

Aquatic Plant Management Program 2019 Annual Report

BY

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CONTENTS

1	Introduction to the APM Program.....	4
1.1	Regulations	4
1.2	Administrative Regions & Permitting Process	4
	<i>Figure 1.1 – Map of MN DNR Fisheries Administrative Regions 1, 2, 3A, 3B, and 4</i>	<i>5</i>
	<i>Figure 1.2 – Simplified flow diagram of the APM Permitting process, showing the actions completed by the permit applicant and those completed by DNR Staff.</i>	<i>5</i>
1.3	Site Inspections.....	6
	<i>Table 1.A – Number of Site Inspections and Treatment Area Reductions by region during 2019.</i>	<i>6</i>
2	Summary of APM Permitting Activity.....	7
2.1	Permit Duration	7
2.2	Permit Fee Schedule	7
	<i>Table 2.A - Fee payment schedule for various APM permit types</i>	<i>7</i>
2.3	Permit Issuance.....	8
	<i>Table 2.B - Number of control activities permitted in 2019 by Region. Note: a permit may have more than one control activity.</i>	<i>8</i>
	<i>Table 2.C - Regional summary of active Aquatic Plant Management permits for 2019</i>	<i>9</i>
	<i>Figure 2.1 - Numbers of APM permits issued for mechanical and chemical control of aquatic vegetation, algae, and swimmer's itch; and number of 1-year and 3-year AAPCD Permits issued during 1998-2019.</i>	<i>9</i>
	<i>Figure 2.2 - Number of permits issued by Control type (Mechanical, Chemical, AAPCD) and Region where issued in 2019. Note: a permit may have multiple control types.</i>	<i>10</i>
	<i>Figure 2.3 - Numbers of properties issued APM permits for aquatic plant control statewide, 1997-2019</i>	<i>11</i>
	<i>Figure 2.4 - Number of active APM permits of varying duration from 1995-2019</i>	<i>11</i>
2.4	Permitted Offshore Acres for Aquatic Plant Control	12
	<i>Figure 2.5 - Permitted off-shore herbicide control acreage of aquatic plants statewide from 2001-2019</i>	<i>12</i>
2.5	Management of Invasive Aquatic Plants	13
	<i>Figure 2.6 - Number of acres permitted under IAPM permits for selected target species in 2019.</i>	<i>13</i>
3	Reported Activity	14
3.1	Reportage usage of permits.....	14
	<i>Table 3.A - Total near-shore area permitted in acres by Region, number of properties, and median area controlled by treatment method for 2019.....</i>	<i>14</i>
	<i>Figure 3.1 - Total reported number of permits used and not used by region, during 2019</i>	<i>14</i>
	<i>Table 3.B - Survey responses for why issued permits were not used.</i>	<i>15</i>
	<i>Figure 3.2 - Percent of reported APM work done by permittee or by a commercial service for each region in 2019</i>	<i>15</i>
3.2	Satisfaction of permit user.....	16
3.3	Automated Aquatic Plant Control Devices (AAPCD) Permits	16
	<i>Figure 3.3 - Numbers of one-year and three-year AAPCD permits issued, 1998-2019.....</i>	<i>16</i>

3.4	Copper-based Permits	17
	<i>Figure 3.4 - Number of permits issued for the control Filamentous algae, Chara/Nitella, and Swimmer Itch</i>	<i>17</i>
4	Program Enforcement	18
	<i>Table 4.A - Enforcements actions issued 2019 for APM-related violations.....</i>	<i>18</i>
	<i>Table 4.B - Routine Pesticide Use Inspections completed in 2019</i>	<i>19</i>
5	References	21
6	Appendices	22
	<i>Table 6.A - List common EPA-registered pesticides approved for aquatic use by the MN DNR</i>	<i>22</i>
	<i>Table 6.B - Reported various aquatic herbicide use statewide 1998-2019</i>	<i>23</i>
	<i>Table 6.C - History and Timeline of Invasive (Exotic) Species Program and Aquatic Plant Management Program</i>	<i>24</i>

1 INTRODUCTION TO THE AQUATIC PLANT MANAGEMENT PROGRAM

A healthy lake is dependent on a healthy aquatic plant community to provide habitat for aquatic organisms, absorb & recycle nutrients, and to stabilize shorelines. These near-shore plants, which are commonly referred to as weeds, are often perceived as a nuisance. Minnesota state law allows lakeshore property owners the right to use and access the lake adjacent to their property, which includes managing the areas impacted by these plants.

The purpose of the DNR's aquatic plant management (APM) program is to balance native plant conservation with the desires of lakeshore residents to recreate and access their property. State law establishes what property owners can do to control aquatic plants. DNR fisheries' APM staff administer those controls via a permitting system.

Other aquatic organisms can also interfere with the lakeshore property owner's enjoyment of the lake and the APM program issues permits to provide relief from them. Swimmer's itch, caused when an immature life stage of a parasite occurring in snails encounters a swimmer, 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.

This report will provide an overview of the following program details for the 2019 season:

- Summary details on the various types of permits we issue, including the number and their general location
- Survey data related to permit usage and user satisfaction from permit users
- Summary data on aquatic enforcement activity conducted by the DNR and Minnesota Department of Agriculture

1.1 Regulations

The APM Program operates within the bounds established by a set of state statutes (MS) and rules (MR):

- [MS 84.091, Subdivision 1](#) – The State owns wild rice and other aquatic plants growing in public waters.
- [MS 103G.615](#) – Authorizes 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.
- [MR 6280](#) – Details the standards for the issuance of permits to control aquatic plants and the permit fee structure

[MR 6280.0250](#) also outlines certain conditions where an APM permit is not required due to the minimal impact expected from these activities; refer to 6280.0250 or visit our APM Website for further details:

<https://www.dnr.state.mn.us/apm/index.html>

1.2 Administrative Regions & Permitting Process

The Section of Fisheries in the DNR's Division of Fish and Wildlife is responsible for the administration of the APM permit program. Permit application review, and permit issuance, is conducted by APM permitting staff located at three regional offices and three Area Fisheries offices based on where applicants lake properties are located.

Permits are submitted online at <https://www.dnr.state.mn.us/mpars/index.html>, or by contacting the local Regional Fisheries Office to request a paper application.

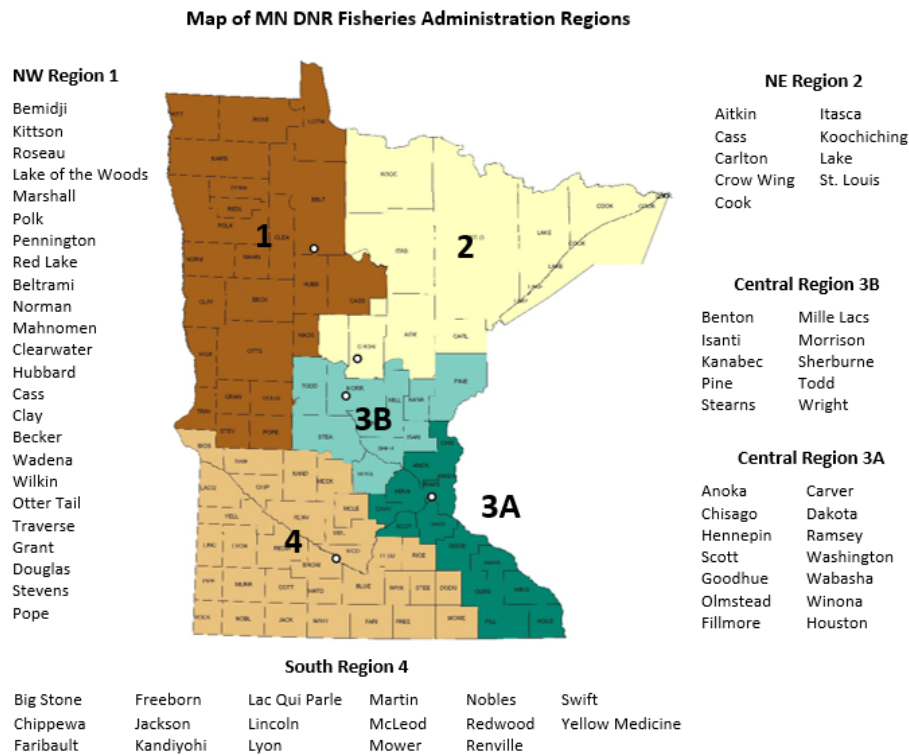


Figure 1.1 – Map of MN DNR Fisheries Administrative Regions 1, 2, 3A, 3B, and 4

A decision on a permit application’s issuance depends on several factors listed in MR 6280, which includes the property’s permitting history, the lake’s development classification, and the amount of management requested. If an application is modified or denied, the applicant may appeal to the Commissioner’s Office for review of the permit decision; this review determines if the permit decision was based upon rule standards. Finally, an unsatisfactory permit decision can be appealed to an Administrative Law Judge through the contested case hearing process.

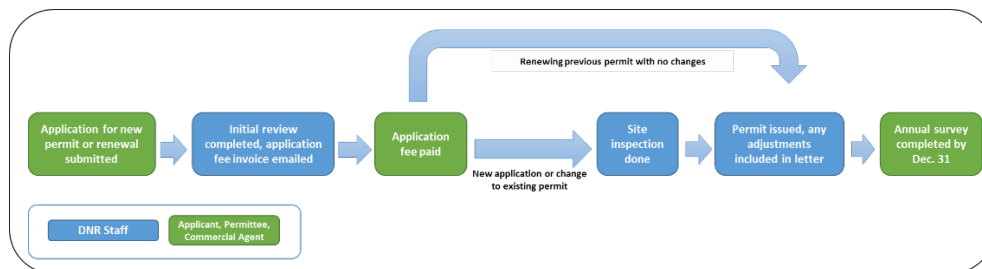


Figure 1.2 – Simplified flow diagram of the APM Permitting process, showing the actions completed by the permit applicant and those completed by DNR Staff.

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 leads 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 ensure compliance with state and federal pesticide law and responds to reports of pesticide misuse (Tables 4.A & 4.B). The U.S. Environmental Protection Agency (EPA) partially funds DNR’s aquatic pesticide enforcement activities through a grant administered by MDA.

1.3 Site Inspections

Per MR 6280, a site inspection is required before a permit for aquatic plant control in public waters is issued for properties with no previous permit history. Site inspections are also conducted for renewals of previous permits when there are changes in treatment area size, methods used, or target plant species. 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. During 2019, staff conducted 1,434 of these site inspections. The site inspection provides an opportunity to determine what kinds of plants and habitat are present in the proposed treatment area. Additionally, inspections serve as an outreach opportunity for staff to discuss the advantages of maintaining a healthy aquatic plant community and shoreline. Based on the inspection, DNR staff may reduce the size of the treatment area to protect important habitat based on their observations and professional judgment. Approximately 54% of all inspected near-shore control permit requests were issued with some reduction during 2019 (Table 1.A).

Table 1.A – Number of Site Inspections and Treatment Area Reductions by region during 2019.

	Region 1	Region 2A	Region 2B	Region 3A	Region 3B	Region 4	Statewide
Number of Site Inspections Conducted	534	29	275	353	136	107	1434
Reduced Following Inspection	365	12	166	151	49	35	778
Percent of Permits Reduced	68.4%	41.4%	60.4%	42.8%	36.0%	32.7%	54.3%

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

2 SUMMARY OF APM PERMITTING ACTIVITY

2.1 Permit Duration

Permits issued by the APM program are valid for one calendar year and expire on December 31 of the year they are issued. There are exceptions in state rule for of extended duration permits that are unique to a specific type of control method. Permittees may request them if they wish. Both permits types are intended to reduce the amount of aquatic vegetation removed by incentivizing the convenience of less frequent permit renewals:

- **Permanent Channel Permit:** this permit remains active as long as the permittee owns the property. The permit allows a 15-foot wide channel though cattails, bulrush, and other emergent vegetation maintained mechanically (no herbicides) as long as the channel’s location is in the same place every year.
- **3-year AAPCD Permit:** this permit is valid for three years but limits the control area to no more than 2,500 square feet; also, the area of control must remain in the same location throughout the permit period.

2.2 Permit Fee Schedule

Table 2.A outlines the fees associated with the various permits issued by APM program; these fees are set within MR 6280.0450.

Table 2.A - Fee payment schedule for various APM permit types

Control Type	Lake size, if applicable	Fee	Max. fee per permit
Rooted Aquatic Vegetation (Submersed, Emergent, Floating-leaf)	Greater than 20 Acres	\$35.00 per Property	\$2,500.00
	20 Acres or less	\$17.50 per Property	\$1,250.00
Duckweed		\$20.00 per Property	\$200.00
Snails, Leeches, Chara, Filamentous Algae Control		\$4.00 per 100 feet section of shoreline <i>Example: Less than 100 feet = \$4.00 100-199.99 feet = \$8.00</i>	\$200.00
Lakewide Algae Control		\$20.00 plus an additional \$0.40 per Acre <i>Example: 25 Acres = \$20.00 + (25 x \$0.40)= \$30.00</i>	\$200.00
Offshore Harvest of Submersed Plants (more than 150 feet from shore)	>20 Acres	\$35.00 for 1 st Acre plus \$2.00 each additional Acre <i>Example: 150 Acres = \$35.00 + (150 x \$2.00) = \$335.00</i>	\$2,500.00
	≤20 Acres	\$17.50 for 1 st Acre plus \$1.00 each additional Acre <i>Example: 15 Acres = \$35.00 + (15 x \$2.00) = \$65.00</i>	\$1,250.00

2.3 Permit Issuance

APM permits can authorize the use of three different methods of managing aquatic vegetation along lake fronts:

- Pesticide control – Various herbicides (a specific type of pesticide) registered by the EPA and MDA can be used to manage susceptible plants and pests.
- Mechanical control – Cutting, pulling, raking, or otherwise removing or altering aquatic plants by physical means, including by hand and motorized or non-motorized equipment.
- Automated Aquatic Plant Control Device (AAPCD) - A self-propelled device that is capable of destroying aquatic plants (does not include blowers, jet pumps, suction dredges or similar devices)

A given permit may have multiple control methods allowed for a single location, depending on the management strategy for the location; for example, mechanical control to reduce biomass followed by an herbicide to reduce the amount of product required for effective management.

Table 2.B details the different types of control activities that were permitted in 2019; these activities include 1-year pesticide and mechanical control, permanent channels, 1-year and 3-year AAPCD, and restoration projects. The table summarizes that different areas of the state not only authorize different amounts of APM activity but also that permittees rely on different management methods for nuisance relief. In 2019, Region 3A Saint Paul issued the most control permits (1,706) and had the most pesticide-related activity with 1,395 pesticide activities. Statewide, most activities involve pesticides (3,672 of 5,961), followed by some kind of AAPCD (1,337, combined), and then mechanical control (809).

Table 2.B - Number of control activities permitted in 2019 by Region.

Note: a permit may have more than one control activity.

Region	1 Bemidji & Glenwood	2A Grand Rapids	2B Brainerd	3A Saint Paul	3B Little Falls	4 New Ulm	Statewide
Pesticide	537	51	731	1,395	651	307	3,672
Mechanical	430	34	87	176	47	35	809
Channel	75	9	25	6	10	8	133
1-year AAPCD	235	0	79	71	45	13	433
3-year AAPCD	407	6	207	58	161	65	904
Restoration	1	1	10	3	49	3	67
Sum by Region	1,684	100	1,129	1,706	914	428	5,961

In addition to a permit having multiple permitted activities, a permit may also include multiple properties; for example, if a group of 15 lake home owners apply for a single multiparty permit. As shown in Table 2.B and 2.C, the 5,961 permitted activities of 2019 were authorized across 5,373 permits statewide. Additionally, the number of 3-year AAPCD permits issued in 2017 and 2018, and the previously issued permanent channels, raised the total number of active permits statewide in 2019 to 10,269 permits. These 10,269 permits allowed for various control activities on 971 lakes at 11,188 properties, the majority of which were located in the Central Region (3A/3B) of the state (6,704 properties).

Table 2.C - Regional summary of active Aquatic Plant Management permits for 2019.

Region	1 Bemidji & Glenwood	2A Grand Rapids	2B Brainerd	3A Saint Paul	3B Little Falls	4 New Ulm	Statewide
# of Issued Permits	1,309	88	1,023	1,648	888	417	5,373
# of public waters	283	54	139	256	146	93	971
# of permitted properties	2,077	97	1647	4,846	1,858	663	11,188
# of active permits	3,422	397	2,011	2,210	1,502	727	10,269
# of active channels	1,103	270	336	209	206	115	2,239

Over the past 20 years, APM activity has increased statewide. Figure 2.1 illustrates that while the number of AAPCD permits have stabilized over the past 10 years, the number of pesticide and mechanical control permits has increased from 1,060 in 1998 with a plateau of roughly 2,100 in the early-2010's to a high of 4,303 permits in 2018. The oscillation of the 3-year AAPCD permits is a result of their renewal cycle.

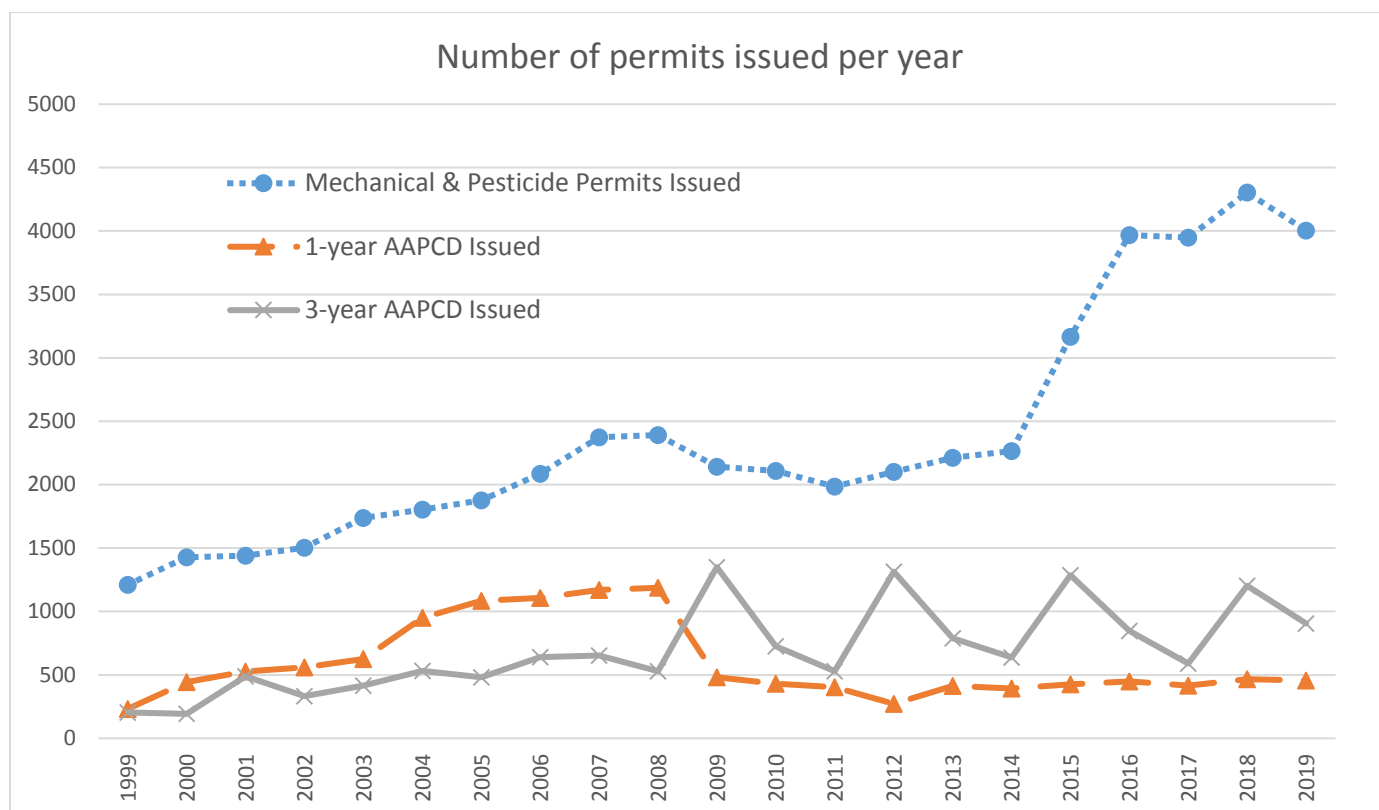


Figure 2.1 - Numbers of APM permits issued for mechanical and chemical control of aquatic vegetation, algae, and swimmer's itch; and number of 1-year and 3-year AAPCD Permits issued during 1998-2019.

The six DNR Fisheries Regions have different permitting loads based upon lake abundance, shoreline development, recreational use, and the prevalence of nuisance conditions. Figure 2.2 provides a graphic representation of Table 2.B. It illustrates that the majority of the APM activity in the state is permitted out of three offices – Glenwood & Bemidji in Region 1 and Saint Paul in Region 3.

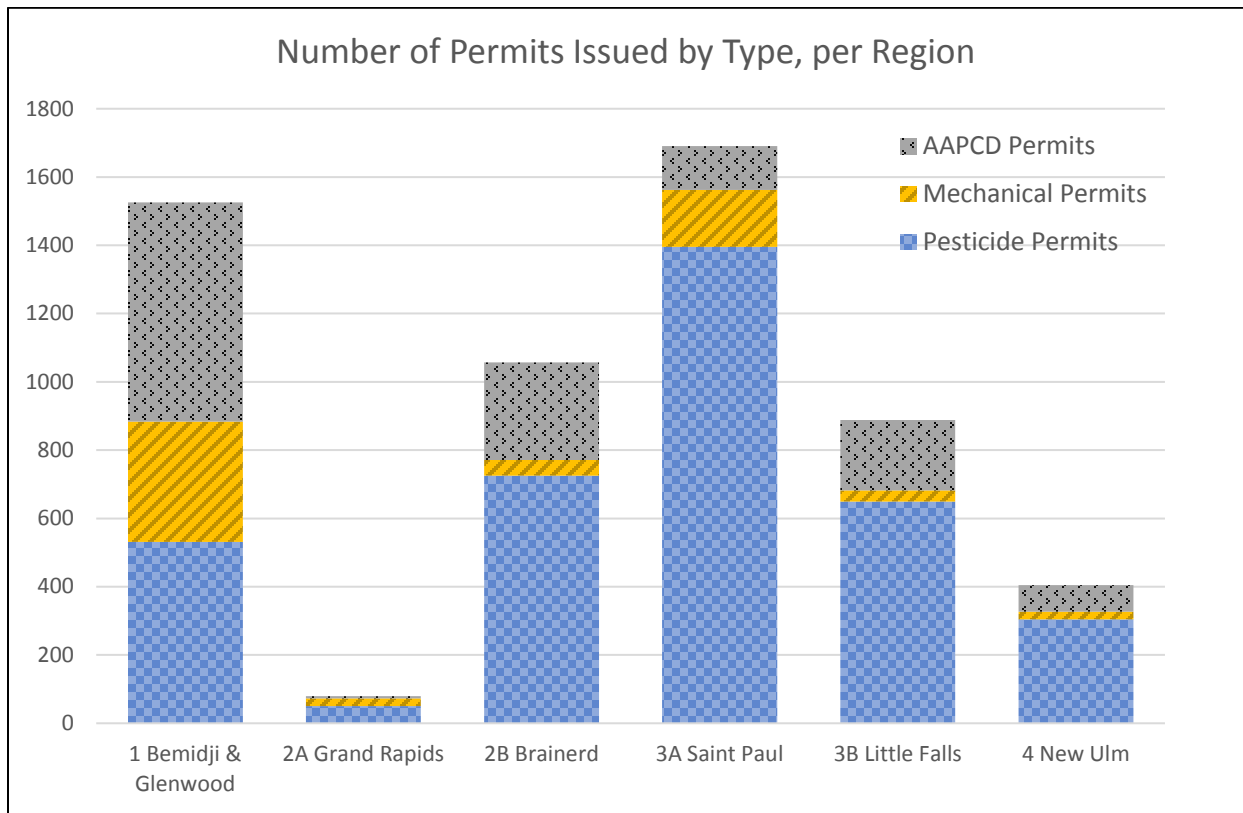


Figure 2.2 - Number of permits issued by Control type (Mechanical, Chemical, AAPCD) and Region where issued in 2019. Note: a permit may have multiple control types.

Since 1998, the number of properties permitted by the APM program has fluctuated between 7,480 and 11,939. In 1998, 8,219 properties were permitted and that number rose steadily to its maximum of 11,939 in 2006 before dropping to its minimum in 2014. Since then, the number of properties permitted has risen, albeit erratically, to 11,188 properties in 2019 (See Figure 2.3).

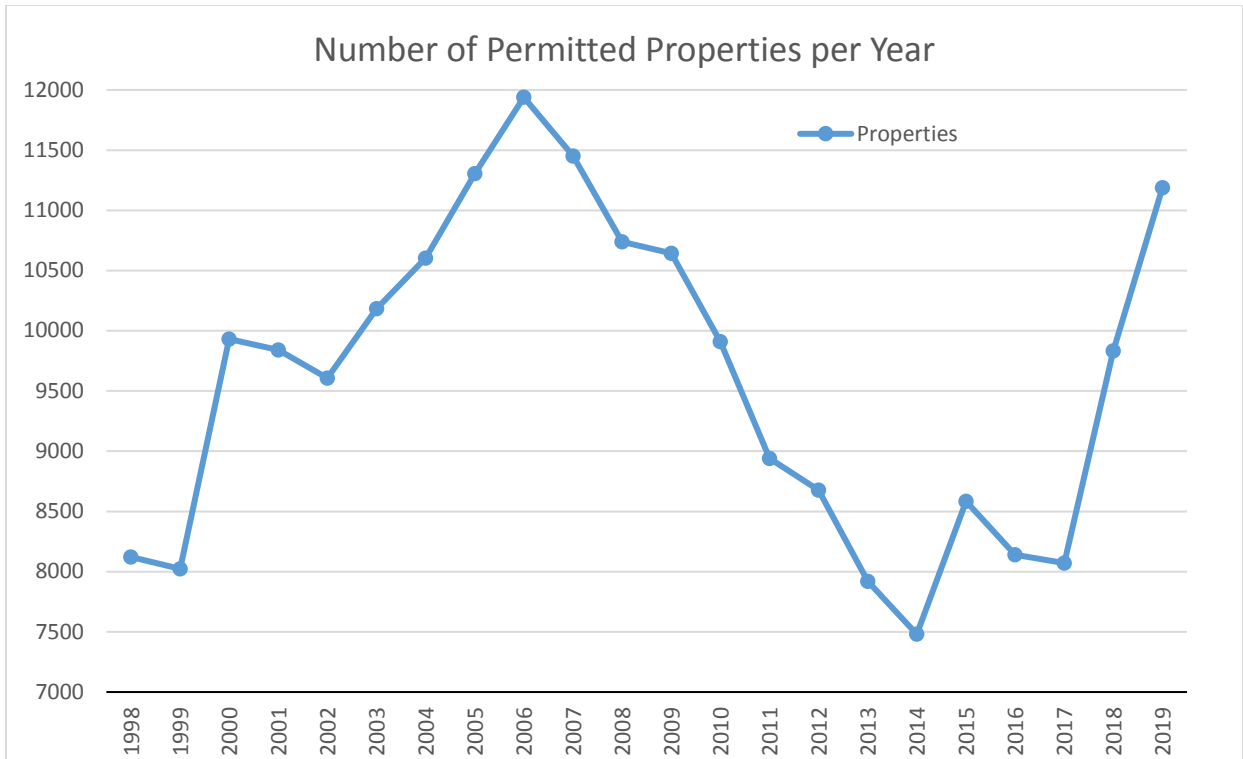


Figure 2.3 - Numbers of properties issued APM permits for aquatic plant control statewide, 1997-2019

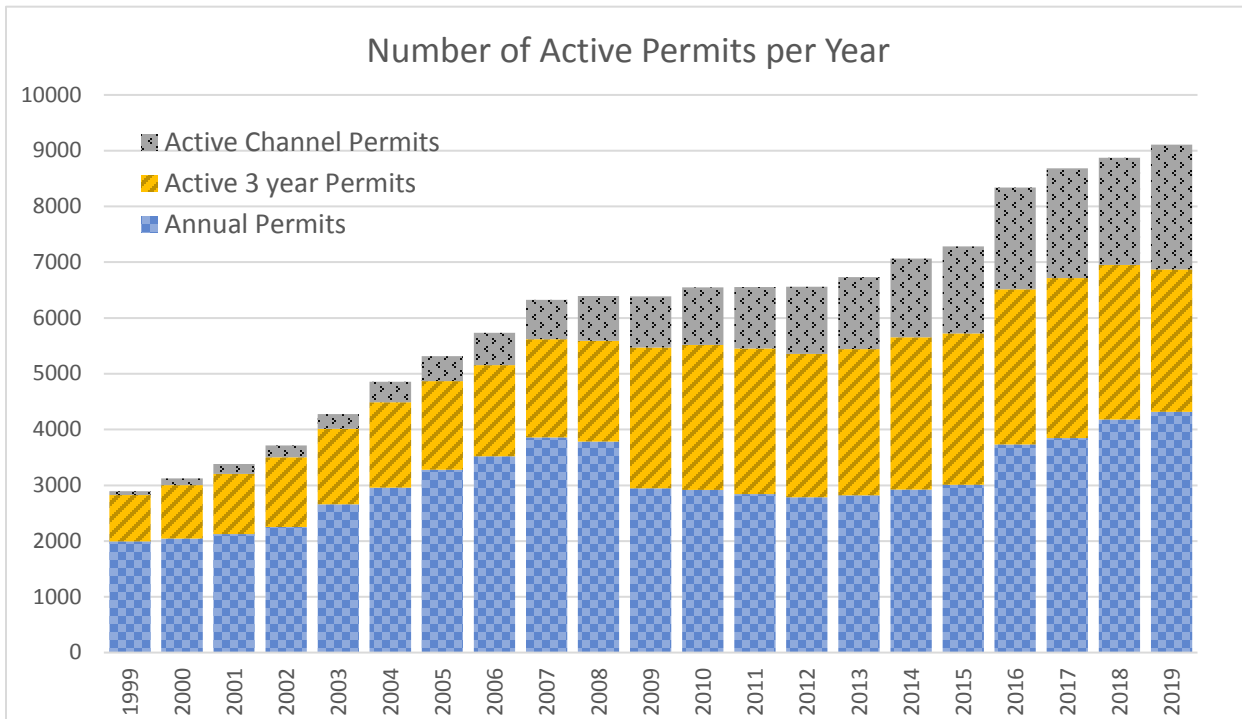


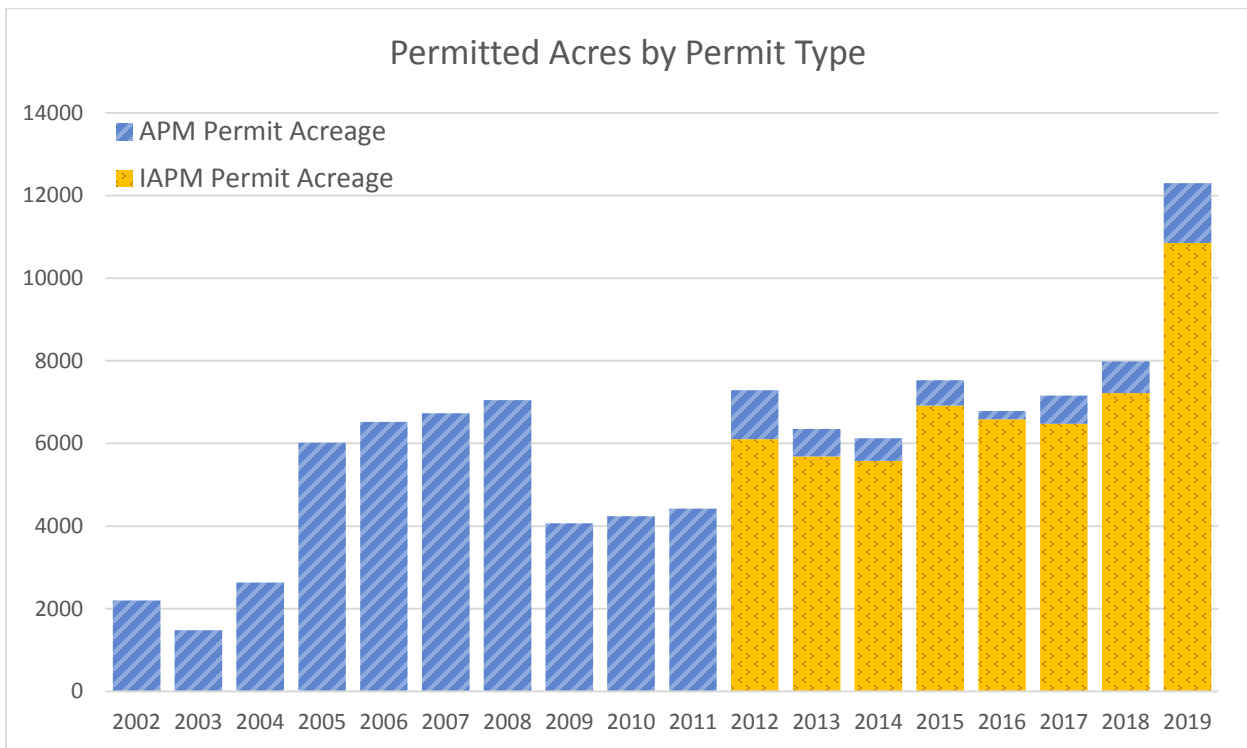
Figure 2.4 - Number of active APM permits of varying duration from 1995-2019

2.4 Permitted Offshore Acres for Aquatic Plant Control

Although Aquatic Plant Management in Minnesota seeks to balance the riparian rights of property owners, it is not uncommon for nuisance populations of plants to have a negative impact on other lake users. Eurasian watermilfoil can cover large areas of a lake, which in turn affects recreation. Most permits are issued for controlling plants along shoreline frontages, but we also issue permits for managing populations of nuisance plants that are more than 150 feet from the shoreline. These treatments are referred to as “Off-shore Treatments.”

The number of acres permitted for control of aquatic plants has increased over time, with a few large Eurasian watermilfoil and curly-leaf pondweed treatments causing significant spikes in the total number of acres permitted for treatment. 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 3,000-acre lake in Lincoln County (South Region), were also treated with an aquatic herbicide to manage curly-leaf pondweed in 2006, 2007, and 2008. 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, the Invasive Aquatic Plant Management (IAPM) Program within the Division of Ecological and Water Resources was created to focus on the management of invasive aquatic plant populations. IAPM Staff assumed responsibility for issuing permits specifically for the management of invasive aquatic plants. The acres permitted for offshore control of submersed invasive aquatic plants in 2019 was 10,850 acres. The acres permitted for the offshore control for submersed species in 2019 in the APM program was 1,450 acres.



* Acreage reported prior to 2012 did not distinguish between permits issued for the control of invasive aquatic plants (IAPM permits) and permits issued for native aquatic plant control (APM permits). Therefore, it should not be concluded that there were no permits issued for invasive species management prior to 2012.

Figure 2.5 - Permitted off-shore herbicide control acreage of aquatic plants statewide from 2001-2019

2.5 Management of Invasive Aquatic Plants

In addition to issuing permits to property owners to improve access or enhance recreational use, the DNR has statewide control programs for a number of non-native invasive aquatic plants.

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

The Invasive Aquatic Plant Management program issued 339 permits in 2019. The majority of these permits were for either Curly-leaf Pondweed or Eurasian Watermilfoil. Specifically, 54% of IAPM permits issued in 2019 included Curly-leaf Pondweed as a target. The amount of acres permitted for invasive species control under IAPM permits shows a similar pattern (Figure 2.6). Permits targeting Curly-leaf Pondweed were issued for approximately 5,504 acres. Permits targeting Eurasian Watermilfoil covered more acreage and increased from 2018 (1,333 acres) to 2019 (2,627 acres).

Additional details on Invasive Aquatic Plant Management can be found in the IAPM annual report located online at: <https://www.dnr.state.mn.us/invasives/ais/programs.html>.

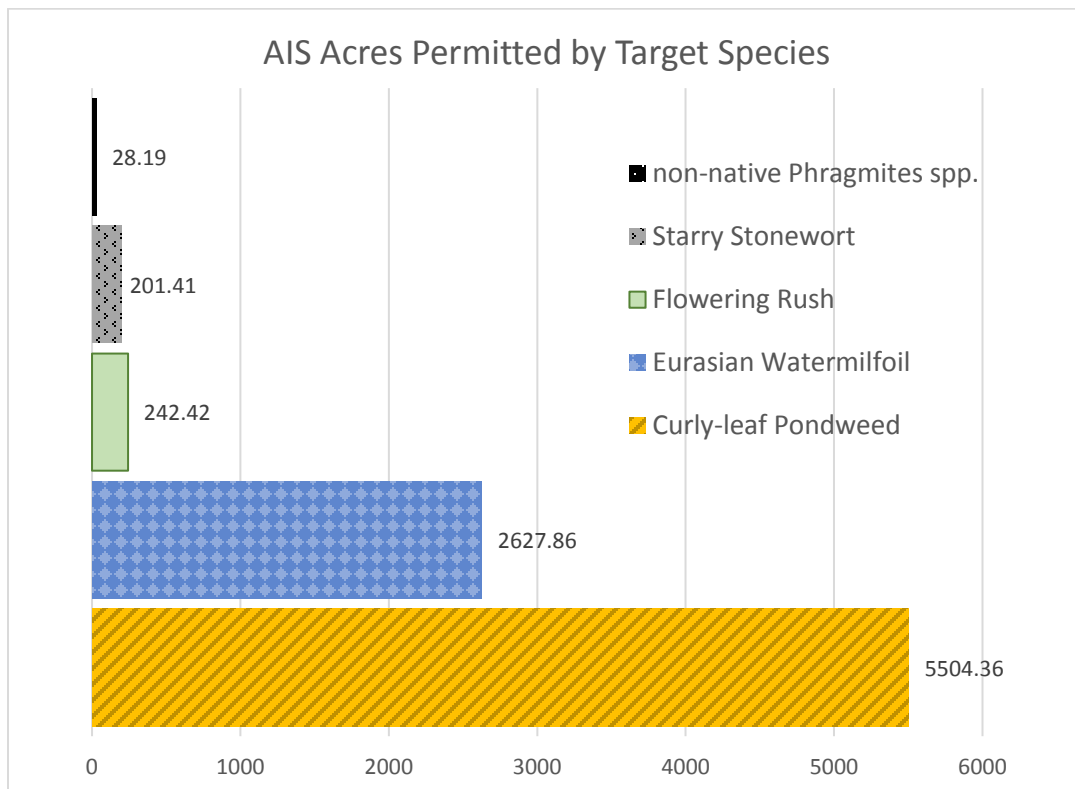


Figure 2.6 - Number of acres permitted under IAPM permits for selected target species in 2019.

3 REPORTED ACTIVITY

Individual who complete activities under an APM permit, commercial mechanical control permit, or commercial aquatic pest control license are required to report their activity by the end of the calendar year. The APM program uses this reported data to get a more complete picture of APM activity within the state, helping us to identify potential trends and issues. We also provide the data to other state and government agencies so they may comply with other state and federal laws as required.

3.1 Reportage usage of permits

Table 3.A - Total near-shore area permitted in acres by Region, number of properties, and median area controlled by treatment method for 2019.

Treatment Method	Central (Acres)	Northeast (Acres)	Northwest (Acres)	Southern (Acres)	Total Acres	# of Properties	Median Square Feet
AAPCD	22	15	45	4	86	1484	2524
Mechanical Control	65	12	46	82	205	744	12002
Pesticide Control (includes Swimmer's itch)	790	139	134	94	1157	7428	6785

In 2019, 1,448 acres of lake area received some type of aquatic plant management; the majority (79%) of which involved the use of a pesticide, with the mean treatment area being less than two tenths of an acre (6,600 square feet). Table 3.A contains additional acreages of reported control divided by region.

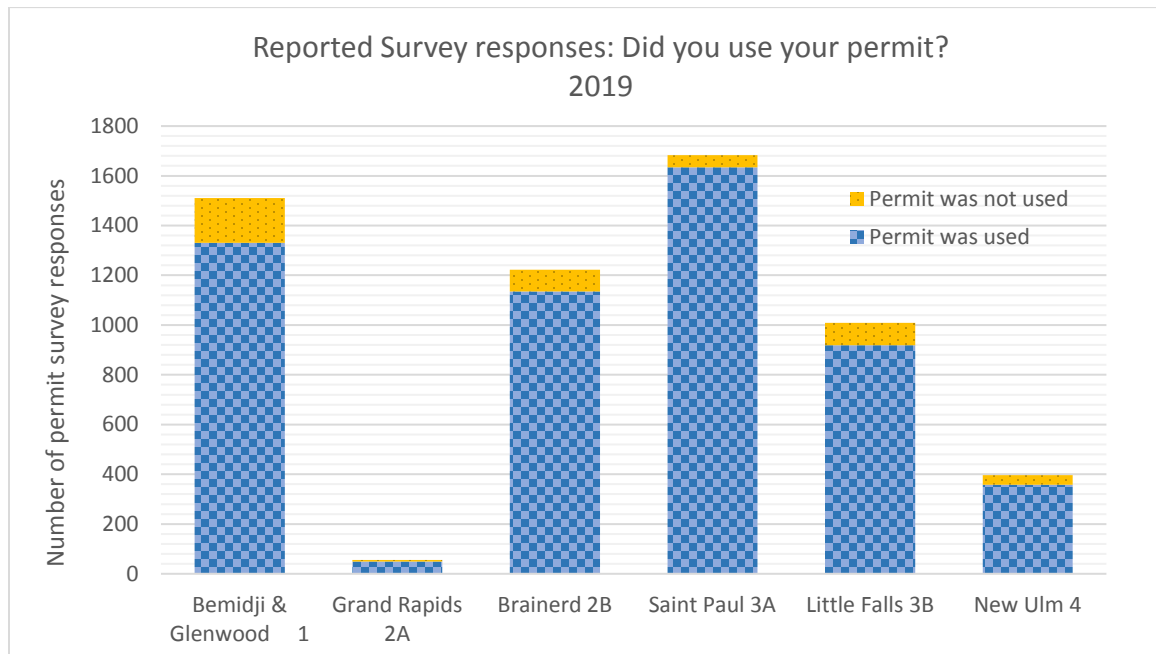


Figure 3.1 - Total reported number of permits used and not used by region, during 2019

Not all apm permits get used based on our survey responses. Roughly 8% of permits didn't get used, due to permittees not needing to use the permit (no nuisance), equipment malfunction, or not having the time to conduct any aquatic plant management. Figure 3.1 illustrates the regional differences in permits usage.

Table 3.B captures detail about why a permit isn't used. Our survey provides respondents an opportunity to explain in detail why they weren't able to use the permit. Statewide, the majority of unused permits were not used because the permittee was unable to do the work.

Table 3.B - Survey responses for why issued permits were not used.

2019 Reason	Bemidji & Glenwood 1	Grand Rapids 2A	Brainerd 2B	Saint Paul 3A	Little Falls 3B	New Ulm 4	Statewide %
Nuisance condition didn't develop	39	1	21	23	25	9	26.2%
Received the permit too late	12	0	7	3	7	2	6.9%
Unable to do the work	121	5	54	21	54	27	62.5%
Other	8	0	5	2	4	1	4.4%

For annual reporting, commercial APM companies are required to report their activity to us, and we have a very high compliance rate in this regard. Figure 3.2 illustrates who, either the homeowner or a commercial company, is conducting the work by Region.

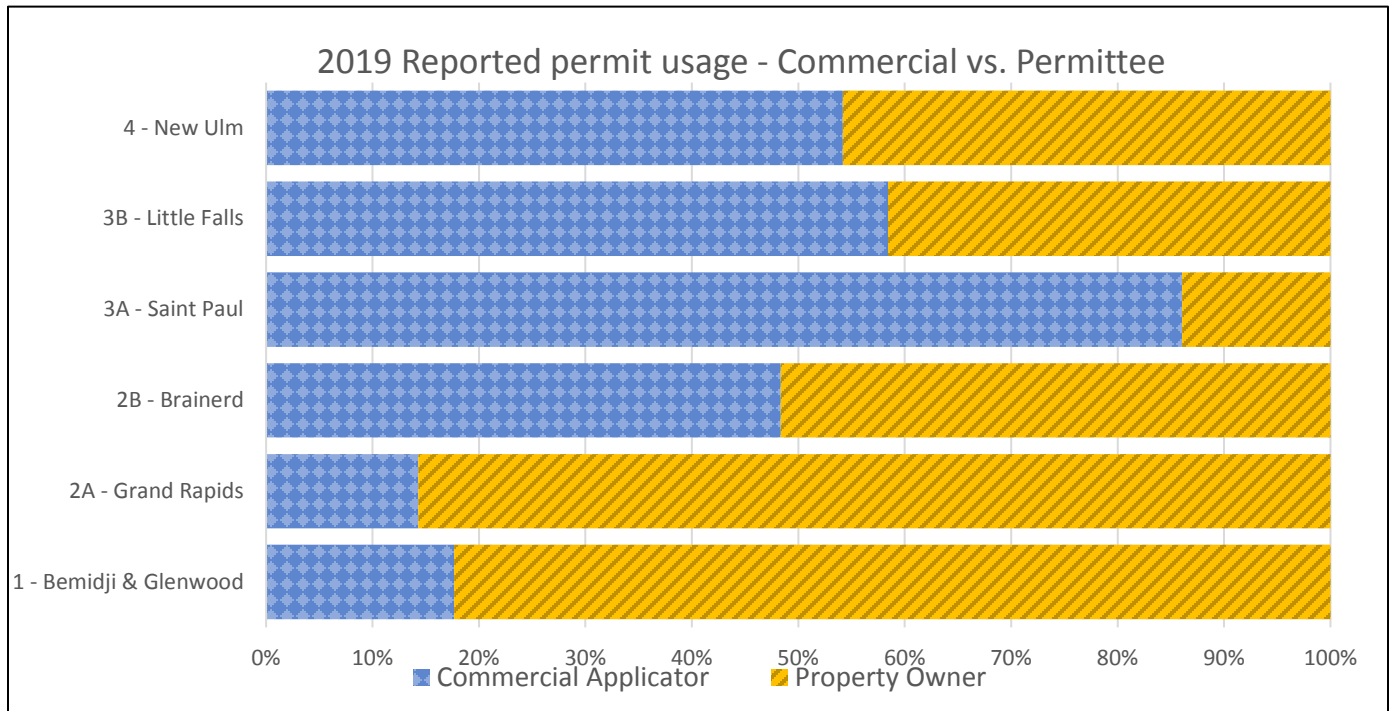


Figure 3.2 - Percent of reported APM work done by permittee or by a commercial service for each region in 2019

3.2 Satisfaction of permit user

Permittees who personally undertook aquatic plant control activities were asked to indicate their satisfaction with the results of the aquatic plant control. Of those who answered the question, 83 percent were satisfied with the work that was done during 2019. It is important to remember that landowners who hire commercial services do not complete the survey; the commercial companies complete the survey on their behalf.

3.3 Automated Aquatic Plant Control Devices (AAPCD) Permits

The APM Rules require a permit for the operation of AAPCD devices because of their potential to excavate bottom sediments, and impact spawning habitat. The APM rules provide two permit options for AAPCD operation. 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). Because of this 2009 rule change, many more permit holders became eligible for a three year AAPCD permit.

Since 2009, the popularity of three-year permits is clear, demonstrated by the start of an obvious three-year cycle of AAPCD permits issued. Given the cyclic nature of issuing three-year AAPCD permits, it is difficult to assess trends. However, an increasing trend is clear when considering the number of active three year AAPCD permits (Figure 3.3). When three-year AAPCD permits first became available in 1999 less than 1000 permits were active – this number has climbed steadily since, with a notable jump in 2009, through 2017 when 2,867 permits were active.

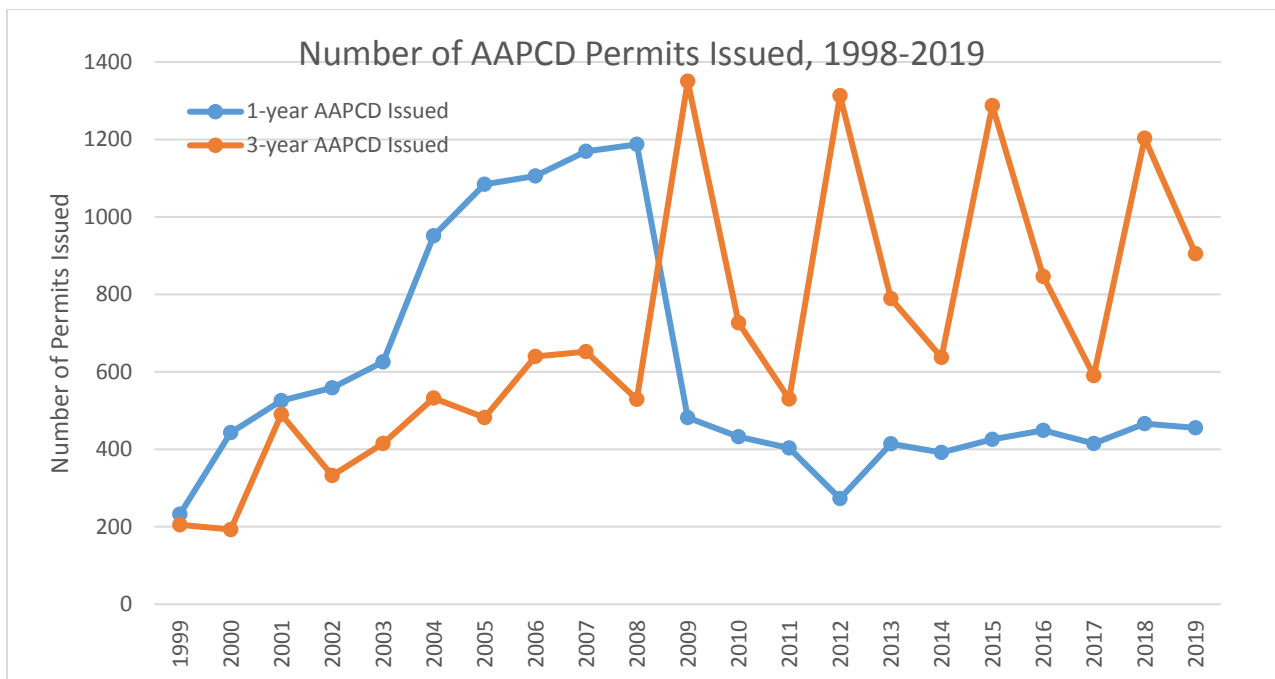


Figure 3.3 - Numbers of one-year and three-year AAPCD permits issued, 1998-2019

3.4 Copper-based Permits

High concentrations of copper are toxic to nearly all forms of life, with some species being more susceptible to the element than others. Additionally, unlike most other pesticides, elemental copper can accumulate in lake sediments over time. Currently, there is little research exploring the long-term impacts of copper use on lake sediments. Numerous copper-based pesticides are registered for aquatic use in Minnesota and have their role in nuisance management either as a stand-only agent or as a synergist with other pesticides. Copper is effective in managing filamentous and planktonic algae populations, although both groups recover over time. Additionally, copper has been shown to be effective in managing the macroalgae species Chara and Nitella. Copper is also effective against snails, which can function as an intermediate host for the swimmer's itch parasite in some lakes.

Figure 3.5 shows the number of permits issued for specific target pests that are susceptible to copper-based pesticides: 2619 for Swimmer's Itch, 1216 for Chara/Nitella species, and 1849 for Filamentous algae.

It is important to note that a permit may be issued to manage multiple target pests (e.g. Submersed plants and chara), and not all permits will be used to manage all pests listed on the permit. Discussion with commercial aquatic pesticide applicators in Minnesota has revealed that they will frequently request the option to manage a pest at a location "just in case" it becomes a nuisance. Later in the season they then use professional judgement as to whether or not it requires additional control.

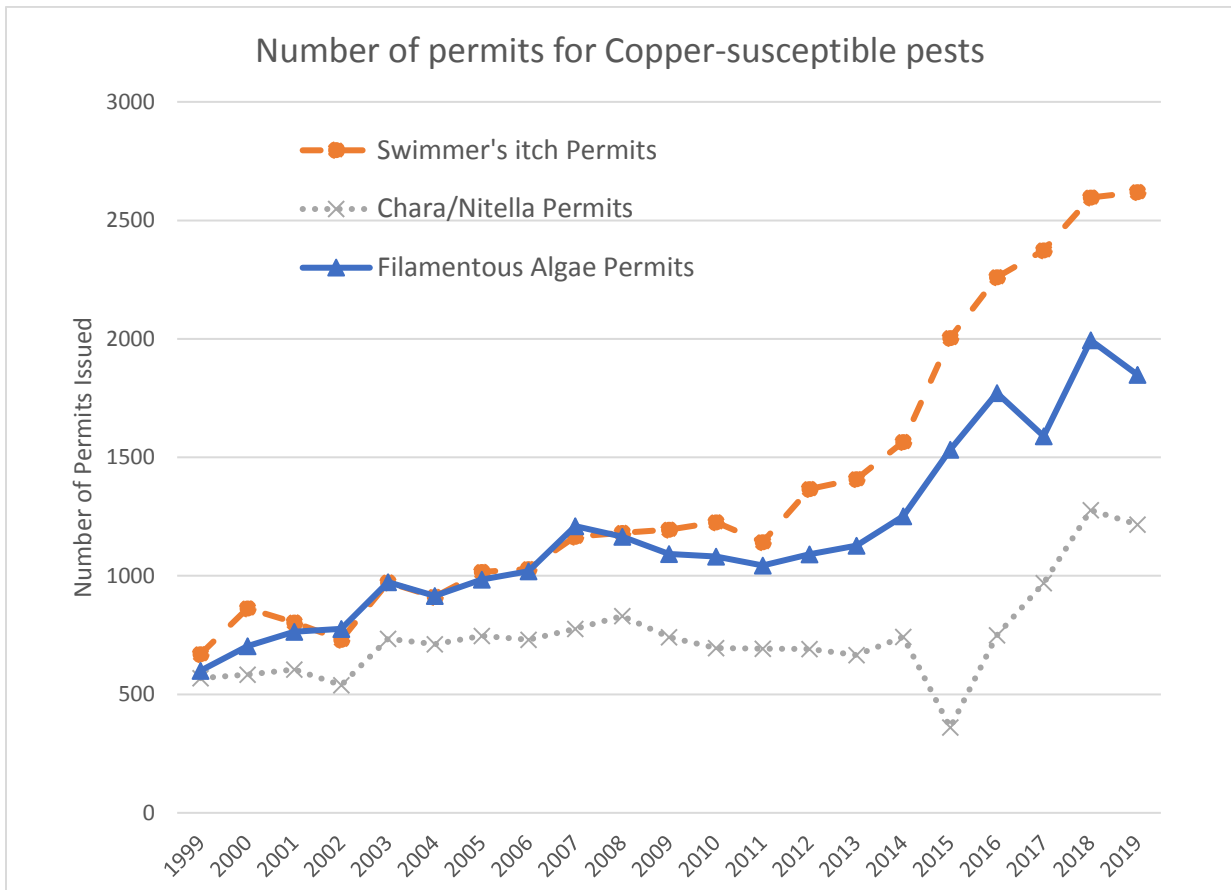


Figure 3.4 - Number of permits issued for the control Filamentous algae, Chara/Nitella, and Swimmer Itch

4 PROGRAM ENFORCEMENT

Program enforcement is carried out through inspections conducted by field staff over the course of the open water season. Permitting staff conduct compliance checks with conservation officers to verify permit conditions are being met while also inspecting shorelines for evidence of APM activity that was not permitted. DNR Conservation Officers have authority to issue citations for violations related to MR 6280. Table 4.A lists 157 enforcement actions taken in 2019 as a result of compliance checks, complaint follow-up, and pesticide misuse investigations.

Table 4.A - Enforcements actions issued 2019 for APM-related violations

Violation Description	Staute/Rule	Verbal Warning	Citation
Use Hydraulic jets or suction dredges to control aquatic plants - Individual	MR 6280.0350.3(G)	57	61
Mechanical control of aquatic plants - dredge, fill, change course, current, or cross-section of public waters without a permit	MR 6280.0350.3(C)	9	10
APM - Commercial Fail to have a permit	MR 6280.0250.2	6	5
No Permit to harvest or destroy aquatic plants - Order violations	MS 103G.615.7	3	2
Failure to remove harvested vegetation from the water	MR 6280.0350.3(A)	0	1
Failure to display AAPCD device sticker	MR 6280.0350.3(E)	0	1
Failure to post or incorrect posting of chemical treatment	MR 6280.0600.2	1	1
Total		76	81

The APM program has one full-time aquatic pesticide enforcement specialist who conducts pesticide use inspections in public waters on behalf of the Minnesota Department of Agriculture (MDA), the state’s regulatory authority on pesticide usage. Inspections verify legal use of pesticides in public waters per their labeling while also ensuring the treatments are conducted per the conditions of the APM permit, and MR 6280. Table 4.B lists the inspections conducted during the 2019 season.

A list of herbicides commonly used for aquatic plant control and the amounts used under permit in Minnesota from 1987-2015 is found in Appendix Tables 6.A and 6.B.

Table 4.B - Routine Pesticide Use Inspections completed in 2019

MNDNR Permit #	Lake Name	Company	County	Application Date (mm/dd/yyyy)
2017-1297	Farquar	Midwest Aqua Care	Dakota	5/10/2019
2017-1044	Minnetonka - North Arm	PLM Lake and Land Management	Hennepin	5/28/2019
2017-1044	Minnetonka - North Arm	PLM Lake and Land Management	Hennepin	5/28/2019
16F-3B631	Pleasant	Lake Restoration, Inc.	Wright	5/28/2019
2018-0962	Prior	Lake Restoration, Inc.	Scott	5/31/2019
2018-1086	French	PLM Lake and Land Management	Wright	6/3/2019
2018-1829	Marie	PLM Lake and Land Management	Stearns	6/3/2019
2018-1581	East Jefferson	Lakescape Enterprises, LLC	Le Sueur	6/4/2019
2018-0101	Medicine	Lake Management, Inc	Hennepin	6/4/2019
2017-1635	Forest	Lake Management, Inc	Washington	6/5/2019
2019-1403	Forest	Lake Management, Inc	Washington	6/5/2019
2019-1581	Long	Clarke Environmental	Meeker	6/10/2019
2017-0409	Coon	Lake Restoration, Inc.	Anoka	6/11/2019
2018-2506	Middle Jefferson	Lake Improvement Consulting, Inc.	Le Sueur	6/11/2019
2019-0836	Minnetonka - Wayzata Bay	Lake Restoration, Inc.	Hennepin	6/12/2019
2017-0666	Clear	Lake Management, Inc	Washington	6/14/2019
2018-1379	Susan	Midwest Aqua Care	Carver	6/17/2019
16F-2b0728	Gull	Central Minnesota Aquatics	Cass	6/18/2019
16F2B0229	Gull	PLM Lake and Land Management	Cass	6/18/2019
16F-2B0700	Margaret	Central Minnesota Aquatics	Cass	6/18/2019
2018-0662	Green	Green Lake Association	Chisago	6/26/2019
2018-0662	Green	Green Lake Association	Chisago	6/26/2019
2018-0662	Green	Green Lake Association	Chisago	6/26/2019
16F-10191	Darling	PLM Lake and Land Management	Douglas	7/11/2019
2018-0712	Le Homme Deiu	PLM Lake and Land Management	Douglas	7/11/2019
2017-0256	Minnetonka - Gray's Bay	Lake Restoration, Inc.	Hennepin	7/11/2019
2019-1754	Smith	Clarke Environmental	Douglas	7/11/2019
2017-2359	Smith	Clarke Environmental	Douglas	7/11/2019
2017-1347	Sugar	Clarke Environmental	Wright	7/11/2019

MNDNR Permit #	Lake Name	Company	County	Application Date (mm/dd/yyyy)
2018-0632	South Center	Lake Restoration, Inc.	Chisago	7/12/2019
2018-0264	Washington	Lake Restoration, Inc.	Le Sueur	7/12/2019
16F-4250	Cedar	Lakescape Enterprises, LLC	Rice	7/16/2019
2017-1260	Crystal	Lake Management, Inc	Dakota	7/16/2019
16F-3A908	Olson	PLM Lake and Land Management	Washington	7/16/2019
2019-0968	Fish	Lake Restoration, Inc.	Hennepin	7/17/2019
16F-2B0576	Holt	Midwest Aqua Care	Crow Wing	7/18/2019
16F-3B686	Horseshoe	Clarke Environmental	Stearns	7/18/2019
16F-3A861	Minnetonka - Upper Lake	Lake Management, Inc	Hennepin	7/19/2019
16F-3A1190	Big Marine	Jacobson Environmental, PLLC	Washington	7/23/2019
16F-3A185	Coon	Lake Restoration, Inc.	Anoka	7/23/2019
16F-3A1137	Schutz	Midwest Aqua Care	Carver	7/23/2019
16F-3B021	Long	PLM Lake and Land Management	Sherburne	7/25/2019
2019-2596	Shaokotan	PLM Lake and Land Management	Lincoln	7/30/2019
2018-0773	Pleasant	Lake Restoration, Inc.	Wright	7/31/2019
16F-3B566	Waverly	Midwest Aqua Care	Wright	8/1/2019
16F-3A1255	Big Marine	Jacobson Environmental, PLLC	Washington	8/7/2019

5 REFERENCES

Invasive Species Program, 2019, Invasive Species of Aquatic Plants and Wild Animals in Minnesota; Annual Report for 2019, Minnesota Department of Natural Resources, St. Paul, MN.

History and Timeline of Invasive (Exotic) Species Program and Aquatic Plant Management Program, Compiled by Jon Hansen and Wendy Crowell; February, 2019.

Minnesota Legislature. "The Office of the Revisor of Statutes." Web. <http://www.leg.state.mn.us/statutes.asp>

6 APPENDICES

Table 6.A - List common EPA-registered pesticides approved for aquatic use by the MN DNR

Product Name	Selective	Broad Spectrum	Active Ingredient (Formulation)
<u>Part 1. Aquatically labelled systemic herbicides:</u>			
Aquacide	X		2,4 Dichlorophenoxyacetic Acid (Sodium Salt)
Navigate®	X		2,4 Dichlorophenoxyacetic Acid (Butoxyethyl Ester)
Alligare 2,4-D Amine	X		2,4 Dichlorophenoxyacetic Acid (Dimethylamine Salt)
Weedtrine II	X		2,4 Dichlorophenoxyacetic (Isooctyl Ester)
DMA-4 IVM	X		2,4 Dichlorophenoxyacetic Acid (Dimethylamine Salt)
Sculpin-G	X		2,4 Dichlorophenoxyacetic Acid (Dimethylamine Salt)
Renovate MAX G	X		2,4 Dichlorophenoxyacetic Acid (Dimethylamine Salt), Triclopyr
Aquasweep	X		2,4 Dichlorophenoxyacetic Acid (Dimethylamine Salt), Triclopyr
Renovate, Navitrol (liquid or granular)	X		Triclopyr
Sonar, Avast! (liquid or granular)		X	Fluridone
Rodeo, Refuge, AquaPro, AquaNeat (X	Glyphosate
Habitat		X	Imazapyr
Clearcast		X	Imazamox
Clipper, Schooner		X	Flumioxazin
<u>Part 2. Contact herbicides:</u>			
Aquathol (Liquid or Granular)		X	Dipotassium salt of endothall
Hydrothol (Liquid or Granular)		X	Mono-amine salt of endothall (liquid by licensed applicator)
Dibrox, Reward, Tribune (Liquid)		X	Diquat dibromide (use by licensed applicator only)
<u>Part 3. Copper Compounds (Algaecides & Herbicides):</u>			
Mizzen, Symmetry (Liquid)	X		Copper Triethanolamine Complex
Captain, Cutrine Plus (Granular & Liquid)	X		Copper Ethanolamine Complex
Clearigate, Komeen, Nautique (Liquid)	X		Copper Ethylenediamine Complex
<u>Part 4. Other:</u>			
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.

The use of any pesticide (i.e. herbicide) in Minnesota's public waters requires a permit issued by the Aquatic Plant Management Program.

Table 6.B - Reported various aquatic herbicide use statewide 1998-2019

Year	2,4-D Ester lbs.	2,4-D Ester gal.	2,4-D Salt lbs.	2,4-D Salt gal	2,4-D Amine/ acid gal.	2,4-D Amine/ acid lbs.	Aquathol lbs.	Aquathol gal.	Diquat gal.	Hydrolthol lbs.	Hydrothol 191 gal	Elemental Copper lbs	Triclopyr lbs	Triclopyr gal	2,4-D salt Triclopyr lbs.	Imazapyr gal.	Imazamox gal.	Flumioxazin lbs.	Glyphosate gal.	Other* gal.	Other* 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	13,905	*	*	*	*	*	*	*	*	*
1992	81,000	*	320	*	0	*	870	1,600	1,700	9,000	67	16,064	*	*	*	*	*	*	*	*	*
1993	96,000	*	400	*	0	*	830	1,000	1,600	5,000	240	8,685	*	*	*	*	*	*	*	*	*
1994	45,000	*	700	*	0	*	710	940	1,800	10,000	510	15,010	*	*	*	*	*	*	*	*	*
1995	80,000	*	87	*	0	*	930	700	2,300	8,300	420	13,805	*	*	*	*	*	*	*	*	*
1996	39,000	*	400	*	0	*	1,000	730	1,900	8,900	830	8,158	*	*	*	*	*	*	*	*	*
1997	46,000	*	290	*	0	*	1,200	700	2,400	7,800	820	9,965	*	*	*	*	*	*	*	*	*
1998	47,000	*	440	*	0	*	790	1,280	2,580	4,460	670	12,751	*	*	*	*	*	*	*	*	*
1999	39,800	*	650	*	0	*	1,050	740	2,280	4,190	740	7,932	*	*	*	*	*	*	*	*	*
2000	41,500	*	700	*	0	*	1,380	1,850	2,970	5,820	530	10,517	*	*	*	*	*	*	*	*	*
2001	49,300	*	1,000	*	0	*	700	2,600	2,700	3,900	950	14,608	*	*	*	*	*	*	*	*	*
2002	49,400	*	700	*	20	*	540	2,660	2,530	4,220	760	10,592	*	*	*	*	*	*	*	*	*
2003	71,100	*	634	*	336	*	339	2,515	2,370	7,610	429	11,822	*	*	*	*	*	*	*	*	*
2004	64,100	*	1,068	*	216	*	366	5,200	2,856	8,040	643	13,479	*	*	*	*	*	*	*	*	*
2005	48,800	*	1,154	*	533	*	1,077	7,054	2,773	6,744	715	15,939	*	*	*	*	*	*	*	*	*
2006	53,400	*	805	*	215	*	1,530	8,757	2,953	11,653	126	11,797	2,189	28	*	*	*	*	*	*	*
2007	57,700	*	971	*	85	*	1,320	9,838	3,665	10,105	782	11,546	1,400	46	*	*	*	*	*	*	*
2008	56,000	*	655	*	7	*	2,462	13,208	2,643	10,693	550	8,105	17,025	1,882	*	*	*	*	*	*	*
2009	48,250	*	655	*	939	*	725	13,801	1,791	7,963	1,758	6,334	63,896	662	*	*	*	*	*	*	*
2010	39,932	*	731	*	1,070	*	737	10,238	1,501	7,973	900	5,823	47,379	1,371	*	*	*	*	*	*	*
2011	16,233	*	775	*	1,066	*	578	10,936	1,760	5,426	626	5,608	151,593	587	3,120	*	*	*	*	*	*
2012	19,007	*	847	*	7,233	*	1,140	12,992	2,197	5,967	493	9,239	74,086	1,014	2,488	*	*	*	*	*	*
2013	22,486	2,005	753	*	6,108	2	5,423	8,778	2,489	4,889	440	5,131	37,305	573	*	6	9,113	146			
2014	22,265	0	451	11,147	894	585	424	12,524	2,214	6,027	169	5,714	3,847	1,047	*	4	12	155	2,647		
2015	16,484	*	686	1,787	7,498	3,113	583	15,866	2,469	6,596	533	6,062	80,660	689	1,200	151	140	138	112		
2016	820	0	1,872	2,192	*	*	263	2,782	1,427	8,393	219	6,169	25	1	*	3	*	203	46	33,593	121,590
2017	2,102	*	28,122	13,964	*	*	440	18,532	3,248	9,825	313	8,627	66,949	274	*	8	*	256	1,574		
2018	418	*	1,084	9,647	924	27,127	5,268	12,973	4,079	5,354	150	14,595	27,939	496	*	77	16	532	576	7	219
2019	2,711	*	957	*	7,029	4,583	326	10,128	4,933	*	314	16,477	15,310	79	55	*	1,031	334	46	164	122

*2016 was the first year pesticide use was entered into MPARS and a new category for Other was offered. Due to some confusion, this category was overused and likely includes much of the 2, 4-D, Aquathol, and Triclopyr use for the year.

Prior to 2018, Elemental Copper had been reported as only Copper sulfate; values in previous reports are roughly four time higher as a result. Elemental Copper reporting allows for the inclusion of various copper chelate products used in APM pesticide treatments.

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 6.C - History and Timeline of Invasive (Exotic) Species Program and Aquatic Plant Management Program

The timeline below summarizes important legal and programmatic changes related to how DNR manages aquatic plants, including native and invasive.

	Year
C.O. 1089: Permits required to destroy aquatic vegetation	1945
C.O. 1700: Permit required to use herbicides; spray permit for sodium arsenite; under 5000 sf mechanical = no permit; control cannot <100 ft. along shore, + channel	1965
C.O. 1734: Control area cannot exceed 0.5 acre; applicators must have permit; only applicators can apply hazardous chemicals; potable water supply chemical restriction	1967
C.O. 1755: MDA administers commercial exams, DOC issues applicators permit	1968
C.O. 1775: Sodium arsenite prohibited; use of earth moving equipment prohibited; control coverage under D.O.W. Soils and Minerals permit	1969
C.O. 1850: under 2500 sf mechanical = no permit; authorized herbicide list removed; treatments signs required; applicator license issued by MDA	1972
C.O. 1938: Permit fees; inspection provision; littoral area restrictions based on classification (GD=10%, RD=5%, NE=0%, historical deference); 100 ft./property max; treatment notification required; permit decision review	1976
C.O. 2210: Emergent plants require permit; littoral area restrictions change from lake class to city (15%) vs. rural (10%); lake-wide mechanical restrictions = 50% of littoral zone	1985
Eurasian watermilfoil (EWM) found in MN. DNR designated lead agency for Purple Loosestrife (PL) control PL program established.	1987
M.S. 103G.617: DNR designated lead agency for coordinating control of EWM	1989
MS. 84.967 – 84.9691: DNR Exotic Species Program established to prevent and curb the spread of ecologically harmful exotic animals and aquatic plants, to prepare a statewide management plan for ecologically harmful exotic species, and was given rulemaking authority to restrict the introduction and spread of ecologically harmful exotic species in the state. DNR actively manages PL and EWM, monitors the results of management, and supports research to improve management of those species.	1991
DNR Exotic Species Program completes a comprehensive management plan for EWM written that establishes goals and objectives for the management and prevention of spread of EWM.	1992
M.S. 18.78: PL listed as a prohibited noxious weed. DNR surveys PL populations and prioritizes control. PL biocontrol program launched with research into potential biocontrol agents.	1992

	Year
<p>M.R. 6280: All previous Conservation Orders converted to rule.</p> <p>MS 86B.415: established a watercraft license surcharge fee for the control, public education, law enforcement, monitoring and research of aquatic exotic species.</p>	1993
<p>M.R. 6216: Emergency rules adopted that established a list of “Undesirable ecologically harmful exotic species” and prohibits their transport, import, sale, possession, propagation, or release. The list of “undesirable exotic aquatic plants” included four species found in MN (EWM, curly-leaf pondweed (CLP), flowering rush, and PL) and two species not yet in Minnesota (water chestnut and hydrilla).</p>	1993
<p>CLP management review with PCA in response to algal bloom proliferation. Review found over 700 lakes in 65 counties with CLP. Researched timing of treatment to avoid algal blooms.</p>	1994
<p>M.S.84D: Invasive Species. Exotic species statutes recodified and expanded. The term “harmful exotic species” replaced with “Invasive Species” defined in law as: a nonnative species that: (1) causes or may cause economic or environmental harm or harm to human health; or (2) threatens or may threaten natural resources or the use of natural resources in the state.</p> <p>M.S.84D.02: The DNR is still required to establish and maintain a plan to curb the spread and manage the growth of aquatic invasive species, in particular PL, CLP, and EWM.</p> <p>M.R. 6216: updated to implement the new classification system of invasive species found in M.S. 84D</p>	1996
<p>PL leaf eating beetles were reared for the first time in MN, at the University of MN and DNR field sites. Research continued on root boring weevils for PL control.</p>	1996
<p>M.R. 6280: updated: 15% littoral area expanded to all lakes, 10% dropped; floating leaf control required permit except channel; perpetual channels; AAPCD require permit; LVMP provision</p>	1997
<p>Legislatively mandated review of APM program – citizen engagement, U of M survey, other states input, literature review. Led to proposed rule changes beginning in 2005.</p>	2002
<p>M.R. 6280: updated: Large overhaul of rules –criteria for issuing APM permits; no more than 100 feet or ½ frontage of submersed, whichever is less, or 35 feet if <70 feet of frontage; invasive control allowed on entire frontage if selective; clarify variance criteria with emphasis on role of invasive species permitting.</p>	2009
<p>M.S. 103G.615 subd.3a: Legislature creates definition of Invasive aquatic plant management permit: “aquatic plant management permit as defined in rules of the Department of Natural Resources that authorizes the selective control of invasive aquatic plants at a scale to cause a significant lakewide or baywide reduction in the abundance of the invasive aquatic plant</p>	2011

	Year
Stakeholder dissatisfaction over APM permit issuance for invasive species treatments leads to split in permitting authority between the Division of Fish and Wildlife and the Division of Ecological and Water Resources. Invasive Species Specialists issue permits for projects targeting aquatic invasive species.	2011 - 2012
M.S. 103G.615 subd. 3a: Legislature removes scale reference “Invasive aquatic plant management permit”: aquatic plant management permit as defined in rules of the Department of Natural Resources that authorizes the selective control of invasive aquatic plants to cause a significant reduction in the abundance of the invasive aquatic plant.	2014
APM and IAPM processed electronically through the MPARs system	2016