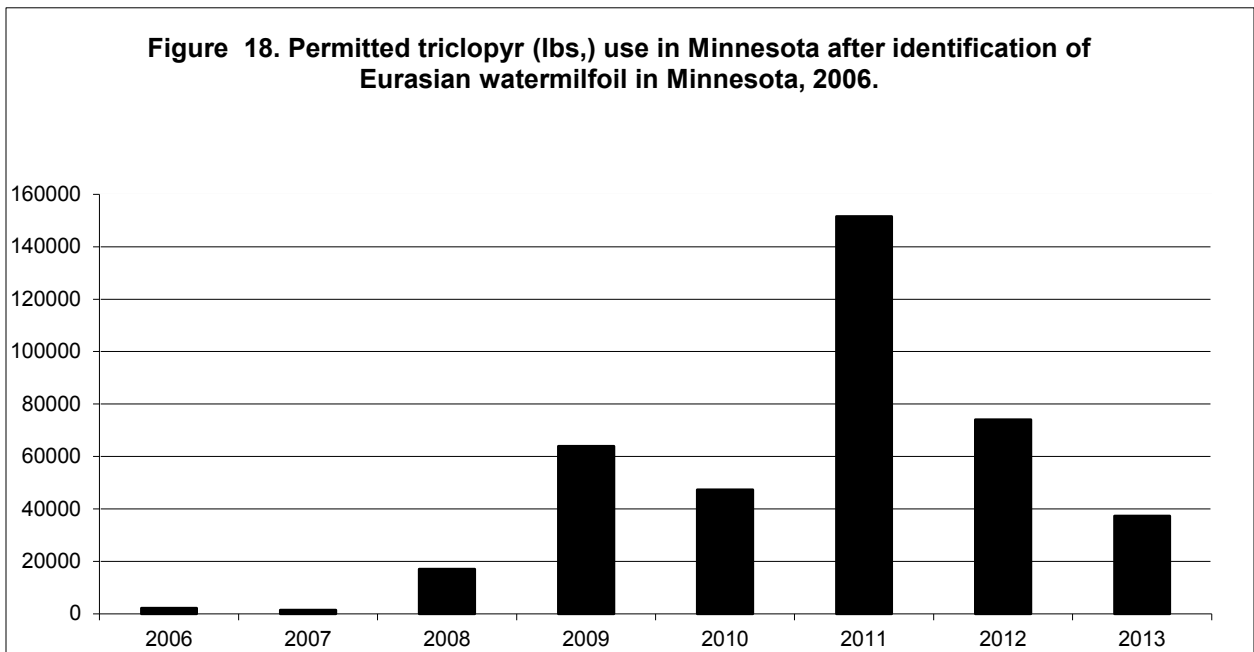
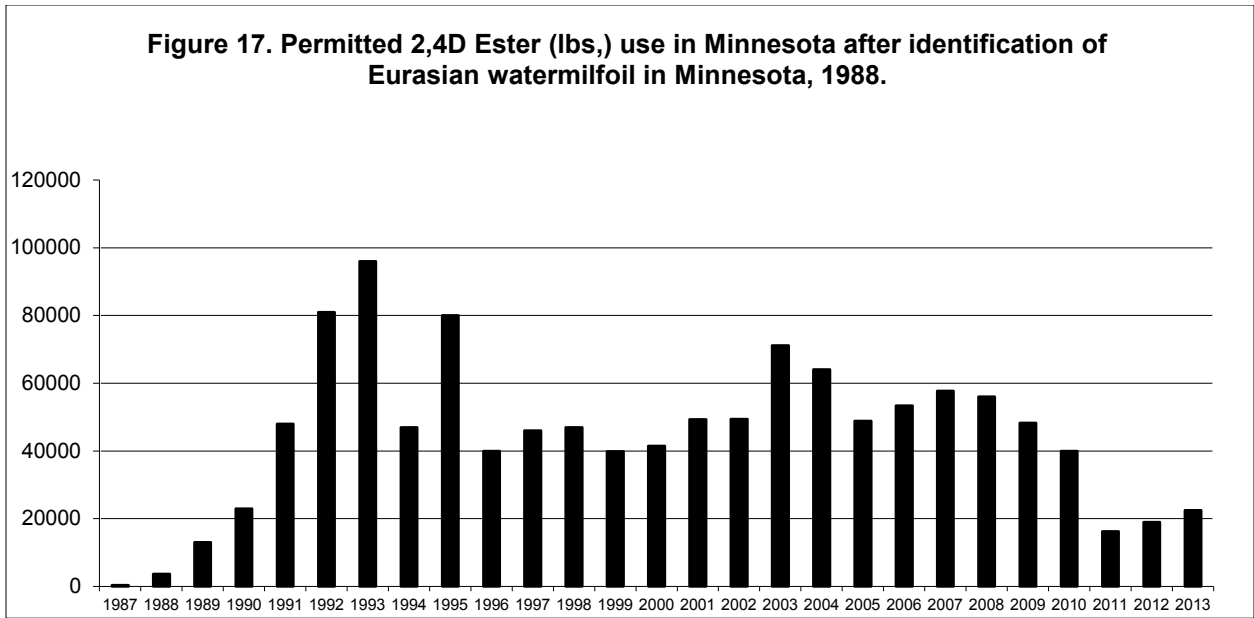
submersed aquatic plant. The acres of Eurasian watermilfoil and curly-leaf pondweed control managed in offshore areas since 1998 is found in Figure 16.



The most commonly used herbicide for control of milfoil from 1997 until 2010 was 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. Since 2010 triclopyr herbicide has overtaken 2,4 D as the product of choice for the control of Eurasian watermilfoil in Minnesota. These systemic herbicides are preferred because they are the most selective products available.

The total reported 2,4-D use in 2013 for milfoil was 22,500 pounds. The total reported annual use of 2,4-D ester products since 1987 is provided in Figure 17. Figure 18 shows the use of triclopyr since 2006.

For more detailed information on the management of invasive species see the 2013 Invasive Species Program Annual Report. The report may be reviewed on line at http://files.dnr.state.mn.us/natural_resources/invasives/2013-ais-annual-report.pdf



Mention of trademarks or proprietary products does not constitute a warranty of the products by the Minnesota Department of Natural Resources and does not imply its approval to the exclusion of other products that may also be suitable.

References Cited

Blankespoor, H.D., and R.L. Reimink. 1991. The Control of Swimmer's Itch in Michigan: Past, Present, and Future. Michigan Academician XXIV, 7-23.

Bolduan, B.R., G.C. Van Eeckhout, H.W. Quade, and J.E. Gannon. 1994. Potamogeton crispus - the other invader. Lake and Reservoir Management 10(2):113-125.

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

Heiskary, S., and R. D. Valley. 2012. Curly-leaf pondweed trends and interrelationships with water quality. Minnesota Department of Natural Resources Investigational Report 558, Saint Paul.

Johnson, J.A., A.R. Jones, and R.M. Newman 2012. Evaluation of lakewide, early season herbicide treatments for controlling invasive curly-leaf pondweed (Potamogeton crispus) in Minnesota lakes. Lake and Reservoir Management 28:346-363.

Jones, A. R. J.A. Johnson, and R.M. Newman 2012. Effects of repeated early season, herbicide treatments of curlyleaf pondweed on native macrophyte assemblages in Minnesota lakes. Lake and Reservoir Management 28:364-374.

APPENDIX

Table:	Page
A. Aquatic Pesticide Enforcement Use Inspections, 2013.....	43
B. A list of commonly used herbicides registered by the EPA for aquatic use and approved by the MN DNR.	45
C. Reported various aquatic herbicide use statewide 1981-2013.....	46
D. Aquatic Plant Management Survey of chemical and mechanical control permit holders in 2013.....	47
E. Aquatic Plant Management Survey of automated aquatic plant control device permit holders in 2013.....	48
F. Statewide numbers of permits and properties by county, 2013.	50
G. Lakes with permits issued for swimmer’s itch in 2013.	51

Appendix Table A. Aquatic pesticide use inspections in 2013

Treatment Date	County	Lake Name	Applicator	Permit Number
05/15/2013	Hennepin	Sarah	Lake Sarah Improvement Assoc.	13W-3A037
05/17/2013	Hennepin	Diamond	Clarke Aquatic Services, 20061 Edison Cir E, Clearwater, MN 55320	13W-3A056
05/21/2013	Blue Earth	Madison	Lakescapes, LLC, 20920 Oak Lane, Greenwood, MN 55331	13F-4089
05/28/2013	Scott	Spring	Lake Restoration, 12425 Ironwood Circle, Rogers, MN 55374	13F-3A379
05/29/2013	Hennepin	Rebecca	Lake Management, Inc, 10400 185th St. N, Marine on St. Croix, MN 55047	13W-3A064
06/03/2013	Chisago	Little Green	Lake Restoration, 12425 Ironwood Circle, Rogers, MN 55374	13W-3B038
06/05/2013	Hennepin	Fish	Lake Restoration, 12425 Ironwood Circle, Rogers, MN 55374	13F-3A291
06/06/2013	Ramsey	West Goose	Midwest Aquacare, 10001 Great Plains Blvd, Chaska, MN 55318	13W-3A069
06/10/2013	Hennepin	North Arm Mtka	Lake Restoration, 12425 Ironwood Circle, Rogers, MN 55374	13F-3A279
06/11/2013	Hennepin	Sarah	Professional Lake Management & Land Corp, 4597 Morehouse Dr., Pequot, MN 56472	13F-3A611
06/06/2013	Ramsey	Gervais	Lake Improvement Consulting, 13787 40th St. Stillwater, MN 55082	13F-3A522
06/17/2013	Hennepin	Mtka Crystal	Midwest Aquacare, 10001 Great Plains Blvd, Chaska, MN 55318	13F-3A574
06/13/2013	Chisago	Rush (west)	Lake Restoration, 12425 Ironwood Circle, Rogers, MN 55374	13F-3A309
06/13/2013	Dakota	Orchard	Lake Management, Inc, 10400 185th St. N, Marine on St. Croix, MN 55047	13F-3A260
06/18/2013	Hennepin	St Albans Mtka	Lake Restoration, 12425 Ironwood Circle, Rogers, MN 55374	13F-3A378

06/18/2013	Ramsey	Josephine	Lake Management, Inc, 10400 185th St. N, Marine on St. Croix, MN 55047	13F-3A261
06/24/2013	Todd	Little Birch	Clarke Aquatic Services, 20061 Edison Cir E, Clearwater, MN 55320	13W-3B002
06/25/2013	Chisago	North Center	Lake Management, Inc, 10400 185th St. N, Marine on St. Croix, MN 55047	13F-3A297
06/27/2013	Isanti	Spectacle	Midwest Aquacare, 10001 Great Plains Blvd, Chaska, MN 55318	13F-3B386
07/08/2013	Chisago	North Center	Lake Restoration, 12425 Ironwood Circle, Rogers, MN 55374	13F-3A481
07/08/2013	Chisago	Chisago	Professional Lake Management & Land Corp, 4597 Morehouse Dr., Pequot, MN 56472	13F-3A590
07/10/2013	Hennepin	Lower Twin	Jacobson Environmental, PLLC, 8409 29th Ave. N, New Hope, MN 55427	13F-3A165
07/15/2013	Dakota	Marion	Midwest Aquacare, 10001 Great Plains Blvd, Chaska, MN 55318	13F-3A430
07/17/2013	Washington	White Bear	Lake Management, Inc, 10400 185th St. N, Marine on St. Croix, MN 55047	13W-3A053
07/23/2013	Todd	Mound	Central Minnesota Aquatics, 26735 Middle Cullen Rd., Nisswa, MN 56468	13F-3B435
07/24/2013	Carver	Lotus	Lake Restoration, 12425 Ironwood Circle, Rogers, MN 55374	13F-3A336
07/22/2013	Chisago	Little Green	Green Lake Association, 9475 Jennifer Ct., Chisago City, MN 55013	13W-3B037
07/30/2013	Waseca	Clear	Lakescapes, LLC, 20920 Oak Lane, Greenwood, MN 55331	13F-4091
07/29/2013	Chisago	ditch to Wallmark	Critical Connections Ecological Services Inc, 21150 Ozard Ave. N, PO Box 184, Scandia, MN 55073	13F-3A794
08/06/2013	Chisago	North Center	Lake Management, Inc, 10400 185th St. N, Marine on St. Croix, MN 55047	13F-3A779
08/08/2013	Wright	Howard	Howard Lake Watershed Alliance, PO Box 438, Howard Lake, MN 55349	13F-3B269

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

Product Name	Selective	Broad	Active Ingredient (Formulation)
<i>Part 1. Aquatically labelled systemic herbicides:</i>			
Aquacide (Pellet)	X		2,4 Dichlorophenoxyacetic Acid (Sodium Salt)
Navigate® (Granular)	X		2,4 Dichlorophenoxyacetic Acid (Butoxyethyl Ester)
SEE 2,4-D (Liquid)	X		2,4 Dichlorophenoxyacetic (Isooctyl Ester)
Weedtrine II (Granular)	X		2,4 Dichlorophenoxyacetic (Isooctyl Ester)
DMA-4 IVM (liquid)	X		2,4 Dichlorophenoxyacetic Acid (Dimethylamine Salt)
Sculpin-G (granular)	X		2,4 Dichlorophenoxyacetic Acid (Dimethylamine Salt)
Sonar (Liquid or Granular)		X	Fluridone
Rodeo, Refuge, AquaPro, AquaNeat (Liquid)		X	Glyphosate
Renovate, Kraken (Liquid or Granular)	X		Triclopyr
Habitat		X	Imazapyr
Clearcast		X	Imazamox
Clipper		X	Flumioxazin
<i>Part 2. Contact herbicides:</i>			
Aquathol (Liquid or Granular)		X	Dipotassium salt of endothall
Hydrothol (Liquid or Granular)		X	Mono-amine salt of endothall <i>(liquid by licensed applicator only)</i>
Reward, Redwing, Tribune (Liquid)		X	Diquat dibromide
<i>Part 3. Copper Compounds (Algaecides & Herbicides):</i>			
Captain, Nautique (Liquid)	X		Copper Carbonate
Mizzen, Symmetry (Liquid)	X		Copper Triethanolamine Complex
Cutrine Plus (Granular & Liquid)	X		Copper Ethanolamine Complex
Clearigate (Liquid)	X		Copper Ethanolamine Complex
<i>Part 4. Other:</i>			
Copper sulfate	X		CuSO4 (wide variety of registered brands)

Mention of trademarks or proprietary products does not constitute a warranty of the products by the Minnesota Department of Natural Resources and does not imply its approval to the exclusion of other products that may also be suitable.

Table C. Reported various aquatic herbicide use statewide in lbs. and gallons of product, 1981-2013.

Year	2,4-D ester lbs.	2,4-D salt lbs.	2,4-D amine/ acid gal.	2,4-D amine/ acid lbs.	2,4-D isooctyl ester gal.	Aquathol lbs.	Aquathol gal.	Diquat gal.	Hydrothol 191 lbs.	Hydrothol 191 gal.	copper sulfate lbs.	Triclopyr lbs.	Triclopyr gal.	2,4-D salt Triclopyr lbs.	Imazapyr gal.	Imazamox gal.	Flumioxazin 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	0	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	47,000	2,189	28	*	*	*	*
2007	57,700	971	85	*	*	1,320	9,838	3,665	10,105	782	46,000	1,400	46	*	*	*	*
2008	56,000	655	7.4	*	*	2,462	13,208	2,643	10,693	550	32,290	17,025	1,882	*	*	*	*
2009	48,250	655	939	*	*	725	13,801	1,791	7,963	1,758	25,234	63,896	662	*	*	*	*
2010	39,932	731	1,070	*	*	737	10,238	1,501	7,973	900	23,200	47,379	1,371	*	*	*	*
2011	16,233	775	1,066	*	*	578	10,936	1,760	5,426	626	22,341	151,593	587	3120	*	*	*
2012	19,007	847	7,233	*	*	1,140	12,992	2,197	5,967	493	36,810	74,086	1,014	2488	*	*	*
2013	22,486	753	6,108	2	2,005	5,423	8,778	2,489	4,889	440	20,442	37,305	573	*	5.68	9113	146

* Data not available

Mention of trademarks or proprietary products does not constitute a warranty of the products by the Minnesota Department of Natural Resources and does not imply its approval to the exclusion of other products that may also be suitable.

Appendix Table D. Aquatic Plant Management Survey, Chemical-Mechanical, 2013.

Was your 2013 permit used?

702 Yes, permitted work was done.

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

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

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

49 No, because:

884 total

When my permit expires:

654 I will reapply for a permit.

32 I will not apply for a permit.

103 I am undecided at this time.

33 Permanent and Non-transferable

54 did not answer the question

The method of control was:

246 mechanical or hand removal.

436 chemical treatment.

88 mechanical and chemical treatment.

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

367 YES

36 NO

124 wasn't as good as expected

60 did not answer the question

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

128 YES

18 NO

47 wasn't as good as expected

16 did not answer the question

When was the work done?

10 April 88 May 348 June 326 July 203 August 34 September 12 October 1 November 4 uncertain

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.

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

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

81 did not answer the question

If you used herbicide, please indicate what you used and how much?

What Did You Use?

How Much Did You Use?

Copper sulphate	<u>4351.00</u> lbs.	Navigate	<u>224.60</u> lbs.
gran.Hydrothol 191	<u>4793.50</u> lbs.	Renovate	<u>0.00</u> gal.
liq. Aquathol K	<u>383.84</u> gal.	Redwing	<u>0.00</u> gal.
Super K Aquathol	<u>377.00</u> lbs.	Aquacide	<u>753.00</u> lbs.
liq. Hydrothol 191	<u>113.00</u> gal.	liq Cutrine Plus	<u>35.50</u> gal.
Tribune	<u>0.44</u> gal.	Renovate OTF	<u>0.00</u> lbs.
Habitat	<u>4.65</u> gal.	gran Cutrine Plus	<u>10.00</u> lbs.
Aqua Neet	<u>0.00</u> gal.	DMA	<u>180.10</u> gal.
Rodeo	<u>71.25</u> gal.	Glyphosate	<u>0.00</u> gal.
Shoreclear	<u>0.01</u> gal.	Weedtrine D	<u>0.00</u> gal.
Reward	<u>1.46</u> gal.	AquaKleen	<u>14215.5</u> lbs.
Mizzen	<u>0.5</u> gal.		

Appendix Table E. Aquatic Plant Management Survey for automated aquatic plant control device (AAPCD) permit holders 2013.

2013 AQUATIC PLANT MANAGEMENT SURVEY					
Automated Aquatic Plant Control Device (AAPCD)					
1.	The type of AUAPCD device I use is a:	514	Crary WeedRoller®		
		7	Lake Restoration Lake Maid		
		78	Colman Beach Groomer		
		2	Other		
		601	Total		
2.	I used an AUAPCD this year:				
	601 Yes				
	83 No, I did not use an AUAPCD this year.				
	684 Total				
3.	The AUAPCD I used in 2013:				
	I have owned for:		Is jointly owned and shared with the other co-owners and has been for:		
	65 less than 1 year			1	rented.
	63 1 - 3 years			9	borrowed.
	391 more than 3 years		8 less than 1 year		
			10 1 - 3 years		
			63 more than 3 years		
4.	<u>How often monthly</u> did you operate the AUAPCD you used ?				
		few	several	many	
	not used	hours	hours	hours	continuous
		>0-20	>20-50	>50-144	
	In May:	326	130	46	23
	In June:	73	261	159	73
	In July:	34	243	199	90
	In August:	70	281	139	66

Appendix Table F. Statewide numbers of APM permits and properties by county, 2013.

County	Permits	Properties
Aitkin	110	114
Anoka	58	122
Becker	174	174
Beltrami	21	21
Blue Earth	8	42
Carlton	15	15
Carver	77	273
Cass	215	218
Chisago	73	309
Clay	7	7
Clearwater	10	10
Cottonwood	1	1
Crow Wing	593	879
Crow Wing/Morrison	3	94
Dakota	61	249
Douglas	156	156
Faribault	5	56
Freeborn	5	5
Grant	10	10
Hennepin	320	1,236
Hubbard	57	57
Isanti	24	78
Itasca	38	38
Jackson	1	1
Kanabec	2	126
Kandiyohi	71	91
LeSueur	72	202
Lincoln	1	1
Marshall	1	1
Martin	7	7
McLeod	1	1
Meeker	33	73
Mille Lacs	16	16
Morrison	75	276
Murray	9	9
Nicollet	1	1
Olmsted	1	1
Otter Tail	403	408
Pine	29	73
Pipestone	1	1
Polk	8	8
Pope	50	50
Ramsey	127	722
Rice	21	64
Rock	1	1

Roseau	1	1
Scott	67	214
Sherburne	47	192
Sibley	1	1
St. Louis	22	22
Stearns	114	126
Steele	2	2
Todd	105	94
Todd & Stearns	1	1
Wadena	6	6
Waseca	5	14
Washington	138	425
Watonwan	1	1
Wright	172	545

Appendix Table G. Lakes with permits issued for swimmer's itch in 2013.

County	Lake	DOW #	Number of Swimmers Itch Permits
AITKIN	MINNEWAWA	1003300	3
AITKIN	HORSESHOE	1003400	1
AITKIN	BIG SANDY	1006200	12
AITKIN	SUGAR	1008700	2
AITKIN	GUN	1009900	5
AITKIN	FLEMING	1010500	3
AITKIN	SECTION 12	1012000	1
AITKIN	ESQUAGAMAH	1014700	1
AITKIN	FARM ISLAND	1015900	19
AITKIN	HANGING KETTLE	1017000	2
AITKIN	LITTLE PINE	1017600	1
AITKIN	SPIRIT	1017800	1
AITKIN	CEDAR	1020900	3
AITKIN	SOUTH BIG PINE	1015700	2
ANOKA	CENTERVILLE	2000600	4
ANOKA	COON	2004200	10
ANOKA	GOLDEN	2004500	6
ANOKA	HAM	2005300	3
ANOKA	EAST MOORE	2007501	1
ANOKA	GEORGE	2009100	1
BECKER	SALLIE	03035900	3
BECKER	DETROIT	03038100	12
BECKER	BIG FLOYD	03038700	1
BECKER	MELISSA	03047500	4
BELTRAMI	ANDRUSIA	04003800	1
BELTRAMI	MARQUETTE	04014200	1
BELTRAMI	JULIA	04016600	1
BLUE EARTH	MADISON	7004400	4
CARLTON	BIG HANGING HORN	9003800	1
CARLTON	EAGLE	9005700	12
CARLTON	TAMARACK	9006700	1
CARVER	RILEY	10000200	6
CARVER	LOTUS	10000600	10
CARVER	LUCY	10000700	1
CARVER	MINNEWASHTA	10000900	8
CARVER	ANN	10001200	1
CARVER	SUSAN	10001300	3
CARVER	VIRGINIA	10001500	6
CARVER	SCHUTZ	10001800	3
CARVER	BAVARIA	10001900	3
CARVER	ZUMBRA	10004100	2
CARVER	PIERSON	10005300	5
CARVER	WACONIA	10005900	2
CARVER	BURANDT	10008400	3
CARVER	FIREMANS	10022600	1
CASS	BIRCH	11041200	1
CASS	TEN MILE	11041300	1

CASS	ROOSEVELT	11004300	2
CASS	LAWRENCE	11005300	2
CASS	HARDY	11020900	2
CASS	UPPER GULL	11021800	6
CASS	MARGARET	11022200	7
CASS	SYLVAN	11030400	2
CASS	GULL	11030500	52
CASS	NORWAY	11030700	6
CASS	GREEN HILL	11078600	2
CHISAGO	CHISAGO	13001200	1
CHISAGO	SOUTH CENTER	13002700	7
CHISAGO	NORTH CENTER	13003200	15
CHISAGO	NORTH LINDSTROM	13003500	3
CHISAGO	GREEN	13004100	5
CHISAGO	LITTLE COMFORT	13005400	1
CHISAGO	RUSH	13006900	9
CHISAGO	MANDALL	13007400	1
CHISAGO	RABOUR	13007900	1
CHISAGO	GOOSE	13008300	1
CLAY	BLUE EAGLE	14009300	1
CLEARWATER	LOMAND	15008100	1
CROW WING	LITTLE WHITEFISH	18000100	1
CROW WING	CAMP	18001800	2
CROW WING	HOLT	18002900	1
CROW WING	SCOTT	18003300	4
CROW WING	BAY	18003400	20
CROW WING	CROOKED	18004100	4
CROW WING	PORTAGE	18005000	1
CROW WING	SERPENT	18009000	5
CROW WING	RABBIT	18009302	2
CROW WING	UPPER SOUTH LONG	18009600	9
CROW WING	BLACKHOOF	18011700	1
CROW WING	LOWER SOUTH LONG	18013600	17
CROW WING	RICE	18014500	1
CROW WING	CROW WING	18015500	5
CROW WING	SEBIE	18016100	4
CROW WING	UPPER MISSION	18024200	1
CROW WING	LITTLE PINE	18026600	12
CROW WING	ISLAND	18026900	2
CROW WING	DAGGETT	18027100	22
CROW WING	WEST FOX	18029700	1
CROW WING	EDWARD	18030500	1
CROW WING	PELICAN	18030800	6
CROW WING	FAWN	18030900	1
CROW WING	WHITEFISH	18031000	18
CROW WING	RUSH	18031100	22
CROW WING	CROSS	18031200	22
CROW WING	BIG TROUT	18031500	15
CROW WING	WISE	18031900	1
CROW WING	GILBERT	18032000	1
CROW WING	GLADSTONE	18033800	2
CROW WING	LITTLE HUBERT	18034000	4

CROW WING	OSSAWINNAKEE	18035200	5
CROW WING	PIG	18035400	3
CROW WING	BERTHA	18035500	5
CROW WING	CLAMSHELL	18035600	10
CROW WING	ARROWHEAD	18036600	1
CROW WING	PERCH	18037100	2
CROW WING	NORTH LONG	18037200	13
CROW WING	ROUND	18037300	7
CROW WING	CLARK	18037400	1
CROW WING	HUBERT	18037500	2
CROW WING	UPPER CULLEN	18037600	3
CROW WING	MIDDLE CULLEN	18037700	5
CROW WING	LOWER HAY	18037800	4
CROW WING	WHITE SAND	18037900	11
CROW WING	RED SAND	18038600	1
CROW WING	LOVE	18038800	5
CROW WING	EDNA	18039600	1
CROW WING	ROY	18039800	5
CROW WING	NISSWA	18039900	5
CROW WING	LOWER CULLEN	18040300	1
CROW WING	SIBLEY	18040400	3
CROW WING	MAYO	18040800	2
CROW WING	UPPER HAY	18041200	7
CROW WING	MISSISSIPPI RIVER	00-00000	1
CROWWING/MORRISON	PLATTE	18008800	4
DAKOTA	MARION	19002600	5
DAKOTA	CRYSTAL	19002700	8
DAKOTA	ORCHARD	19003100	2
DAKOTA	ROSEBERGER	19004100	2
DAKOTA	SUNFISH	19005000	2
DAKOTA	BLACKHAWK	19005900	1
DAKOTA	ROGERS	19008000	2
DAKOTA	WARRIOR POND	19009300	1
DAKOTA	VALLEY	19034800	1
DOUGLAS	GENEVA	21005200	6
DOUGLAS	LE HOMME DIEU	21005600	10
DOUGLAS	CARLOS	21005700	3
DOUGLAS	IRENE	21007600	9
DOUGLAS	DARLING	21008000	4
DOUGLAS	MILTONA	21008300	8
DOUGLAS	IDA	21012300	3
DOUGLAS	AARON	21024200	1
FARIBAULT	BASS	22007400	2
FREEBORN	MORIN	24004300	1
GRANT	PELICAN	26000200	2
GRANT	POMME DE TERRE	26009700	2
HENNEPIN	LAKEWOOD POND	27001700	1
HENNEPIN	EDINA	27002900	1
HENNEPIN	LOWER TWIN	27004200	7
HENNEPIN	ARROWHEAD	27004500	1
HENNEPIN	BUSH	27004700	1
HENNEPIN	HAWKES	27005600	1

HENNEPIN	BRYANT	27006700	5
HENNEPIN	DUCK	27006900	1
HENNEPIN	ROUND	27007100	1
HENNEPIN	RED ROCK	27007600	3
HENNEPIN	LIBBS	27008500	1
HENNEPIN	SHAVERS	27008600	2
HENNEPIN	SHADY OAK	27008900	1
HENNEPIN	GLEASON	27009500	6
HENNEPIN	BASS	27009800	1
HENNEPIN	MEDICINE	27010400	8
HENNEPIN	PARKERS	27010700	3
HENNEPIN	WEAVER	27011700	3
HENNEPIN	FISH	27011800	5
HENNEPIN	MTKA HALSTEDS	27013301	4
HENNEPIN	MTKA PRIESTS	27013302	2
HENNEPIN	MTKA COOKS	27013303	6
HENNEPIN	MTKA W. UPPER LAKE	27013304	5
HENNEPIN	MTKA SOUTH UPPER	27013305	5
HENNEPIN	MTKA SMITHTOWN	27013306	3
HENNEPIN	MTKA PHELPS	27013307	6
HENNEPIN	MTKA E. UPPER LAKE	27013308	2
HENNEPIN	MTKA CARMANS	27013309	4
HENNEPIN	MTKA SPRING PARK	27013310	5
HENNEPIN	MTKA BLACK	27013311	2
HENNEPIN	MTKA EMERALD	27013312	1
HENNEPIN	MTKA HARRISONS BAY	27013314	7
HENNEPIN	MTKA JENNINGS	27013315	2
HENNEPIN	MTKA WEST ARM	27013316	2
HENNEPIN	MTKA CRYSTAL	27013317	2
HENNEPIN	MTKA NORTH ARM	27013318	4
HENNEPIN	MTKA STUBBS	27013319	2
HENNEPIN	MTKA MAXWELL	27013320	5
HENNEPIN	MTKA LAFAYETTE	27013321	4
HENNEPIN	MTKA SMITHS	27013322	1
HENNEPIN	MTKA BROWNS	27013323	2
HENNEPIN	MTKA WAYZATA	27013324	5
HENNEPIN	MTKA GRAYS BAY	27013325	1
HENNEPIN	MTKA ROBINSONS	27013326	1
HENNEPIN	MTKA ST. LOUIS	27013327	1
HENNEPIN	MTKA CARSONS	27013328	3
HENNEPIN	MTKA ST. ALBANS	27013329	10
HENNEPIN	MTKA EXCELSIOR	27013330	5
HENNEPIN	MTKA GIDEONS	27013331	4
HENNEPIN	MTKA LOWER LAKE S.	27013332	3
HENNEPIN	MTKA LOWER LAKE N.	27013333	2
HENNEPIN	CHRISTMAS	27013700	2
HENNEPIN	MTKA FOREST	27013900	1
HENNEPIN	INDEPENDENCE	27017600	4
HENNEPIN	DUTCH	27018100	1
HENNEPIN	SARAH	27019100	7
HENNEPIN	REBECCA	27019200	1
HENNEPIN	UNNAMED (7365 Pond)	27038900	1

HENNEPIN	GREENTREE POND	27046600	1
HENNEPIN	MELODY	27066900	1
HENNEPIN	BELLE POND	27067400	1
HENNEPIN	STAUDER POND	27079900	1
HUBBARD	UPPER BOTTLE	29014800	1
HUBBARD	LONG	29016100	1
HUBBARD	BIG SAND	29018500	1
HUBBARD	BAD AXE	29020800	1
HUBBARD	FISHHOOK	29024200	1
HUBBARD	PORTAGE	29025000	1
HUBBARD	EAGLE LAKE	29025600	1
ISANTI	BLUE	30010700	3
ISANTI	SPECTACLE	30013500	1
ISANTI	GREEN	30013600	3
ITASCA	SWAN	31006700	2
ITASCA	POKEGAMA	31053200	2
ITASCA	JESSIE	31078600	1
ITASCA	BOWSTRING	31081300	1
ITASCA	SAND	31082600	3
KANABEC	FISH	33003600	1
KANDIYOHI	NEST	34015400	1
KANDIYOHI	EAGLE	34017100	13
LESUEUR	SAKATAH	40000200	3
LESUEUR	TETONKA	40003100	8
LESUEUR	GORMAN	40003200	1
LESUEUR	VOLNEY	40003300	2
LESUEUR	FRANCES	40005700	5
LESUEUR	WARNER	40005800	1
LESUEUR	GERMAN	40006300	3
LESUEUR	JEFFERSON	40009202	9
LESUEUR	WASHINGTON	40011700	13
LESUEUR	EMILY	40012400	1
MEEKER	LONG	47002600	3
MEEKER	SPRING	47003200	2
MEEKER	WASHINGTON	47004600	4
MEEKER	MINNIE-BELLE	47011900	5
MEEKER	RIPLEY	47013400	1
MILLE LACS	MILLE LACS	48000200	7
MORRISON	SULLIVAN	49001600	1
MORRISON	ALEXANDER	49007900	8
MORRISON	SHAMINEAU	49012700	2
MORRISON	CROOKNECK	49013300	7
OLMSTED	GEORGE	55000800	1
OTTER TAIL	ADLEY	56003100	1
OTTER TAIL	WEST LEAF	56011400	1
OTTER TAIL	BIG PINE	56013000	1
OTTER TAIL	RUSH	56014100	1
OTTER TAIL	CLITHERALL	56023800	1
OTTER TAIL	OTTERTAIL	56024200	1
OTTER TAIL	MARION	56024300	4
OTTER TAIL	DEER	56029800	27
OTTER TAIL	LITTLE MCDONALD	56032800	2

OTTER TAIL	ROSE	56036000	1
OTTER TAIL	SOUTH TURTLE	56037700	1
OTTER TAIL	BIG MCDONALD	56038601	1
OTTER TAIL	LONG	56038800	1
OTTER TAIL	STALKER	56043700	5
OTTER TAIL	EAST SILENT	56051700	1
OTTER TAIL	WALL	56065800	2
OTTER TAIL	SOUTH LIDA	56074702	1
OTTER TAIL	PELICAN	56078600	1
OTTER TAIL	PRAIRIE	56091500	1
PINE	SAND	58008100	3
PINE	CROSS	58011900	1
PINE	UPPER PINE	58013000	1
PINE	NORTH BIG PINE	58013800	7
PINE	POKEGAMA	58014200	2
POPE	LINKA	61003700	4
POPE	AMELIA	61006400	3
POPE	VILLARD	61006700	2
POPE	MINNEWASKA	61013000	3
RAMSEY	BALD EAGLE	62000200	5
RAMSEY	KOHLMAN	62000600	2
RAMSEY	GERVAIS	62000700	6
RAMSEY	KELLER	62001000	2
RAMSEY	MCCARRONS	62005400	1
RAMSEY	OWASSO	62005600	3
RAMSEY	JOSEPHINE	62005700	2
RAMSEY	TURTLE	62006100	3
RAMSEY	SNAIL	62007300	5
RAMSEY	ISLAND	62007500	1
RAMSEY	JOHANNA	62007800	1
RAMSEY	WABASSO	62008200	1
RAMSEY	PEPPERTREE POND	62008600	1
RAMSEY	KERRY POND	62009500	1
RAMSEY	SHERWOOD POND	62009600	1
RAMSEY	EVERGREEN POND	62009700	1
RAMSEY	DUMBELL POND	62011300	1
RAMSEY	M POND	62011300	1
RICE	ROBERDS	66001800	2
RICE	FRENCH	66003800	1
RICE	HUNT	66004700	3
RICE	CEDAR	66005200	6
SCOTT	CLEARY	70002200	1
SCOTT	LOWER PRIOR	70002600	19
SCOTT	SPRING	70005400	4
SCOTT	UPPER PRIOR	70007200	8
SCOTT	CEDAR	70009100	10
SCOTT	O'DOWD	70009500	2
SCOTT	MILL POND	70011300	1
SCOTT	THOLE	70012000	1
SHERBURNE	ORONO	71001300	3
SHERBURNE	EAGLE	71006700	4
SHERBURNE	MITCHELL	71008100	6

SHERBURNE	BIG	71008200	7
SHERBURNE	JULIA	71014500	1
SHERBURNE	BRIGGS	71014600	1
SHERBURNE	RUSH	71014700	2
SHERBURNE	LONG	71015900	2
ST. LOUIS	PRAIRIE	69084800	1
ST. LOUIS	FLOODWOOD LAKE	69088400	1
ST. LOUIS	BIG STURGEON	69093900	4
STEARNS	MARIE	73001400	2
STEARNS	GRAND	73005500	2
STEARNS	BOLFING	73008800	1
STEARNS	PELICAN	73011800	20
STEARNS	MIDDLE SPUNK	73012800	2
STEARNS	CEDAR ISLAND	73013300	1
STEARNS	RICE	73019600	1
STEARNS	KORONIS	73020000	2
STEELE	KOHLMEIER	74001900	1
TODD	OSAKIS	77021500	13
TODD	MOUND	77000700	3
TODD	BIG SWAN	77002300	5
TODD	BIG BIRCH	77008400	7
TODD	CHARLOTTE	77012000	1
TODD/STEARNS	LITTLE BIRCH	77008900	3
WADENA	STOCKING	80003700	1
WASECA	CLEAR	81001400	2
WASECA	REEDS	81005500	1
WASHINGTON	BIG CARNELIAN	82004900	4
WASHINGTON	BIG MARINE	82005200	3
WASHINGTON	SYLVAN	82008000	1
WASHINGTON	DEMONTREVILLE	82010100	2
WASHINGTON	OLSON	82010300	2
WASHINGTON	JANE	82010400	2
WASHINGTON	TANNERS	82011500	2
WASHINGTON	FOREST	82015900	9
WASHINGTON	CLEAR	82016300	2
WASHINGTON	WHITE BEAR	82016700	8
WASHINGTON	POTAMOGETON POND	82021200	1
WASHINGTON	PINE TREE POND	82033000	1
WRIGHT	CLEARWATER	83025200	1
WRIGHT	MARTHA	86000900	1
WRIGHT	PULASKI	86005300	4
WRIGHT	LITTLE PULASKI	86005301	1
WRIGHT	WAVERLY	86011400	7
WRIGHT	SULLIVAN	86011900	1
WRIGHT	MAPLE	86013400	5
WRIGHT	LOCKE	86016800	4
WRIGHT	HOWARD	86019900	2
WRIGHT	GRANITE	86021700	1
WRIGHT	MINK/SOMERS	86022900	3
WRIGHT	MINK/SOMERS	86022900	1
WRIGHT	SUGAR	86023300	9
WRIGHT	BASS	86023400	1

WRIGHT	PLEASANT	86025100	7
WRIGHT	CLEARWATER	86025201	13
WRIGHT	FRENCH	86027300	3
WRIGHT	WEST LAKE SYLVIA	86027900	4
WRIGHT	LOUISA	86028200	1
WRIGHT	AUGUSTA	86028400	3
WRIGHT	EAST LAKE SYLVIA	86028900	4