Minnesota Department of Natural Resources Aquatic Invasive Species Community-Based Social Marketing Project

Photo credit: Minnesota Department of Natural Resources

Pond And Aquarium Hobbyists Survey

Summary Report

October 30, 2021

This document is part of the Minnesota Department of Natural Resources (DNR) Invasive Species Program's Community-Based Social Marketing (CBSM) project. The project aims to promote the adoption of desirable aquatic invasive species (AIS) prevention behaviors and create positive social norms around AIS prevention in Minnesota.

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Executive Summary

The Minnesota Department of Natural Resources (DNR) delivers the Invasive Species Program with the goals of preventing introductions of new invasive species into Minnesota, preventing the spread of invasive species within Minnesota, and reducing the impacts caused by invasive species to Minnesota's environment, society, and economy.

The DNR is undertaking an Aquatic Invasive Species (AIS) Community-Based Social Marketing (CBSM) project to apply behavioral psychology techniques to address the human behaviors that contribute to the introduction and spread of AIS in Minnesota waters. As part of the project, a survey of aquarium and pond hobbyists (hobbyists) was conducted. The objective of the survey was to determine hobbyists' attitudes, levels of awareness and understanding about aquatic invasive species laws and prevention best practices; current practices; sources of plant and animal species, and communications channels related to water garden ponds and aquariums in Minnesota.

The survey was distributed online through hobbyist groups, Minnesota DNR communications channels, in-store flyers, and social media. A total of 479 respondents filled out the survey.

Attitudes and Awareness

There is a high level of AIS awareness about AIS among pond and aquarium hobbyists. There is a strong awareness that regulations exist to prevent the spread of AIS. Still, hobbyists are less knowledgeable about which invasive plants and animals cannot be sold and owned in Minnesota.

Hobbyists are concerned about the risks associated with AIS and believe that there is a link between human behavior and the spread of AIS. They also understand that people can and should prevent the spread of AIS. Most hobbyists want to take appropriate action to prevent the introduction and spread of AIS.

Plant and Animal Species Trade

Hobbyists acquire plants and animals for their ponds and aquariums from many sources. While retail pet stores, both big chain and local establishments, are popular sources, hobbyists also buy species through online stores, auctions, and other hobbyists selling online. Many plants and animals are shared through pond and aquarium clubs, friends and family, and other hobbyists.

Aquarium hobbyists tend to get their plants and animals from the same place, most often retail pet stores. On the other hand, Pond hobbyists access a wider variety of sources for their species and are much more likely to acquire their animal species from different sources than for their plant species.

Management of Species

At one time or another, most hobbyists have had to manage species that they no longer wanted or could no longer care for. Because they understand the risks associated with disposing of plants or animals in the wild, very few hobbyists consider that as an option.

Aquarium owners prefer to dispose of plants in the trash, and the second most preferred solution is to compost them. Pond owners would rather compost plants, with disposal in the trash coming second.

Pond and aquarium owners will consider other options such as trading plants with others or selling them but are more likely to place them in the trash or compost. Very few pond and aquarium owners would consider releasing their plants into natural areas.

Aquarium and pond owners sometimes face the difficult situation of getting rid of an animal. Most hobbyists would rather rehome an animal than resort to humanely euthanizing it. However, a majority would euthanize it rather than release it into the wild.

Hobbyists would like more information on how to humanely end an animal's life when there is no other option.

Communications

Pond and aquarium owners received most of their information about prohibited and regulated species from the Minnesota DNR. Other sources include University of Minnesota - Extension, the Minnesota Aquarium Society, The Minnesota Water Garden Society, other hobbyists, clubs, and auctions. Several other sources provide information but do not reach as many hobbyists as the primary ones.

When asked where they would prefer to receive information on pond and aquarium care, almost 60% of hobbyists indicate via internet search, followed by at pet stores and in informational pamphlets or brochures.

Pond and aquarium owners place significant trust in the Minnesota DNR, the University of Minnesota - Extension, the Minnesota Aquarium Society, the Minnesota Water Garden Society, and other hobbyists for pond and aquarium care information. Pet stores we're next on the list, with 28% of people trusting them for information.

Fifty-six percent of pond and aquarium owners believe they have the information they need to avoid purchasing invasive species, while 20% say they do not have the information, 24% don't know if they have it. Almost nine out of ten hobbyists say that they would purchase an alternative non-invasive species to one that was invasive. They would like to see information about safe alternatives on the web, in brochures, and at retailers.

Recommendations

A high level of awareness and the desired attitudes towards an issue is a solid foundation for a successful behavior change program. Still, strong positive attitudes and awareness are not sufficient on their own to drive change. Applying behavioral change strategies can leverage a strong foundation to target the desired behaviors, achieving action more consistently and by more people.

The Minnesota DNR should continue its outreach work to pond and aquarium hobbyists. While there is a high level of knowledge about AIS issues concerning ponds and aquariums, there are always new people coming into the hobby. It is important to maintain that high level of knowledge by engaging newcomers.

People in the pond and aquarium hobbyist community want to do the right thing to prevent the spread of invasive species. They need access to accurate information to support their intention to take responsible actions. Access via a website allows hobbyists to have the information as close as their smartphones, helping them make responsible purchasing decisions, identify problematic species, and search for rehoming opportunities for species they are looking to get rid of. The existing website on organisms and trade managed by Minnesota DNR can fulfill the information requirements of the industry and hobbyists. The website should be promoted by retailers, hobby societies and groups, and other organizations involved with ponds and aquariums.

To support the intention of hobbyists to take actions that will help prevent the introduction and spread of AIS, the Minnesota DNR should continue to integrate Community-Based Social Marketing techniques into its existing outreach programs. Because most people are doing the right thing already, these best practices should be promoted as a social norm to create peer pressure within the community to do the right thing. Hobbyists should feel that people around them are being responsible, and they should be responsible as well.

The second Community-Based Social Marketing technique that should be employed is gathering commitments from hobbyists to take responsible action. The survey indicated that approximately 75% of hobbyists would be willing to sign a pledge form at a retailer to commit to taking action to stop the introduction and spread of invasive species. Behavioral psychology research has repeatedly proven that people who make commitments to take specific actions are much more likely to act than those who have not committed.

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1 Introduction

1.1 About the Project

The Minnesota Department of Natural Resources (DNR) delivers the Invasive Species Program with the goals of preventing introductions of new invasive species into Minnesota, preventing the spread of invasive species within Minnesota, and reducing the impacts caused by invasive species to Minnesota's environment, society, and economy.

In August 2018, AZENTIVE, LLC and Beyond Attitude Consulting were awarded a contract to deliver the Aquatic Invasive Species (AIS) Community-Based Social Marketing (CBSM) project for the DNR. The project aims to apply behavioral psychology techniques to address the human behaviors that contribute to the introduction and spread of AIS in Minnesota waters.

A component of the early work on the project was an evaluation of pathways for the spread of AIS. Two of the five primary AIS pathways identified in Minnesota were the aquarium trade and retail plant trade. Also known as Organisms in Trade (OIT), these pathways involve the sale, purchase, and possession of organisms, with species of concern being aquatic plants and animals in ponds and aquariums. Of the over 150 behaviors identified and ranked earlier in the project, seven of the top ten behaviors were related to these two pathways.

In 2019, the consultants and Minnesota DNR aquatic invasive species staff met with representatives of the pond and aquarium industries and local hobbyist communities[1]. One of the outcomes of that consultation was a recommendation for more information gathered about what businesses and customers currently do regarding AIS prevention and what information or resources they need to address AIS issues in these trades in Minnesota. Since then, the DNR has more actively engaged businesses about invasive organisms in trade and the resources they need for their business operations and customer education. The next step was to engage customers. Therefore, the DNR extended the contact with AZENTIVE and Beyond Attitude Consulting to survey water garden pond and aquarium hobbyists.

1.2 Purpose of the Pond and Aquarium Hobbyists Survey

The Pond and Aquarium Hobbyists Survey (the survey) was conducted to inform CBSM strategies to promote behaviors that prevent the introduction and spread of aquatic invasive species. The behaviors are related to pond and aquarium hobbyists' acquisition, possession, and disposal of aquatic species.

[1] The Aquarium and Aquatic Plant Trade Working Session Report can be found on the DNR's Behavior Change for AIS Prevention webpage.

Aquatic invasive species (AIS) are defined as non-native species that cause or may cause environmental harm or harm to human health, or threaten or may threaten natural resources or their use in the state. There are regulations that address non-native aquatic plants and animals in Minnesota. For instance, it is illegal to release any non-native species into Minnesota waters. However, some aquatic invasive species are legal to possess, sell, buy, and transport (called regulated invasive species), while others are illegal to possess, import, purchase, sell, propagate, or transport (called prohibited invasive species). Given the availability of various species through many sources, communicating these regulations to hobbyists and businesses can be challenging.

In particular, the survey research was intended to:

- Build an understanding and establish a baseline of current behaviors, awareness, and attitudes related to acquiring and disposing of plant and animal species from ponds and aquariums.
- Gauge awareness and attitudes of pond and aquarium hobbyists related to aquatic species, AIS, preventing introductions, risks, responsibilities, and regulations.
- Identify actual and perceived barriers to engaging in desired behaviors, particularly related to the disposal of aquatic species.
- Gauge willingness or acceptance of modifying behaviors to reduce the spread of AIS.
- Understand incentives and motivators to foster desired behaviors that reduce the risk of spreading AIS.
- Understand communication and engagement preferences, including preferred communication channels and trusted messengers.

1.3 Research Method

The voluntary survey was conducted online from July 28 to September 21 of 2021, targeting Minnesota residents over 18 years old. The survey was distributed online through hobbyist groups (the Minnesota Aquarium Society and Minnesota Water Gardening Society), Minnesota DNR AIS communications channels (email listservs, website, social media), University of Minnesota Extension Master Gardener and Naturalist programs, county AIS programs, flyers at some local retailers in the Greater Twin Cities metropolitan area, and social media. A total of 479 respondents filled out the survey.

The assistance of the many people and organizations that distributed the survey is greatly appreciated.

If this were a random sample determined through a random telephone number dialing system, the survey results would have a confidence interval of +/-4.5 at a confidence level of 95%. In other words, if this survey were administered 20 times, 19 of those surveys would have results

within 4.5% (plus or minus) of the results in this survey. Since it was an online survey distributed by numerous associations, the statistical significance cannot be accurately calculated, and the numbers above are for guidance only.

Several survey design methods were used to reduce bias in the data gathered. To encourage respondents to be comfortable taking the survey, potentially sensitive questions were carefully constructed and made optional. In addition, respondents were told the importance of the survey in helping to inform the design of a program that would help protect Minnesota's natural areas from AIS. Participants were assured that the survey software protected anonymity by not collecting any personal data such as location that could identify them.

Despite the steps to reduce bias, some response bias is likely present. In particular, social-desirability bias may influence some of the answers. Social-desirability bias is the tendency to answer questions in a manner that a respondent feels is more socially acceptable and puts them in a better light. For example, someone asked a question like, "have you ever released fish from your ponds into the natural environment" may respond no even if they have done so because they are reluctant to admit they have done something wrong. Social-desirability bias can result in the underreporting of bad behaviors and over-reporting of good behaviors.

Distribution of the survey through the DNR's AIS communication channels (email listservs, website, and social media) and hobbyist groups may present another source of bias. The respondents that learned of the survey opportunity through these channels may be more aware of and concerned about invasive species issues. However, some respondents likely learned of the survey opportunity through different channels, such as the UMN-Extension programs and fliers distributed by Twin Cities metro area locally-owned pet and garden stores. Unfortunately, how a particular respondent came across the survey was not documented as part of this effort.

1.4 Purpose of the Summary Report

This report summarizes survey responses, including frequency charts, analysis of results, and highlights of interesting data from the analysis. In particular, CBSM-related findings are reported, including barriers, motivators, level of knowledge and awareness, communication channels, and reported behavior, as a baseline. Recommendations on behavior change strategies are also included in each section and compiled at the conclusion of this report.

2 Awareness and Attitudes

2.1 Overview

Behavioral psychology research has determined that there is often a gap between intention and action. People often fail to take positive actions, even with the best intentions. When promoting positive behaviors, it is important to be aware of the Intention-Action gap and address behavior directly. It is not enough to educate people and convince them to take a particular action and expect it to follow. Instead, behavioral psychology approaches, as defined in Community-Based Social Marketing, must be employed to nurture preferred behaviors.

Nonetheless, it is difficult to convince someone to take action if they do not have a strong awareness of issues and the appropriate attitude. Ensuring that people are aware of why they should take a preferred action and that they have the attitude that it is the right thing to do is important in promoting the actions.

For pond and aquarium hobbyists to take preventative measures against AIS, they must understand the risks presented by AIS and the laws and regulations that apply. They must also believe they have a role to play in preventing the introduction and spread of AIS. The behavioral psychology employed through CBSM is much more likely to be effective if hobbyists have the desired mindset about AIS and are ready to take action.

2.2 Awareness and Attitude Findings

The survey tested awareness and attitudes by asking pond and aquarium hobbyists about their knowledge of AIS and relevant laws and regulations in Minnesota. Although there may be some social-desirability and survey distribution biases represented in the results, respondents indicated a very high awareness of AIS.

Approximately 75% of respondents report they were either completely or somewhat aware that selling and owning some aquatic species in Minnesota is illegal. In comparison, about 15% were either completely unaware or somewhat unaware (Figure 1, Q35). The awareness is encouraging as it shows that most hobbyists already know that some species are illegal to sell or own. However, there is still a need to strengthen knowledge about which species are prohibited.

Respondents reported being similarly aware that some species available for sale and trade in Minnesota are AIS. It is positive that people are aware that AIS are being sold and shared. However, the high awareness may also indicate how prevalent AIS may be in the hobbyist community.

Approximately 95% of respondents are aware that releasing non-native plants and animals into the environment is illegal. A similar percentage are aware of the risks associated with AIS.

Almost 90% of respondents are aware that legal aquatic species can harbor other species that may be invasive.

Recommendation *– Continue with communications and outreach.*

It is important to continue with communication and education outreach to maintain these high levels of awareness and attitude. Newcomers to the pond and aquarium hobbies may not know about the risks of AIS and how to prevent them, so it is essential to continue the successful communication and education outreach efforts in Minnesota.

Recommendation *– Fine-tune communications and outreach.*

The survey results indicate high general awareness amongst pond and aquarium hobbyists about AIS. However, some gaps in knowledge exist and could be filled by focusing on them with communication and outreach efforts. In this report, those potential areas of focus are highlighted.

While 68% of respondents are aware that some aquatic species should not be sold or owned in Minnesota, only 33% of respondents knew which aquatic species were prohibited (Figure 2, Q34). This is a significant knowledge gap. It would be difficult for someone to ensure they are not acquiring prohibited species if they did not know which are prohibited. While it may be unreasonable to expect hobbyists to memorize the list of prohibited species, the survey results indicate a need to make the information available to hobbyists and sellers for quick reference.

Figure 1 - Q35. Minnesota laws exist to prevent the spread of invasive species through aquarium and pond activities. Please rate your level of awareness of the following true statements on a scale of 1 to 5. (n=418)

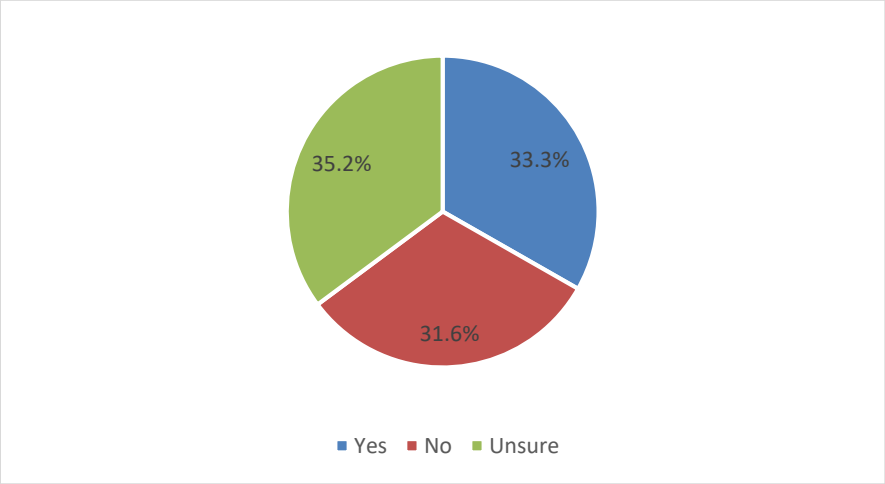
	1 Completely unaware	2 Somewhat unaware	3 Unsure	4 Somewhat aware	5 Completely aware	N/A	Total	Average
It is illegal to sell some aquarium and pond species in Minnesota.	6.5%	5.3%	14.1%	25.4%	47.1%	1.7%	418	4.03
It is illegal to own some aquarium and pond species in Minnesota.	7.0%	7.9%	15.6%	26.4%	41.8%	1.2%	416	3.89
Some aquarium and pond species available for trade or purchase are aquatic invasive species.	5.3%	5.1%	12.8%	26.0%	49.6%	1.2%	415	4.11
It is illegal to release non-native plants and animals into the environment.	1.0%	1.2%	2.4%	12.0%	82.5%	1.0%	416	4.75
Legally sold and purchased aquarium and pond species can harbor other potentially invasive seed, plant, or animal hitchhikers.	1.9%	2.9%	4.8%	28.0%	61.2%	1.2%	418	4.46
Invasive species are non-native species that present risks to Minnesota's fish, wildlife, plants, water quality, recreation, or human health.	1.2%	0.2%	1.7%	13.9%	81.1%	1.9%	417	4.77

Recommendation – *Make a list of prohibited species as accessible as possible.*

A readily accessible and user-friendly webpage with species names and photos can be created without much effort. The website could be reached by scanning a QR code displayed at a retail point of purchase and in communications and outreach pieces. By also displaying available similar alternatives to prohibited species, the website could guide hobbyists towards safer choices. Eighty-eight percent of pond and aquarium hobbyists indicated they would be willing to

buy a similar and non-invasive alternative to an invasive species (Figure 37, Q.47). Such a website would help remove the barrier of not having relevant information to support a responsible buying decision

Figure 2 - Q34. Do you know which pond and aquarium species are not supposed to be sold or owned in Minnesota? (n=418)



Most hobbyists are knowledgeable and have responsible attitudes towards invasive species (Figure 3, Q33). Ninety percent of respondents are concerned about AIS, 95% believe it is important to protect Minnesota waters, and 93% agree that preventing the spread of AIS is the right thing to do.

Respondents also understand that people play a role in spreading and preventing the spread of AIS. Eighty-four percent of respondents believe that individuals contribute to the spread of invasive species, and 94% believe that people have a role in preventing the spread of invasive species. Further, 7 in 10 respondents know someone taking action to help prevent the spread of invasive species.

Figure 3 - Q33. On a scale of 1 to 5, how strongly do you agree with each of the following statements? Please make a selection for each statement. (n=428)

	1 Strongly disagree	2 Moderately disagree	3 Neither agree nor disagree	4 Moderately agree	5 Strongly agree	N/A	Total	Weighted Average
I am concerned about aquatic invasive species in Minnesota	1.6%	0.9%	3.5%	17.8%	72.9%	3.3%	428	4.65
Individuals are contributing to the spread of aquatic invasive species	3.0%	1.6%	8.2%	23.4%	60.3%	3.5%	428	4.41
Individuals have a role to play in preventing the spread of aquatic invasive species	2.3%	0.5%	1.2%	8.9%	84.6%	2.6%	428	4.77
People I know are helping to prevent the spread of aquatic invasive species	1.6%	2.8%	15.7%	21.3%	48.4%	10.3%	428	4.25
Preventing the spread of aquatic invasive species is the right thing to do	2.6%	0.2%	1.4%	4.0%	88.8%	3.0%	428	4.82
It is important to protect Minnesota waters	2.3%	0.2%	0.0%	4.2%	90.9%	2.3%	428	4.85

The survey asked respondents how much they agreed with the statement, "Aquarium and pond species should never be released into the wild." Ninety-six percent of respondents either strongly agree or somewhat agree with this statement (Figure 4, Q37).

Figure 4 - Q37. On a scale of 1 to 5, how much do you agree with the following statement? (n=400)

	1 Strongly disagree	2 Somewhat disagree	3 Neither agree nor disagree	4 Somewhat agree	5 Strongly agree	N/A	Total	Weighted Average
Aquarium and pond species should never be released into the wild	1.3%	0.3%	1.8%	6.3%	90.0%	0.5%	400	4.84

Eighty-two percent of hobbyists indicated they were moderately, very, or extremely interested in learning more about preventing the spread of invasive species to Minnesota's lakes and rivers (Figure 5, Q38). This hunger for information is an advantage for outreach efforts. Later questions explored who they trusted as sources of information and where they would like to see it see Section 8 Communications of this report).

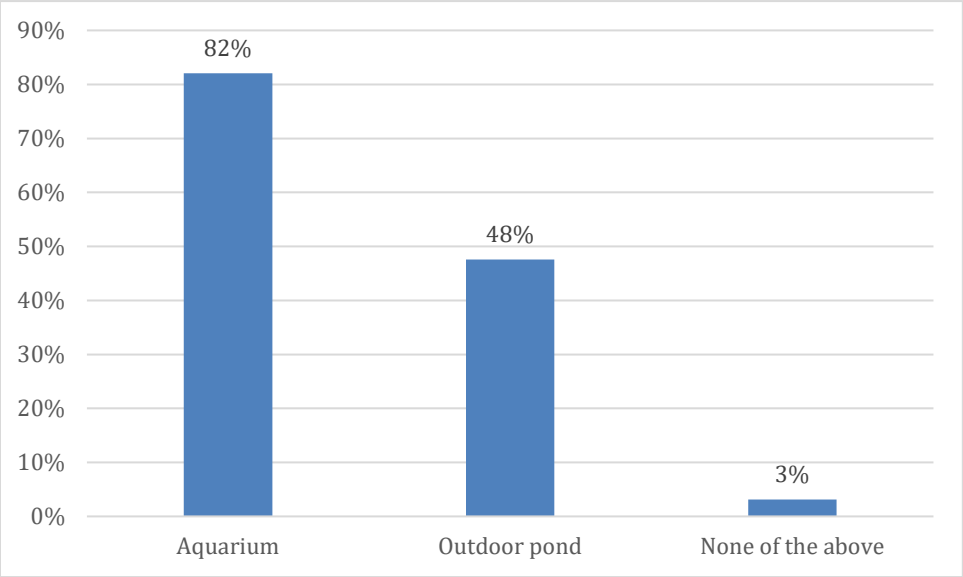
Figure 5 - Q38. How interested are you in learning more about how pond and aquarium hobbyists can help prevent the spread of invasive species to Minnesota's lakes and rivers? (n=409)

1 Not at all interested	2 Slightly interested	3 Moderately interested	4 Very interested	5 Extremely interested	Total	Weighted Average
7.3%	11.3%	30.1%	30.3%	21.0%	409	3.46

3 Hobby Activity

Eight in 10 (82%) survey respondents have owned or maintained aquariums (Figure 6, Q3). Half (48%) of the respondents have owned or maintained ponds. Many people have both. Forty percent of aquarium owners have also had a pond, and 69% of pond owners have also had an aquarium.

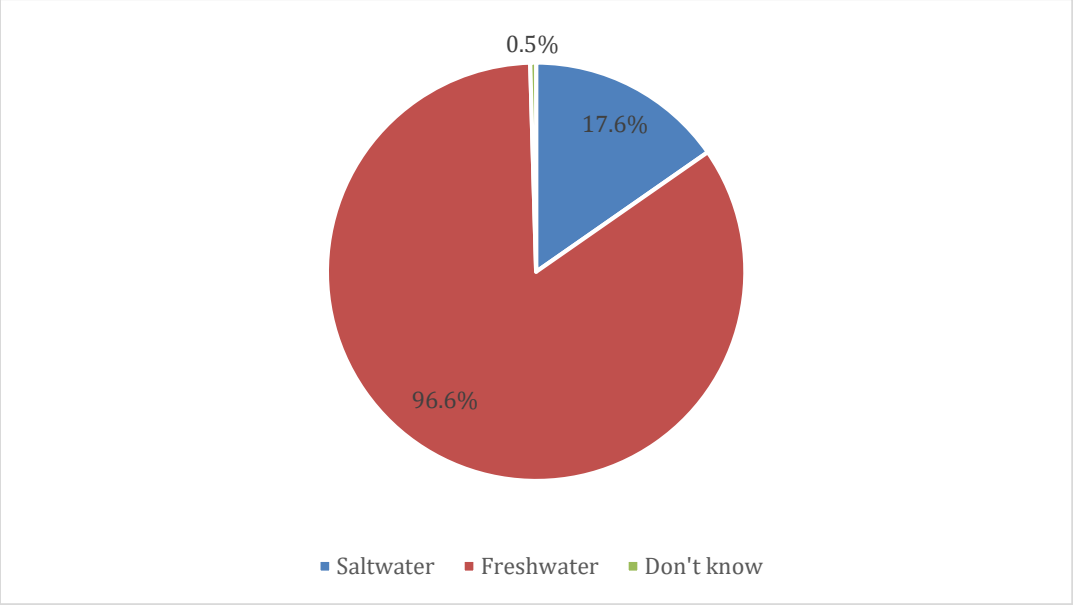
Figure 6 - Q3. Please indicate which of the following you have ever owned yourself or maintained for others. Select all that apply. (n=479)



4 Aquarium Owners

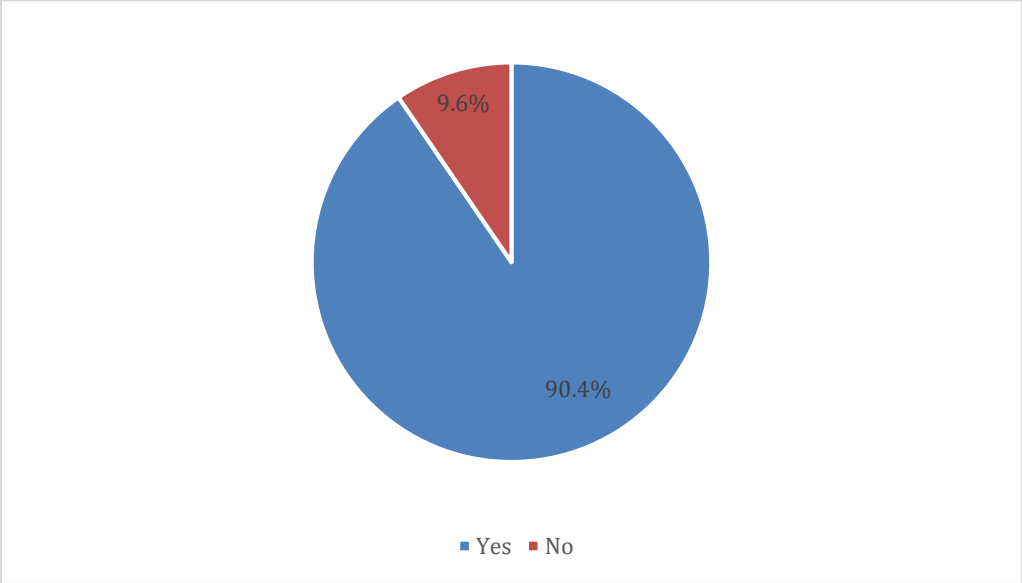
Freshwater aquariums are much more popular than saltwater aquariums (Figure 7, Q7). Eighteen percent of aquarium owners have saltwater aquariums, while 96% have freshwater aquariums, and some have both.

Figure 7 - Q7. Have you had saltwater or freshwater aquariums? Select all that apply. (n=387)



Ninety percent of respondents have owned or managed an aquarium in the past three years (Figure 8, Q6), suggesting that most are current in their knowledge and understanding.

Figure 8 - Q6. Have you owned or managed an aquarium in the past three years? (n=387)



Seventy-six percent of aquarium owners have live plants (Figure 9, Q8), and 96% have animals in their aquariums (Figure 10, Q14).

Figure 9 - Q8. Have you had live plants in your aquarium(s)? (n=387)

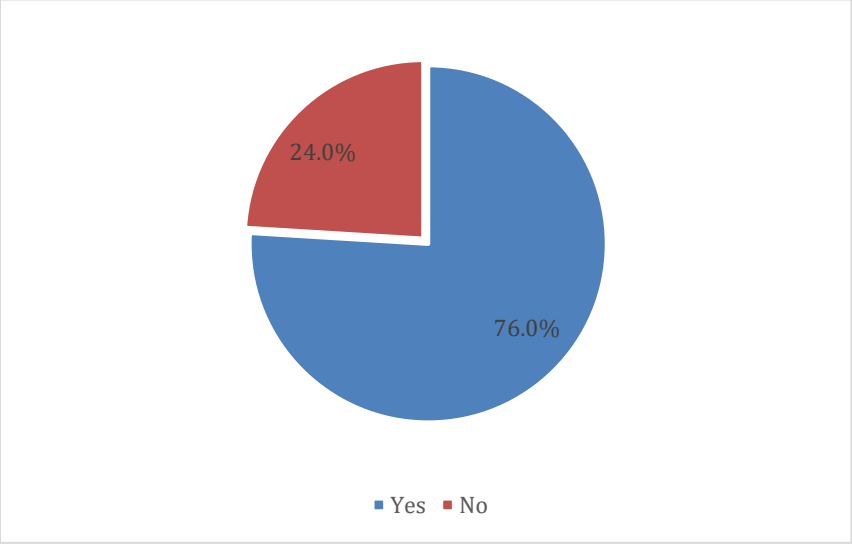
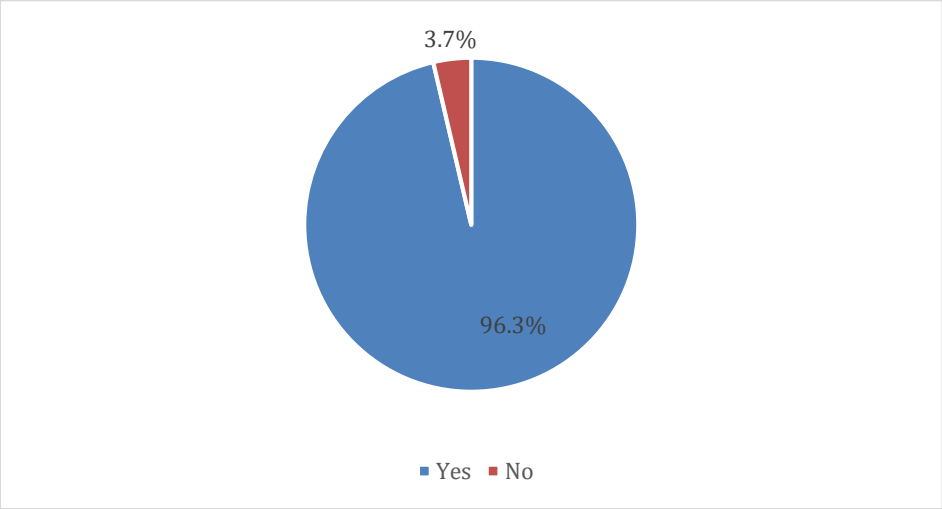


Figure 10 - Q14. Have you had live animals in your aquarium(s)? (n=382)



4.1 Acquiring Species for Aquariums

Most aquarium owners in Minnesota acquire plants and animals from brick and mortar pet stores (Figure 11, Q9 and Q15). However, a significant amount of trade of both plants and animals occurs through other channels. About 1 in 3 aquarium hobbyists have placed online orders for plants and animals with companies or hobbyists. There is also considerable sharing amongst fellow hobbyists and friends and family, and some buy directly from growers and breeders. The many sources and varieties of aquatic species available to the hobbyist provide a challenge in quantifying and preventing the acquisition of prohibited species, particularly because most hobbyists report that they do not know which species are prohibited and which are not.

***Recommendation** - Make information readily available that would help hobbyists avoid prohibited species.*

If the information is available on a website and easily accessed through a smartphone, the hobbyist can have the information they need in their pocket when making a purchase or sharing species. If Minnesota DNR provides that information and keeps it current, hobbyists will have it available regardless of where and with whom they may purchase or trade.

Figure 11 – Q19 and Q15. Thinking of your aquarium(s), from where have you acquired plants/animals? Select all that apply. (Data from questions 9 and 15 have been combined in this chart. Bolding indicates a difference larger than the margin of error) (n=295, 382)

Answer Choices	Plants	Animals
Locally owned independent pet stores	75%	78%
Big chain pet stores like PetSmart and PetCo	63%	**68%**
Other hobbyists through online channels	34%	31%
Online orders from companies	**34%**	27%
Aquarium and pond hobby clubs and auctions	24%	24%
Other hobbyists, not online	21%	23%
Growers/Breeders	15%	**28%**
Friends, family or neighbors	15%	**23%**
Gardening store	13%	3%
Harvest them myself from the environment	12%	13%
Other (please specify)	3%	10%
None of the above	0%	0%

Almost all aquarium hobbyists have fish in their aquariums. Sixty-eight percent also have snails (Figure 12, Q16). About 20% of respondents also have frogs, crayfish, crabs, or turtles in their aquariums. In the "Other" responses, about 20% report having shrimp, and a much smaller number report having newts and salamanders.

Eighty percent of hobbyists with live plants indicate that they have had snails in their aquariums. Only 24% of hobbyists without live plants have had snails.

Figure 11 - Q16. What types of aquatic animals have you had in your aquarium? Select all that apply. (n=365)

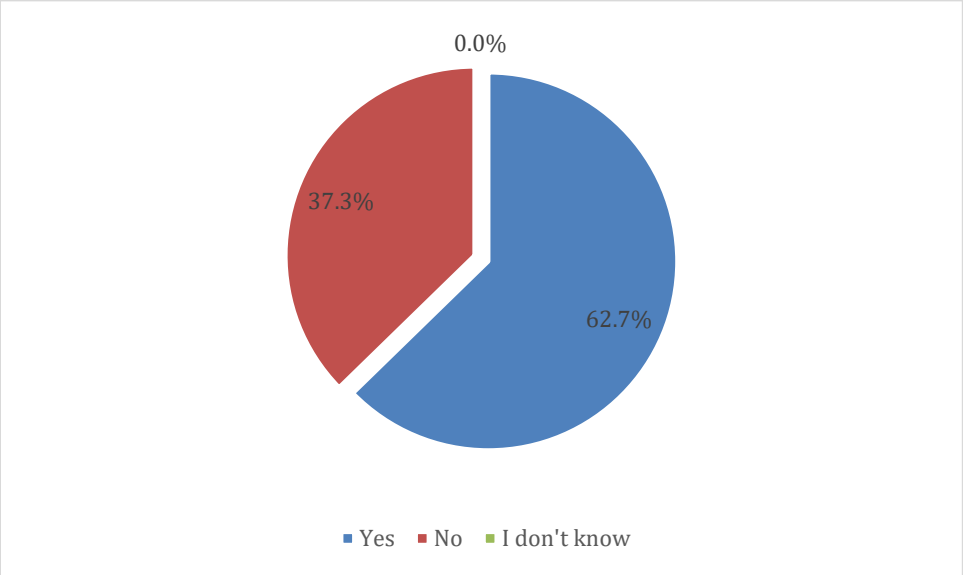
Answer Choices	%	Count
Fish	98.4%	359
Snails	67.7%	247
Frogs	22.2%	81
Other (please specify)	22.2%	81
Crayfish	20.8%	76
Crabs	19.2%	70
Turtles	18.4%	67
None of the above	0.3%	1

4.2 Disposal of Aquarium Plants

Due to the potential for introducing invasive species through the improper disposal of aquarium plants and animals, the research explored what hobbyists do with species they no longer wanted or could no longer care for.

Almost 63% have disposed of plants that they no longer wanted or could not care for (Figure 13, Q10).

Figure 12 - Q10. Have you ever gotten rid of an aquarium plant that you no longer wanted or could not care for? (n=295)



Half of the respondents prefer to dispose of aquarium plants by placing them in the trash (Figure 14, Q11). Another 18% prefer to compost them, and an equal number either share or trade them with other hobbyists. Nine percent sell them.

A few feed them to cichlids and insects, as reported in the "other" category. The worst scenario, releasing them into the wild, was the preferred disposal method of only four respondents out of 185 that answered the question.

Figure 13 - Q11. What is your preferred method of getting rid of an aquarium plant that you no longer wanted or could not care for? (n=185)

Answer Choices	%	Count
Dispose in the trash	50%	92
Compost	18%	33
Share or trade with other hobbyists	18%	33
Sell them	9%	16
Other (please specify)	22%	7
Put into a natural or human-made waterbody	2%	3
Put into a wooded area	1%	1

When asked which options they would consider for getting rid of an aquarium plant, disposal in the trash was the most popular option, followed by sharing or trading with other hobbyists, composting, and selling them (Figure 15, Q12). Only 11 out of 294 respondents indicated that they would consider releasing unwanted plants into the environment. Two respondents indicated they might flush them down the toilet if they were small enough.

Many hobbyists consider sharing or trading unwanted plants with other hobbyists or selling them, even though they tend not to do it. Disposing unwanted plants in the trash or compost is much more convenient than finding someone to trade with or who might buy them. It is likely the convenience that makes disposal in the trash and composting the most frequent disposal options chosen. It would make sense that communications and outreach material stress the safety and the convenience of disposing of unwanted plants in the trash.

Recommendation *- Establish a social norm of disposing of unwanted plants in the trash.*

Communications materials should stress both the convenience and the effectiveness of disposing of plants in the trash, the preferred disposal method for unwanted plants. The materials should also mention that most aquarium owners use trash disposal to establish peer pressure to support the growth of a social norm.

Figure 14 - Q12. Which options would you consider for getting rid of an aquarium plant that you no longer wanted or could not care for? Select all that apply. (n=294)

Answer Choices	%	Count
Dispose in the trash	74.5%	219
Share or trade with other hobbyists	62.6%	184
Compost	53.7%	158
Sell them	40.8%	120
Other (please specify)	7.8%	23
Put into a wooded area	2.4%	7
None of the above	1.7%	5
Put into a natural or human-made water body	1.4%	4

The preferred method of disposing of aquarium plants that someone can no longer care for or no longer wants is to place them in the trash. Respondents were asked if there was anything that would prevent them from disposing of them in the trash.

Forty-four percent said nothing would prevent them from placing aquarium plants in the trash (Figure 16, Q13). Forty-nine percent of respondents reported that they would rather share or trade the plants with other hobbyists. Almost 30% said they would rather sell them, and another 30% said they would not want to waste them. Eighteen percent preferred not to kill the plants. Only 5% of respondents reported that plants are not allowed in the garbage in their community. Only four out of 290 respondents said they would rather transfer them to a natural or human-made water body.

While it appears it hobbyists would rather not dispose of unwanted plants, most do either by placing them in the trash or by composting them. While there is trading that does go on, it is in the minority.

Figure 15 - Q13. Is there anything that might prevent you from placing live aquarium plants in the trash if you could no longer care for or no longer wanted them? Select all that apply. (n=290)

Answer Choices	%	Count
Would rather share or trade them with other hobbyists	49.0%	142
Nothing would prevent me	43.5%	126
Would rather sell them	28.6%	83
Don't want to waste them	28.6%	83
Prefer not to kill plants	17.9%	52
Other (please specify)	9.3%	27
Disposal of plants in trash is not allowed in my community	4.8%	14
Would rather transfer them to a natural or human-made water body	1.4%	4

4.3 Disposal of Aquarium Animals

Disposal of aquarium animals that people may no longer be able or willing to keep is challenging to discuss. Some options are available, such as rehoming, but it can be difficult to find a destination. It is feared that some hobbyists may resort to releasing species into the wild if they feel that there is no acceptable alternative available. One option is euthanasia, although it may not be palatable to some people. The research sought to understand people's attitudes and knowledge regarding euthanasia as an alternative to releasing aquatic species into the wild.

Only 3% of respondents indicated that they might release animals into the wild that they could no longer or were unwilling to keep (Figure 17, Q17). Ninety-five percent said they would not.

Fifty-four percent of aquarium owners said they would be willing to euthanize animals humanely, and 81% said they would rather euthanize them than release them into the environment. Only 5.6% indicated that they would rather release them into the environment than humanely euthanize them. About 61% of respondents said they would go to great lengths to find an alternative to humanely euthanizing them or releasing them into the environment. Fifteen percent said they would not go to those great lengths.

Hobbyists do not want to release animals into the wild but would rather not euthanize them. However, if there were only two choices, releasing them or euthanizing them, most hobbyists would not release them into the wild. Nonetheless, many hobbyists would like to see other alternatives like rehoming species that they no longer are able or willing to keep. In the

comments in some of the questions, hobbyists indicated that neither extreme of releasing or euthanizing was acceptable.

Figure 16 - Q17. On a scale of 1 to 5, how much do you agree with the following statements about aquarium animals that you may no longer be able or willing to keep. (n=363)

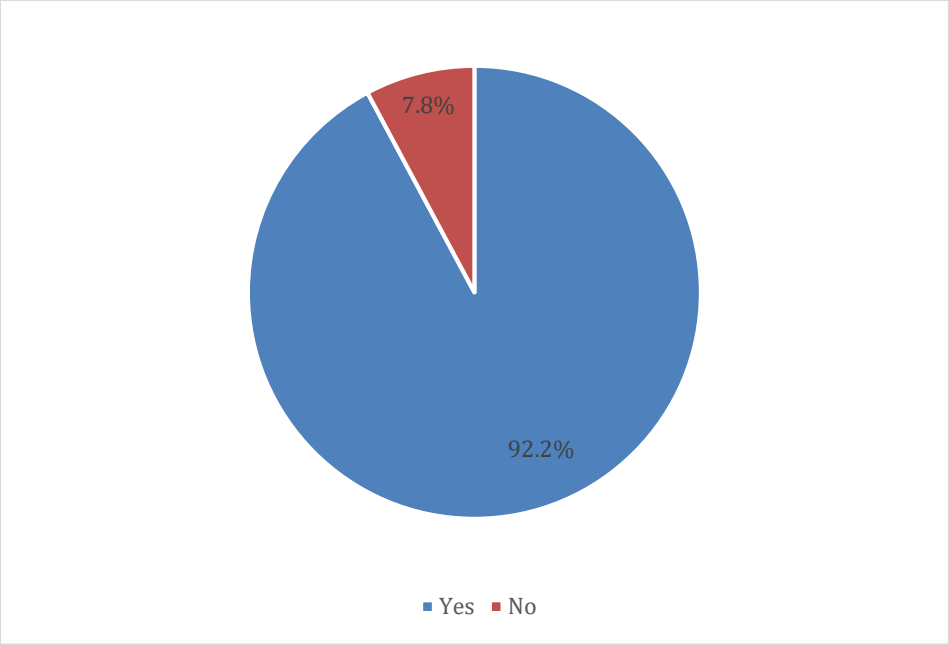
	1 Completely disagree	2 Somewhat disagree	3 Neither agree nor disagree	4 Somewhat agree	5 Completely agree	N/A	Total	Weighted Average
I might release them into the environment.	92.0%	2.8%	1.1%	1.4%	1.7%	1.1%	363	1.16
I would be willing to humanely euthanize them.	14.1%	8.3%	11.0%	16.0%	48.2%	2.5%	363	3.78
I would rather humanely euthanize them than release them into the environment.	3.0%	2.2%	8.5%	11.6%	69.7%	5.0%	363	4.5
I would rather release them into the environment than humanely euthanize them.	79.9%	5.5%	6.3%	3.9%	1.7%	2.8%	363	1.37
I would go to great lengths to find an alternative to humanely euthanizing them or releasing them into the environment.	9.4%	5.8%	17.6%	16.8%	44.4%	6.1%	363	3.86

More questions were asked about euthanasia of both pond and aquarium hobbyists. The results can be found in Section 5.3 – Animals in Ponds and Section 6.2 - Euthanasia.

5 Ponds

Of the 217 respondents who have had ponds, 92% have had them in the past three years (Figure 18, Q19), indicating their knowledge and experiences are current.

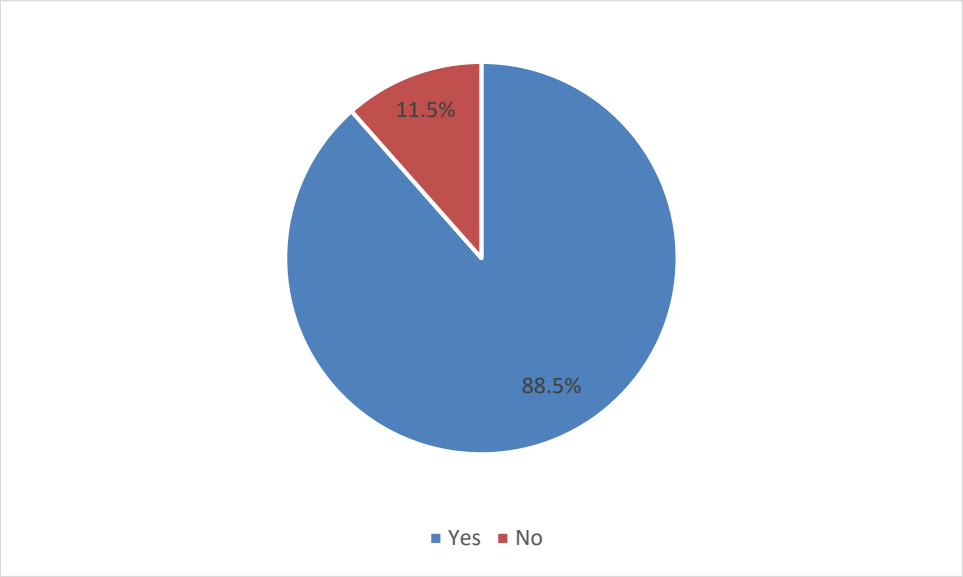
Figure 17 - Q19. Have you owned or managed a pond in the past three years? (n=217)



5.1 Plants in Ponds

Almost 9 in 10 (88.5%) pond owners have aquatic plants (Figure 19, Q20), compared with 76% of aquarium owners.

Figure 18 - Q20. Thinking of your pond(s), do you have live plants in it? (n=289)



One in five (21%) respondents indicated that their ponds are near other water bodies (Figure 20, Q21). Nearness was not defined in the question and was left up to the judgment of the pond owner. Only 3% of ponds (7 ponds) are in areas that experience flooding (Figure 21, Q22). Of the seven ponds that experience flooding, five are near other waterbodies. Ponds that experience flooding close to natural waterbodies, while a rarely reported occurrence, pose a higher risk of potentially invasive species escaping into the environment.

Figure 19 - Q21. Is your pond near other natural or human-made waterbodies? (n=217)

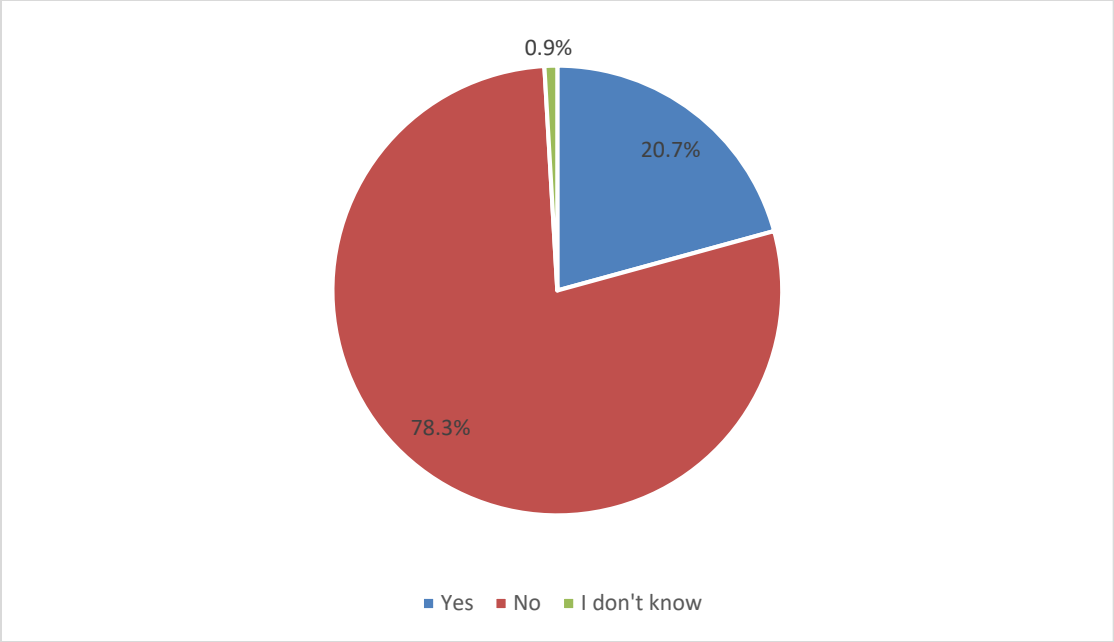
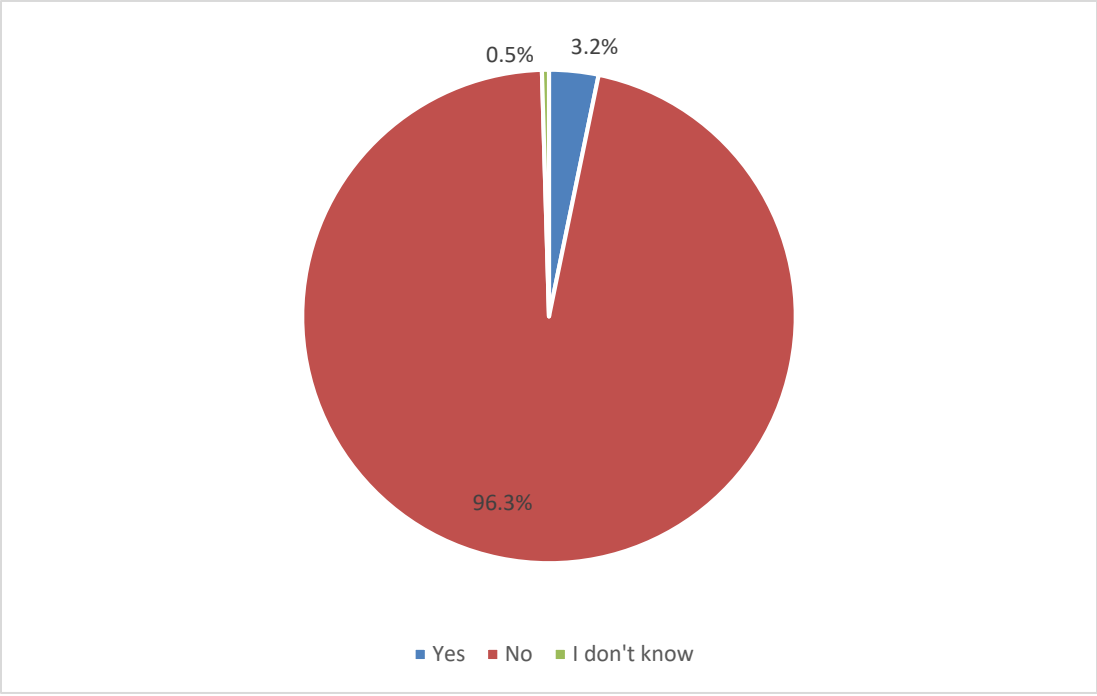


Figure 20 - Q22. Is your pond in an area that experiences flooding? (n=217)



5.2 Acquiring Species for Ponds

Gardening stores are popular sources for aquatic plants for ponds at 60% (Figure 22 - Q23 and Q29). Next are aquarium and pond hobby clubs and auctions at 29%. About one in four pond owners source plants from locally-owned independent pet stores, and a similar proportion buy them from online companies. There is a significant amount of trade between other hobbyists and friends, family or neighbors at about 17%. Fifteen percent of pond owners harvest plants themselves from the environment.

Unlike aquarium owners, who tend to acquire their plants and animal species from the same sources, pond owners are more likely to acquire their plants and animals from different places. They also access a greater number of sources when acquiring plants and animals. In addition, pond owners have plants and animals that they did not introduce themselves but rather appeared naturally.

Recommendation *- When developing communications and outreach programs, consider there are a wide variety of options available to hobbyists to acquire aquatic plants and animals.*

Providing relevant information at retail outlets will help prevent the purchase of AIS. However, there are many other sources of species. The information should be made available universally, including in online sharing forums. Hobbyist clubs and societies should be engaged to help provide the information to their members. Readily accessible online information can provide access to hobbyists whenever and wherever they are acquiring species for their ponds and aquariums.

Figure 21 - Q23 and Q29. Thinking of your pond(s), from where have you acquired live plants? Select all that apply. (Data from questions 23 and 29 have been combined in this chart. Bolding indicates a difference larger than the margin of error) (n=191, 169)

Answer Choices	Plants	Animals
Gardening store	**60%**	9%
Aquarium and pond hobby clubs and auctions	**29%**	22%
Locally owned independent pet stores	26%	**43%**
Online orders from companies	**24%**	11%
Some appear naturally	19%	**41%**
Other hobbyists, not online	17%	18%
Friends, family or neighbors	17%	21%
Big chain pet stores like PetSmart and PetCo	16%	**44%**
Harvest them myself from the environment	**15%**	8%
Other hobbyists, through online channels	9%	12%

Answer Choices	Plants	Animals
Breeders/Growers	9%	**20%**
Landscaper	**9%**	1%
Other (please specify)	7%	9%
None of the above	1%	1%

A little more than half (54.5%) of pond owners have gotten rid of a pond plant for which they no longer wanted or could no longer care for (Figure 23, Q24).

Composting (46.2%) and disposal in the trash (22.1%) are the most popular preferred methods of getting rid of unwanted pond plants (Figure 24, Q25). Composting them is more popular than disposal in the trash, which is different than the preference for plant disposal by aquarium owners. However, this may result from pond owners having enough space for composting and gardening. Gardeners often practice backyard composting.

Sharing unwanted plants with other hobbyists is preferred by 18.3% of pond owners. Only 3 of 191 respondents (1.6%) preferred to release the plant into a wooded area, and none favored putting them in water. (Figure 24, Q25).

Figure 22 - Q24. Have you ever gotten rid of a pond plant that you no longer wanted or could not care for? (n=191)

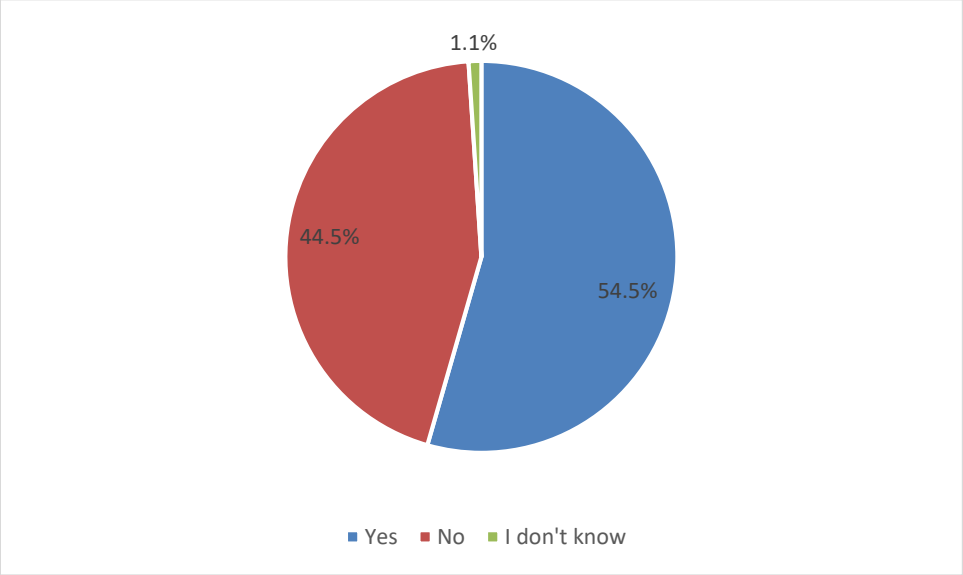


Figure 23 - Q25. What is your preferred method of getting rid of a pond plant that you no longer wanted or could not care for? (n=104)

Answer Choices	%	Count
Compost	46.2%	48
Dispose in the trash	22.1%	23
Share or trade with other hobbyists	18.3%	19
Other (please specify)	8.7%	9
Put into a wooded area	2.9%	3
Sell them	1.9%	2
Put into a natural or human-made waterbody	0.0%	0

Pond owners would consider sharing their plants with other hobbyists (43.5%), and some would even sell them (19.9%), but they most frequently would consider composting (70.2%) or disposal in the trash (50.8%) (Figure 25, Q26). Placing in the trash and composting are much more convenient for getting rid of plants than finding a buyer or someone to share with.

Figure 24 - Q26. Thinking of your pond(s), which options would you consider for getting rid of live plants that you no longer wanted or could not care for? Select all that apply. (n=191)

Answer Choices	%	Count
Compost	70.2%	134
Dispose in the trash	50.8%	97
Share or trade with other hobbyists	43.5%	83
Sell them	19.9%	38
Other (please specify)	8.4%	16
Put into a wooded area	6.3%	12
None of the above	2.6%	5
Put into a natural or human-made water body	1.6%	3

There are no significant barriers preventing people from disposing of unwanted plants in the trash (Figure 26 - Q27). There are some preferences to compost (45.3%) and share with others (33.2%), but these are not barriers. The only barrier may be the prohibition of placing plants in the trash (real or perceived) in some communities, as was reported by 11.6% of respondents. Because many hobbyists are composting or placing unwanted plants in the trash now, communications and outreach can build on those numbers by promoting the actions as best practices.

Figure 25 - Q27. Thinking of your pond(s), is there anything that might prevent you from placing in the trash any live plants that you no longer wanted or could not care for? Select all that apply. (n=190)

Answer Choices	%	Count
Would rather compost them or bury them in the garden	45.3%	86
Nothing would prevent me	35.8%	68
Would rather share or trade them with other hobbyists	33.2%	63
Prefer not to kill plants	16.8%	32
Don't want to waste them	15.3%	29
Would rather sell them	12.1%	23
Disposal of plants in trash is not allowed in my community	11.6%	22
Keeps natural areas natural	11.1%	21
Other (please specify)	7.4%	14
Would rather transfer them to a natural or human-made water body	1.1%	2

Recommendation *- Outreach materials should stress both the convenience and the effectiveness of disposing of plants in the trash, which is the preferred disposal method for unwanted pond plants.*

This preference for disposal is the same for aquarium plants. Therefore, the same message can target both pond and aquarium hobbyists.

Recommendation *- Create a social norm of placing unwanted plants in the trash.*

Since most pond owners are composting and placing unwanted plants in the trash, building the practice as a social norm is an opportunity. Communication and education outreach should state that most pond owners destroy plants by composting or disposal in the trash to protect the environment. By positioning this as a best practice, other pond owners will feel that it is the right thing to do and should do it too. Having influential and trusted spokespeople would help in building the social norm. Trusted sources are identified in Section 8 – Communications*.*

5.3 Animals in Ponds

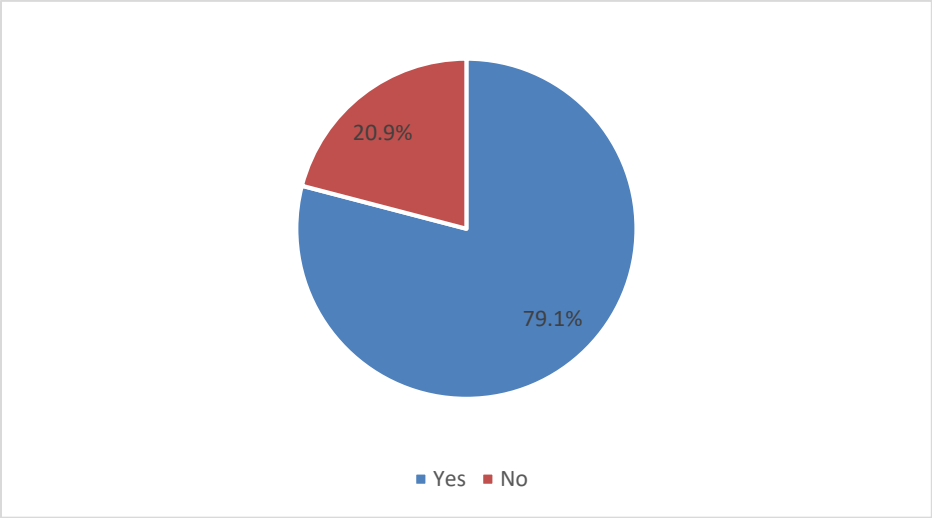
Seventy-nine percent of pond owners report having animals in their ponds (Figure 27, Q28).

Pond owners get their animal species from a wide range of sources (Figure 22, Q23 and Q29). They typically go to big chain pet stores like PetSmart and Petco and locally owned independent pet stores at 44% and 43%, respectfully. About 20% of respondents acquire their animals from aquariums, pond hobby clubs and auctions, and 21% get them from friends,

family, or neighbors. Breeders are sources for 20%, and other hobbyists through online channels are sources for 20%. Hobbyists that are not online are a source for 18% of pond owners. Forty-one percent of pond owners report that some animals appear in their ponds naturally, and only 8% report harvesting animals from the wild and placing them in their ponds. When crafting messaging for this audience, it will be important to include more nuanced information about addressing native, non-invasive animals that naturally moved into their ponds.

Further research could be done to better understand how pond owners manage animals in their pond, how the animals get there, how populations are controlled, and what is done with unwanted animals. The situation with pond animals is complex, and a better understanding will help inform effective communications.

Figure 26 - Q28. Do you have animals in your pond(s)? (n=215)



Pond owners have a wide variety of animals in their ponds (Figure 28, Q30). Of those with animals, 92% report having fish, and 57% have frogs or toads. Snails, turtles, and birds are popular animals. Eleven percent have crayfish. Others listed are snakes, salamanders, and insects that have arrived on their own.

Figure 27 - Q30. What types of aquatic animals have you had in your pond? Select all that apply. (n=169)

Answer Choices	%	Count
Fish	92.3%	156
Frogs or toads	57.4%	97
Snails	36.1%	61
Turtles	24.9%	42
Birds	24.9%	42
Crayfish	10.7%	18
Other (please specify)	10.7%	18
Crabs	0.6%	1
None of the above	0.0%	0

Like aquarium owners, pond owners were asked how much they agreed with certain statements about pond animals that they may no longer be able or willing to keep. The results were very similar between pond owners and aquarium owners. Seventy-five percent of pond owners said they would be willing to euthanize pond animals humanely, and 7% said they would consider releasing them into the environment (Figure 29 - Q31). Seventy percent felt that they would rather humanely euthanize the animals than release them into the environment. Six percent said they would rather release them into the environment than humanely euthanize them. Reflecting discomfort with either choice (euthanasia or release), 59% of respondents said they would go to great lengths to avoid euthanizing them or releasing them into the environment. Fifteen percent indicated they would not go to those great lengths.

Recommendation - *Engage trusted messengers on euthanasia, as identified in* Section 8 – Communications.

Trusted messengers can influence others. Euthanasia is a challenging message, and it may be better received if people can hear it from their peers and those they trust. Most pond owners take positive action when confronted with the need to dispose of an animal they no longer want to have in their pond. This action by many is an opportunity to build a social norm of never releasing potentially invasive species.

Figure 28 - Q31. On a scale of 1 to 5, how much do you agree with the following statements about pond animals that you may no longer be able or willing to keep. (n=164)

	1 Completely disagree	2 Somewhat disagree	3 Neither agree nor disagree	4 Somewhat agree	5 Completely agree	N/A	Total	Average
I would consider releasing them into the environment.	83.4%	1.8%	3.7%	3.7%	3.1%	4.3%	163	1.34
I would be willing to humanely euthanize them.	13.0%	5.6%	9.3%	23.0%	42.2%	6.8%	161	3.81
I would rather humanely euthanize them than release them into the environment.	5.6%	4.3%	9.9%	9.9%	60.5%	9.9%	162	4.28
I would rather release them into the environment than humanely euthanize them.	74.5%	5.6%	6.8%	1.9%	3.7%	7.5%	161	1.43
I would go to great lengths to find an alternative to humanely euthanizing them or releasing them into the environment.	10.4%	4.9%	16.6%	17.2%	41.7%	9.2%	163	3.82

6 Prevention Behaviors

Respondents were asked about their frequency of taking specific actions related to preventing the spread of invasive species.

Prevention behaviors are popular (Figure 30, Q36), with 74% of hobbyists saying they usually or always avoid introducing invasive species into their ponds and or aquariums. Sixty-four percent said they only acquire low-risk or non-invasive species. Those results indicate an intention to prevent the spread of invasive species. However, these results may be overly positive since only 33% of hobbyists indicated they knew which invasive species were illegal to sell or own (Figure 2, Q34).

Sixty-two percent of respondents said they check newly acquired plants and animals for hitchhiker species. Over 50% reported they quarantine plants and animals before introducing them into ponds and aquariums.

Ninety-one percent of respondents said they avoid releasing species into the environment. About 56% said that they dispose of live plants that they no longer want in the trash. Fourteen percent said they never dispose of live plants in the trash, but this could mean that they never dispose of plants at all or compost them.

Recommendation - *Communications should emphasize that many responsible hobbyists take steps to protect their aquariums and ponds from AIS.*

Highlighting the specific actions being taken will serve as a reminder to those who already take the actions and promote those actions to others. The messaging should indicate that the actions are common best practices by expert hobbyists, which will help establish a social norm of prevention.

Figure 29 - Q36. On a scale of 1 to 5, how often do you take the following measures to prevent the spread of invasive species? Please make a selection for each statement. (n=401)

	1 Never	2 Rarely	3 Sometimes	4 Usually	5 Always	Unsure	N/A	Total	Weighted Average
I avoid introducing invasive species into my pond(s) and/or aquarium(s).	1.5%	1.5%	6.5%	20.2%	53.6%	12.0%	4.7%	401	3.91
I only acquire low-risk/non-invasive species for my pond(s) and/or aquarium(s).	1.5%	2.5%	8.0%	25.2%	38.7%	16.0%	8.2%	401	3.54
I check newly acquired plants/animals for hitchhikers species.	9.7%	9.7%	9.5%	24.4%	37.2%	2.2%	7.2%	401	3.68
I dispose of live plants that I no longer can care for or no longer want in the trash.	13.5%	5.7%	11.0%	16.0%	40.4%	2.0%	11.5%	401	3.66
I avoid releasing species into the environment.	0.0%	0.8%	1.3%	4.7%	86.5%	3.0%	3.7%	401	4.75
I quarantine my plants and animals before introducing them to established ponds and aquariums.	13.2%	11.2%	14.2%	20.0%	31.2%	0.5%	9.7%	401	3.48

6.1 Euthanasia

Section 4.3 reports on the results when aquarium owners were asked questions about what they would do with animals they were no longer able or willing to keep. Similar questions were asked of pond owners, and their responses were described in Section 5.3.

In summary, most pond and aquarium owners said they would be willing to euthanize animals humanely, with less than 10% preferring to let them loose in the wild. Reflecting discomfort with either choice (euthanasia or release), more than half of pond and aquarium respondents said they would go to great lengths to avoid euthanizing them or releasing them into the environment.

All respondents were given the option to comment on the euthanasia of pond and aquarium animals. Seventy-five respondents provided comments. Most people did not like to euthanize animals but felt that it was the right thing to do for invasive non-native species if there was no other option such as rehoming. Some suggested that there should be more rehoming options as they would prefer to rehome than euthanize. Interestingly, some people said they became willing to euthanize aquatic species after seeing news stories about goldfish released into natural areas.

Some people strongly object to euthanizing a pet. Others stated they realized that it might be necessary, but they do not know how to humanely end an animal's life. The lack of knowledge is a barrier to taking action.

Recommendation - *There should be information available to people who find themselves in the position they may have to end an animal's life rather than let it go in the wild.*

The information could be provided on a website and other alternatives like rehoming or surrendering it to a retailer willing to take unwanted species. Links to resources like Habitattitude would provide them with the opportunity to exhaust all other options. Care should be taken to be supportive and assuring in the messaging.

7 Trusted Sources for Species

Respondents were asked who they trusted as a source for non-invasive legal pond and aquarium species. The overall responses and breakdowns between aquarium and pond owners are presented in Figure 31 – Q39. Because some hobbyists have ponds and aquariums, the sum of pond owners and aquariums counts is greater than the total response count.

Among all respondents, locally owned independent pet stores are most trusted at 59.5%, followed by aquarium and pond hobby clubs at 44.6%. At 29.4%, big chain pet stores like PetSmart and Petco were cited half as frequently as locally owned independent pet stores. Breeders and other hobbyists are further down the list at less than 20%.

Comparing and contrasting results between aquarium owners and pond owners, pond owners are more trusting of garden stores than aquarium owners are. Aquarium owners are more trusting of locally owned independent pet stores, big chain pet stores, and breeders. These results correspond with the sources for species that aquarium and pond owners identified (Figure 30 - Q9 and 15 and Figure 31 - Q23 and Q29).

The following table shows all responses to the question and breaks down responses by aquarium owners and pond owners. It is important to note that some people own both ponds and aquariums. Bolding indicates a difference larger than the margin of error.

Figure 32A - Q39. Which of the following sources do you trust as a source for non-invasive, legal pond and aquarium species? Select all that apply. (n=395, 333 aquarium owners and 200 pond owners)

Answer Choices	Total Responses (%)	Total Responses (count)	Aquarium Owners (%)	Aquarium Owners (count)	Pond Owners (%)	Pond Owners (count)
Locally owned independent pet stores	59.5%	235	**66.4%**	221	46.0%	92
Aquarium and pond hobby clubs	44.6%	176	46.8%	156	47.5%	95
Big chain pet stores like PetSmart and PetCo	29.4%	116	**31.8%**	106	26.5%	53
Garden stores	24.1%	95	18.3%	61	**40.0%**	80
Breeders	21.5%	85	**24.3%**	81	19.0%	38
Other hobbyists, not online	18.7%	74	18.9%	63	21.0%	42
Other hobbyists, online	18.5%	73	19.8%	66	16.5%	33
Online orders from companies	15.7%	62	16.5%	55	16.5%	33
None of the above	13.2%	52	11.4%	38	17.0%	34
Friends, family or neighbors	11.7%	46	12.3%	41	10.5%	21
Other (please specify)	8.6%	34	8.7%	29	8.0%	16

The following table breaks down the responses of aquarium owners by those that own plants and those that own animals. It is important to note that some aquarium owners have both live plants and animals.

Figure 31B - Q39

Answer Choices	Aquarium Owners (%)	Aquarium Owners With Plants (%)	Aquarium Owners With Animals (%)
Locally owned independent pet stores	66.4%	72.3%	67.9%
Aquarium and pond hobby clubs	46.8%	50.0%	46.3%
Big chain pet stores like PetSmart and PetCo	31.8%	30.1%	32.4%
Garden stores	18.3%	18.0%	17.9%
Breeders	24.3%	26.6%	24.4%
Other hobbyists, not online	18.9%	21.9%	18.8%
Other hobbyists, online	19.8%	22.3%	19.8%
Online orders from companies	16.5%	18.0%	16.4%
None of the above	11.4%	9.0%	11.1%
Friends, family or neighbors	12.3%	12.5%	12.7%
Other (please specify)	8.7%	7.8%	8.6%

The following table breaks down the responses of pond owners by those that own plants and those that own animals. It is important to note that some pond owners have both live plants and animals.

Figure 31C - Q39

Answer Choices	Pond Owners (%)	Pond Owners With Plants (%)	Pond Owners With Animals (%)
Locally owned independent pet stores	46.0%	46.3%	48.7%
Aquarium and pond hobby clubs	47.5%	50.8%	50.0%
Big chain pet stores like PetSmart and PetCo	26.5%	25.4%	26.3%
Garden stores	40.0%	42.4%	37.8%
Breeders	19.0%	19.8%	21.8%
Other hobbyists, not online	21.0%	23.7%	21.2%
Other hobbyists, online	16.5%	17.5%	16.0%
Online orders from companies	16.5%	18.6%	19.2%
None of the above	17.0%	14.1%	15.4%
Friends, family or neighbors	10.5%	11.3%	12.2%
Other (please specify)	8.0%	9.0%	9.0%

8 Communications

Respondents were asked questions that were designed to determine:

- Their current and past sources of information.
- Who they trust for information.
- How they would prefer to receive information.
- If the information would help them avoid the purchase of AIS.

The information gathered provides insight into which communications channels are currently reaching the most people. More importantly, it provides information on channels people prefer and trust, indicating how best to reach and influence them.

With this information, communications efforts can be designed to be most effective for the target audience, using trusted sources of information delivered through preferred communications channels.

8.1 Current Communication Channels

Respondents were asked to identify their current sources of information on prohibited and regulated pond and aquarium species (Figure 32 - Q40).

The Minnesota DNR was by far the most often cited source for information at 55%. The University of Minnesota - Extension, Minnesota Aquarium Society, other clubs, and other hobbyists were frequently cited. Only 16% of respondents reported that they received their information from pet stores.

Eighteen percent of respondents reported they had never received information about prohibited and regulated pond and aquarium species before.

Pond owners more frequently identified the University of Minnesota – Extension (34%) and the Minnesota Water Garden Society as sources for information about prohibited and regulated pond and aquarium species than aquarium owners. Aquarium owners cited the Minnesota Aquarium Society more often than pond owners did.

The following table shows all responses to the question and breaks down responses by aquarium owners and pond owners. It is important to note that some people own both ponds and aquariums. Bolding indicates a difference larger than the margin of error.

Figure 33 - Q40. From whom have you received information about prohibited and regulated pond and aquarium species in the past? Select all that apply. (n=383, 323 aquarium owners and 200 pond owners)

Answer Choices	Total Responses (%)	Total Responses (count)	Aquarium Owners (%)	Aquarium Owners (count)	Pond Owners (%)	Pond Owners (count)
Minnesota DNR	54.8%	210	55.7%	180	58.4%	115
University of Minnesota - Extension	25.6%	98	23.2%	75	**34.0%**	67
Minnesota Aquarium Society	21.4%	82	**25.4%**	82	18.8%	37
Other hobbyists	20.6%	79	22.0%	71	20.3%	40
I have not received information in the past	18.5%	71	20.1%	65	13.2%	26
Hobbyist societies, clubs or auctions	17.8%	68	19.5%	63	19.8%	39
Information provided at events	16.5%	63	17.6%	57	19.8%	39
Pet stores	16.2%	62	18.9%	61	14.7%	29
Minnesota Water Garden Society	15.4%	59	11.8%	38	**28.4%**	56
Minnesota Department of Agriculture	14.6%	56	13.3%	43	17.8%	35
Friends, family or neighbors	11.5%	44	11.1%	36	12.2%	24
Other (please specify)	10.2%	39	10.5%	34	9.6%	19
Minnesota Sea Grant	6.5%	25	7.4%	24	7.1%	14
Habitattitude	6.3%	24	7.4%	24	7.1%	14
Garden stores	5.0%	19	3.7%	12	**8.6%**	17
Pet Industry Joint Advisory Council (PIJAC)	2.4%	9	2.8%	9	4.1%	8
Landscapers	2.4%	9	1.9%	6	3.6%	7

8.2 Preferred Communication Channels

Respondents were asked to identify how they would prefer to receive information about AIS in general (Figure 33 – Q41). Almost 60% identified internet search as their most preferred option. Informative pamphlets and brochures were favored by 36%.

Thirty-eight percent of respondents would like to receive their information at where they make purchases, like pet stores and garden stores. Social media was preferred by 30%. Interestingly, 30% listed fishing piers and boat launches as places they would like to receive the information. This preference could suggest an opportunity to provide watercraft inspectors with information about aquatic invasive species for pond and aquarium hobbyists. More traditional channels like television, newspaper, radio, and direct mail are near the bottom of the list.

Internet search and pet stores were the most frequently identified preferred information sources. Both options allow for immediate information to guide responsible aquarium and pond purchases at retail locations.

***Recommendation** – Equip watercraft inspectors and others who interact with the public on invasive species topics with information regarding ponds and aquariums.*

After discussing boat maintenance and angling, the person could be asked if they have a pond or aquarium. If they do, they could be provided with information, including a link to the website.

***Recommendation** – Help pet stores and other sources to provide information about responsible pond and aquarium management to prevent the spread of invasive species.*

Hobbyists want to receive information at retail outlets like garden centers and pet stores; however, most report not getting information from those sources. Make it easy for these stores to provide information about responsible pond and aquarium management to prevent the spread of invasive species. The Minnesota DNR should provide a website that is kept current and provides all the information people need to make the right decisions when managing their ponds and aquariums. Work with retail stores and provide communications pieces that include a link to the website and a QR code for quick access.

***Recommendation** – Work with retailers to make access to information readily available when people choose what to purchase for their ponds and aquariums.*

Retailers are the largest source for ponds and aquarium plants and animals. It would be effective to have that information available for customers at the retail stores. It would mean that it is also available for the retailers to help them ensure that they are not supplying prohibited species. It would also be a goodwill effort by retailers to provide that important information to their customers, giving them a competitive advantage since hobbyists want this information.

The following table shows all responses to the question and breaks down responses by aquarium owners and pond owners. It is important to note that some people own both ponds and aquariums. Bolding indicates a difference larger than the margin of error.

Figure 34 - Q41. How do you prefer to receive information about aquatic invasive species? Select all that apply. (n=383, 323 aquarium owners and 197 pond owners)

Answer Choices	Total Responses (%)	Total Responses (count)	Aquarium Owners (%)	Aquarium Owners (count)	Pond Owners (%)	Pond Owners (count)
Internet search	58.5%	224	60.4%	195	55.3%	109
At pet stores	38.4%	147	**44.6%**	144	22.8%	45
Informational pamphlets or brochures	35.8%	137	37.5%	121	38.6%	76
Social media (Facebook, Twitter, Instagram, etc.)	30.3%	116	34.4%	111	23.4%	46
Fishing piers and access points	29.8%	114	32.2%	104	27.9%	55
At boat launches	28.7%	110	30.7%	99	26.4%	52

Answer Choices	Total Responses (%)	Total Responses (count)	Aquarium Owners (%)	Aquarium Owners (count)	Pond Owners (%)	Pond Owners (count)
Email listserv	25.1%	96	22.6%	73	25.9%	51
At garden stores	24.3%	93	21.4%	69	**31.5%**	62
Newsletters	24.0%	92	23.2%	75	26.9%	53
From lake/homeowner associations or lake improvement districts	17.0%	65	16.4%	53	18.3%	36
Television	16.7%	64	18%	58	15.2%	30
Newspaper	15.7%	60	14.6%	47	19.3%	38
Direct mail	15.7%	60	15.5%	50	13.7%	27
Radio	11.5%	44	12.1%	39	12.2%	24
From family, friends, or neighbors	11.0%	42	11.5%	37	8.6%	17
Library search	6.3%	24	5.9%	19	6.1%	12
Other (please specify)	5.2%	20	5.3%	17	4.6	9

8.3 Trusted Information Sources

Respondents were asked whom they trust for information about aquarium and pond care and whom they trust for information about AIS regulations (Figure 34, Q43).

Minnesota DNR (55.1%) topped the list for trusted information about pond and aquarium care, followed closely by the University of Minnesota – Extension (50.4%) and the Minnesota Aquarium Society. The Minnesota Water Garden Society was also frequently cited, as were hobbyist societies and the Department of Agriculture. Pet stores were chosen by 28% of respondents.

The following table shows all responses to the question and breaks down responses by aquarium owners and pond owners. It is important to note that some people own both ponds and aquariums. Bolding indicates a difference larger than the margin of error.

Figure 35 - Q43. Whom do you trust for accurate information on pond and aquarium care? Select all that apply. (n=383, 323 aquarium owners and 197 pond owners)

Answer Choices	Total Responses (%)	Total Responses (count)	Aquarium Owners (%)	Aquarium Owners (count)	Pond Owners (%)	Pond Owners (count)
Minnesota DNR	55.1%	211	52.01%	168	59.9%	118
University of Minnesota - Extension	50.4%	193	47.37%	153	53.8%	106
Minnesota Aquarium Society	46.0%	176	51.08%	165	38.1%	75
Minnesota Water Garden Society	34.5%	132	31.3%	101	48.7%	96
Hobbyist societies, clubs or auctions	33.7%	129	38.1%	123	27.9%	55
Minnesota Department of Agriculture	32.4%	124	29.7%	96	35.5%	70
Other hobbyists	31.3%	120	35.0%	113	27.9%	55
Pet stores	27.9%	107	31.9%	103	22.3%	44
Information provided at events	14.1%	54	13.9%	45	17.3%	34
Friends, family or neighbors	12.0%	46	12.7%	41	11.2%	22
Garden stores	9.7%	37	8.1%	26	13.2%	26
Minnesota Sea Grant	7.3%	28	8.4%	27	6.6%	13
Landscapers	6.3%	24	6.2%	20	7.1%	14
Other (please specify)	6.0%	23	5.9%	19	7.1%	14
Pet Industry Joint Advisory Council (PIJAC)	5.5%	21	6.2%	20	5.6%	11
Habitattitude	5.0%	19	5.6%	18	5.6%	11

Respondents were asked who they trusted for accurate information on aquatic invasive species regulations (Figure 36 - Q42). The Minnesota DNR was identified by 93%, followed by the University of Minnesota - Extension at 63% and the Minnesota Department of Agriculture at 57%. The Minnesota Aquarium Society and Minnesota Water Garden Society also featured prominently, as did other hobbyist societies, clubs or auctions. Pet stores were at 10.4%.

There is an opportunity at pet stores to increase available information and improve trust. Few people currently receive information at pet stores (16%), but 38% want to receive information

there. While fewer people currently list pet stores as a trusted source of AIS information (10%), they are trusted slightly more for aquarium/pond care (28%).

Recommendation *- Collaborate with pet stores to help their customers by making the information accessible on a website.*

Assist pet stores by providing resources they could use when onboarding new staff members. Pet store staff members do not have to be experts about pond and aquarium management to assist customers and guide them in making proper choices. They need to have access to correct information and point it out to their customers. Pet stores would then benefit from being seen as responsible corporate citizens, environmental stewards, and a trusted source of information.

The following table shows all responses to the question and breaks down responses by aquarium owners and pond owners. It is important to note that some people own both ponds and aquariums. Bolding indicates a difference larger than the margin of error.

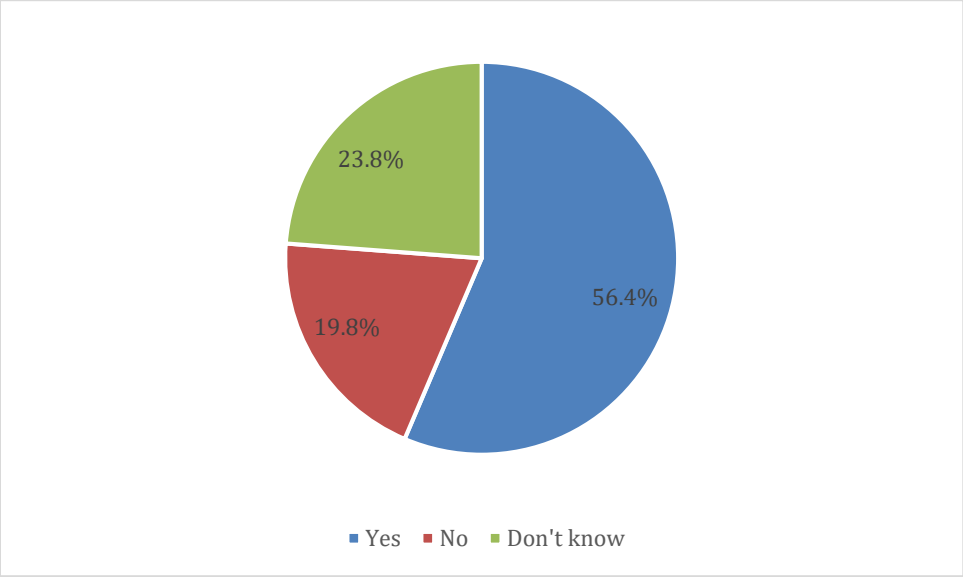
Figure 37 - Q42. Whom do you trust for accurate information on aquatic invasive species regulations? Select all that apply. (n=383, Aquarium = 323, pond = 197)

Answer Choices	Total Responses (%)	Total Responses (count)	Aquarium Owners (%)	Aquarium Owners (count)	Pond Owners (%)	Pond Owners (count)
Minnesota DNR	93.2%	357	94.7%	306	90.36%	178
University of Minnesota - Extension	62.9%	241	60.4%	195	65.99%	130
Minnesota Department of Agriculture	57.2%	219	57.3%	185	56.85%	112
Minnesota Aquarium Society	39.4%	151	43.7%	141	32.99%	65
Minnesota Water Garden Society	29.8%	114	26.6%	86	42.13%	83
Hobbyist societies, clubs or auctions	17.8%	68	19.2%	62	14.72%	29
Minnesota Sea Grant	14.4%	55	16.4%	53	10.15%	20
Information provided at events	12.5%	48	12.4%	40	14.21%	28
Pet stores	10.4%	40	12.1%	39	8.63%	17
Habitattitude	8.4%	32	9.0%	29	9.14%	18
Garden stores	8.1%	31	7.4%	24	10.66%	21
Other hobbyists	7.1%	27	7.7%	25	6.60%	13
Pet Industry Joint Advisory Council (PIJAC)	5.0%	19	5.9%	19	4.06%	8
Friends, family or neighbors	4.7%	18	4.3%	14	5.08%	10
Landscapers	4.4%	17	4.3%	14	4.57%	9
Other (please specify)	2.6%	10	2.5%	8	4.06%	8

8.4 Purchasing Alternatives to Invasive Species

A fundamental aspect of avoiding the spread of invasive species is the ability to decide not to purchase invasive species in the first place. Respondents were asked if they believed they had the information necessary to avoid purchasing invasive species (Figure 36, Q48). Fifty-six percent of respondents reported yes, and 44% reported either they didn't have the information or didn't know. Improvements could be made in the availability of the information required to avoid purchasing an invasive species.

Figure 38 - Q48. Do you believe you have the information you need to avoid the purchase of invasive species? (n=374)

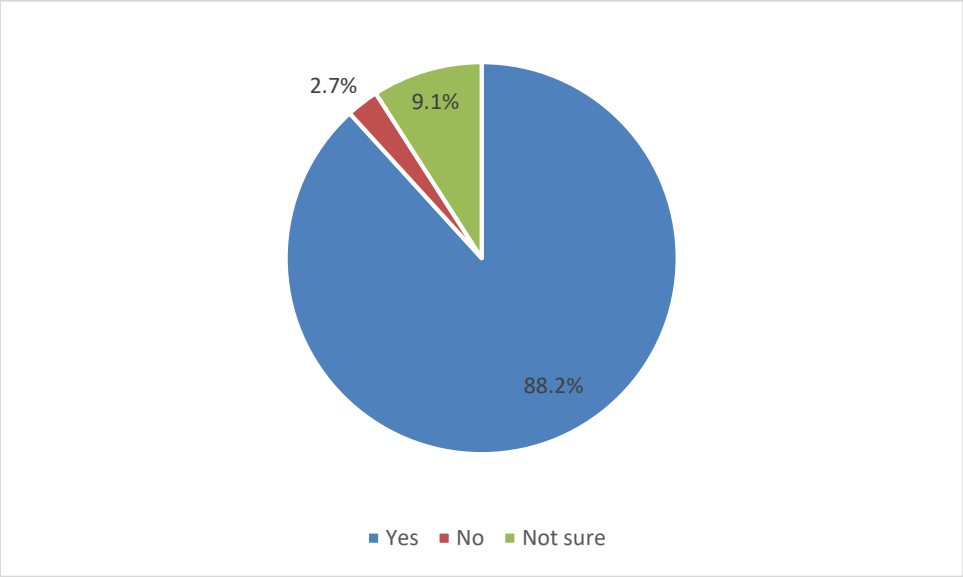


Respondents were asked if they knew that a plant or animal they intended to purchase was invasive, would they be willing to purchase a non-invasive alternative instead. Eighty-eight percent said yes (Figure 37, Q47).

***Recommendation** - Ensure retailers have information on what is invasive and what is not.*

Having reliable information at the point of purchase about what is invasive and what is not invasive is crucial to reducing the spread of AIS by pond and aquarium hobbyists. Hobbyists want to avoid invasive species; it is important to ensure they have the required information to make the right choices.

Figure 39 - Q47. If you found out that an aquatic plant or animal you intended to buy was invasive, would you be willing to buy a similar but non-invasive alternative instead? (n=374)



Respondents were asked how useful particular information sources would be to avoid the purchase of AIS.

A website with information about what species are invasive was seen as helpful by 96% of respondents (Figure 38, Q49). Ninety-five percent also wanted information on safe alternatives to invasive species on a website. Eighty-five percent of respondents wanted information provided by sellers about which species are invasive, and 89% wanted sellers to provide information about safe alternatives. A brochure or booklet on invasive species was deemed helpful by 90% of respondents, with the same percentage wanting to see information on safe alternatives in a brochure or booklet.

Figure 40 - Q49. On a scale of 1 to 4, where 1 is not at all helpful and 4 is very helpful, please indicate how helpful the following information sources would be to you in avoiding the purchase of aquatic invasive species. (n=374)

	1 Not at all helpful	2 Somewhat unhelpful	3 Somewhat helpful	4 Very helpful	N/A	Total	Weighted Average
Information provided by sellers about which species are invasive	5.9%	5.9%	27.3%	57.5%	3.5%	374	3.41
A brochure or booklet about which species are invasive	2.4%	5.6%	33.7%	55.9%	2.4%	374	3.47
A website about which species are invasive	0.3%	2.1%	15.0%	80.8%	1.9%	374	3.8
Information provided by sellers about safe alternatives to invasive species	2.9%	5.6%	28.1%	61.0%	2.4%	374	3.51
A brochure or booklet about safe alternatives to invasive species	3.2%	5.4%	33.4%	55.6%	2.4%	374	3.45
A website about safe alternatives to invasive species	0.5%	2.7%	21.4%	73.5%	1.9%	374	3.71

At a point of purchase, information by sellers on what is invasive and what are safe alternatives can make a big difference in preventing the purchase of invasive species. From the results of the questions, that information could be delivered by staff, by reference to a website, and by having a brochure readily available on-site.

A website managed by DNR meets all of the requirements of a good source of information: correct, current, and accessible. A brochure could provide general information and point people to the website.

Seventy-nine percent of respondents said they were more likely to purchase from a seller who could prove that they participated in a state-wide invasive species prevention training and recognition program (Figure 39, Q50).

Recommendation *- Establish a state-wide invasive species prevention training and recognition program.*

If sellers could prove that they participated in a state-wide invasive species prevention training and recognition program, their customers would be more likely to purchase from them. This should be an incentive to participate in such a program, providing a competitive advantage to participants. Training should be developed in cooperation with retailers, hobby groups, and societies to ensure it is effective and works for them. The training program should be branded. Materials such as stickers, window clings, small signs, and other recognition mechanisms should be provided to participants to indicate that they have fulfilled the training program's requirements.

Figure 41 - Q50. How likely would you buy from a seller that had proof of participation in a state-wide invasive species prevention training and recognition program? (n=374)

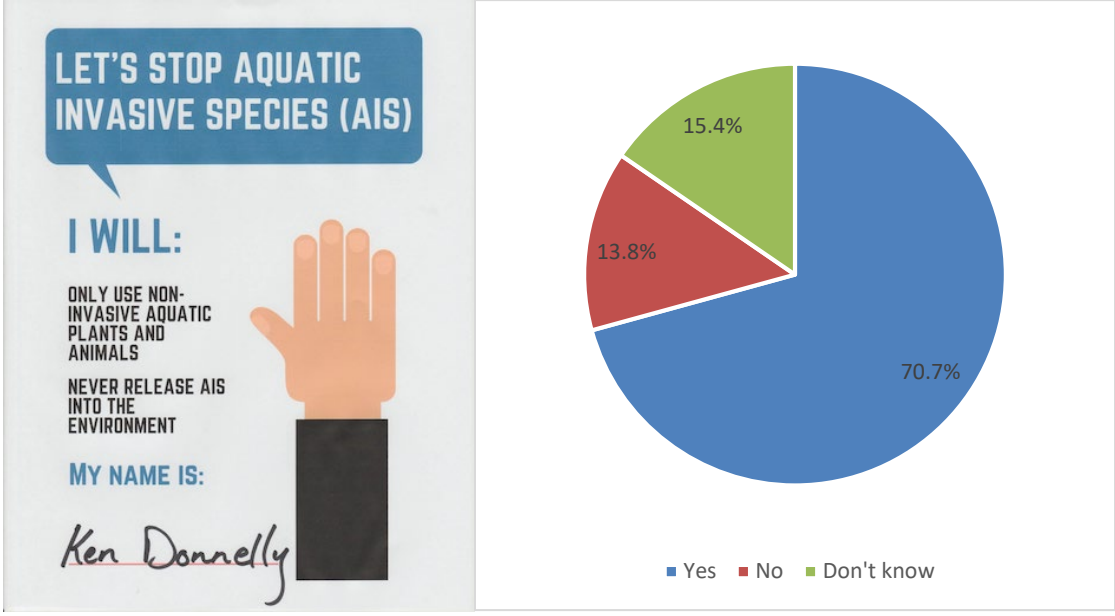
Answer Choices	%	Count
More likely	78.9%	295
About the same	16.6%	62
Less likely	1.3%	5
I don't know	3.2%	12

9 Pledge Forms

An important element of Community-Based Social Marketing is gathering pledges from people to take appropriate actions. Behavioral psychology research finds that people who commit to taking action are more likely to follow through with the behavior than if they had not committed to it. Gathering commitments helps close the Intention-Action Gap.

Respondents were asked if they would be willing to make a written pledge to prevent the spread of invasive species if asked to do so by a retailer (Figure 42 - Q51A and Figure 41 – Q51B). Respondents were randomly presented with one of two sample pledge forms. One was a very simple form that required only a name. The other was a more detailed form and requested further information and required more effort to fill out. The question's objective was to determine if people were willing to pledge and more likely to pledge with a simple form or a more detailed one.

Figure 43 - Q51A. If a retailer were to ask you to commit to best efforts to avoid introducing or spreading aquatic invasive species, would you be willing to pledge on a form similar to this one? (n=188)



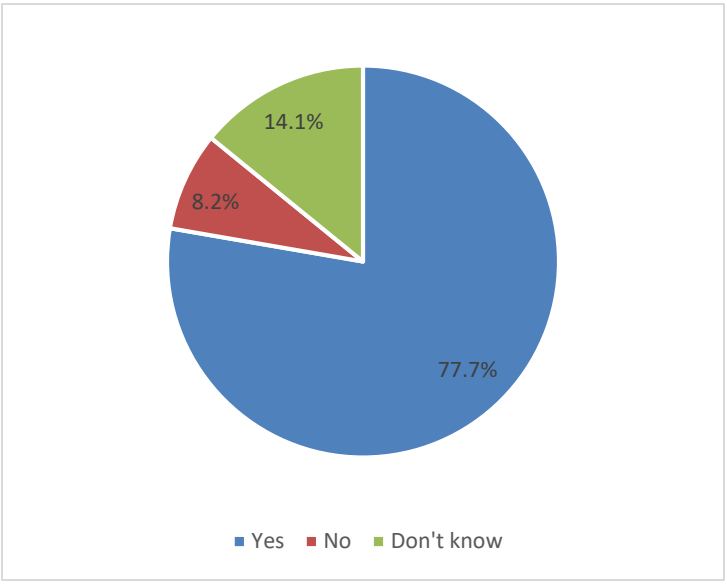
Seven in ten (70.7%) respondents indicated they would take the pledge using the simpler form. Almost eight in ten (77.7%) reported they would take the more detailed pledge. There may be an element of social-desirability bias in the response rate.

While it appears that people are more willing to take the more detailed pledge, the more important fact is that approximately three out of four respondents would take a pledge if offered by the retailer. The results also suggest that retailers could play an important role in gathering pledges to prevent their customers from spreading invasive species from their ponds and aquariums. By gathering commitments, retailers would be helping close the Intention-Action Gap. Hobbyist groups and societies could do the same.

Recommendation *- Establish a pledge gathering program in cooperation with retailers, hobbyist groups, and societies.*

Try the pledge out as a pilot project with a few cooperating retailers to see if the theoretical question in the survey translates to people filling out the pledge form in a store.

Figure 44 - Q51B If a retailer were to ask you to commit to best efforts to avoid introducing or spreading aquatic invasive species, would you be willing to pledge on a form similar to this one? (n=184)

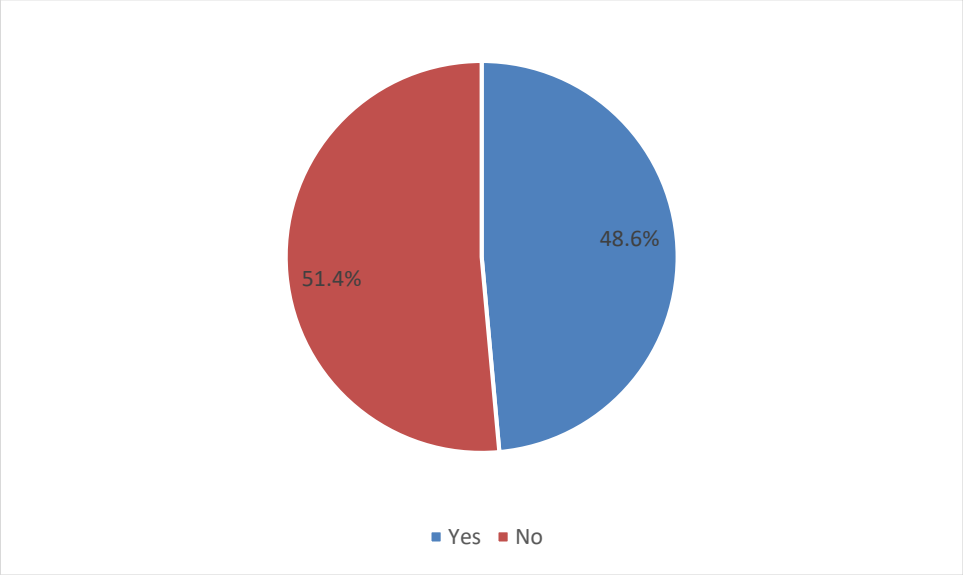


10 Accessing the DNR Website

Respondents were asked if they had accessed the Minnesota DNR website to look for information about regulations or prohibited aquatic plants and animals.

Almost half (48.6%) of respondents have accessed the website (Figure 45, Q44).

Figure 46 - Q44. Have you accessed the Minnesota DNR website to look up information on regulations or access lists of prohibited aquatic plants and animals? (n=383)



Of those who accessed the website, 83.8% reported finding what they were looking for (Figure 43, Q45).

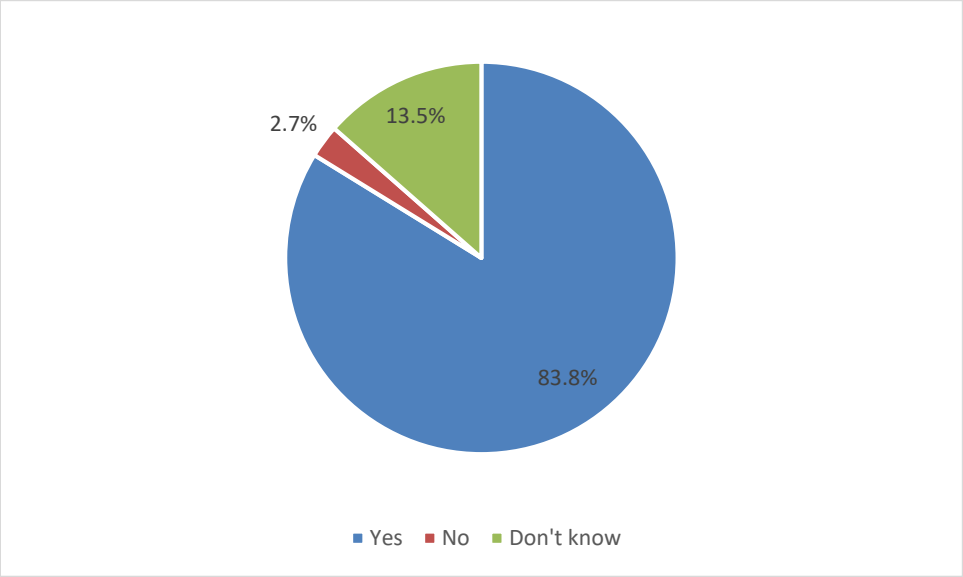
Five respondents indicated what they were looking for but could not find. They responded:

- "It has been difficult in the past to find out which species are illegal species. Because one person can ruin a habitat or waterway for everyone, it is of the utmost importance this information is easy to find."
- "Aquatic plants"
- "List and common names"
- "Don't remember"
- "Legality of tropical crayfish in the state of Minnesota. Current site says that tropical are still sellable, yet suppliers are convinced that they are illegal in the state."

Recommendation *- Review and modify the existing website to reflect the recommendations in this report.*

The existing website is performing well and is being used by pond and aquarium owners. A review of the website should be conducted to see how it matches up against the research findings. Some minor changes could be made to incorporate the recommendations in this report. It would be important to ensure that the website is user-friendly and easily accessible to ensure it is as effective as possible. The website should provide information that is useful to hobbyists and industry participants.

Figure 47 - Q45. Were you able to find the information you were looking for? (n=185)



11 About the Respondents

The majority of survey respondents tend to consider themselves to have a serious interest in ponds and aquariums, with 64% reporting that they are serious or very serious about their hobby (Figure 44, Q5).

Figure 48 - Q5. On a scale of 1 to 5, where 1 is very casual and 5 is very serious, how would you describe your interest in aquariums and ponds? (n=459)

1 Very casual	2 Casual	3 Neither casual nor serious	4 Serious	5 Very serious	N/A	Total	Average
4.8%	11.1%	20.3%	37.9%	25.7%	0.2%	459	3.69

Respondents are biased towards being male, at 54% (Figure 45, Q54), and are distributed across all age groups from 18 to 70 or above (Figure 46, Q55). They are predominantly white, but a wide range of ethnicity is represented, albeit in small numbers in some cases (Figure 47, Q53).

Figure 49 - Q54. What is your gender? Select one. (n=376)

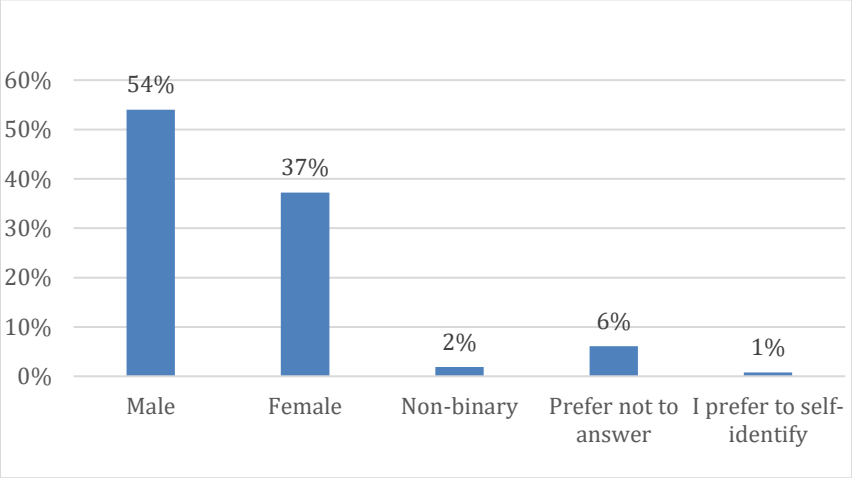


Figure 50 - Q55. Which of the following age groups would you classify as? (n=377)

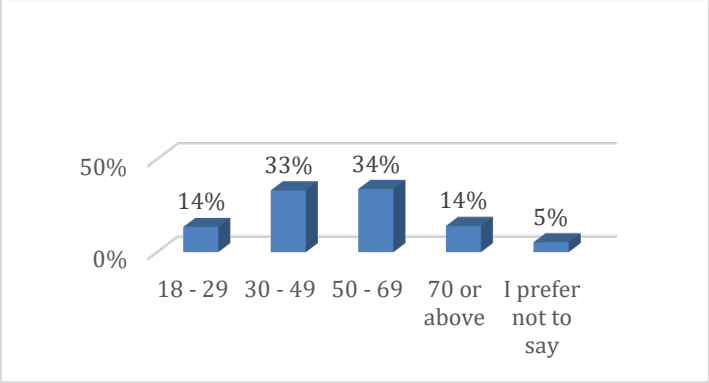


Figure 51 - Q53. What is your race, ethnicity, or origin? Select all that apply. (n=378)

Answer Choices	%	Count
White	86.5%	327
Middle Eastern or North African	0.5%	2
Black or African America	0.3%	1
Hispanic or Latino	1.6%	6
American Indian or Alaskan Native	1.9%	7
Asian or Asian American	2.7%	10
Native Hawaiian or Pacific Islander	0.0%	0
Prefer not to answer	7.9%	30
I prefer to self-identify	2.1%	8

12 Key Findings Summary

The following is a summary of key research findings.

12.1 Awareness and Attitude

- Awareness regarding AIS is strong among pond and aquarium hobbyists.
- There is a high awareness of regulations and steps to prevent AIS introduction and spread. Still, there is a need for better access to information on specific prohibited and regulated species.
- Hobbyists are concerned about the risks associated with AIS.
- Hobbyists understand there is a link between human behavior and the spread of AIS. They also understand that people can and should prevent the spread of AIS to protect Minnesota's waterbodies.

12.2 Communications

- Hobbyists prefer to have readily available information, like on websites and information provided at the point of sale.
- The Minnesota DNR topped the list for trusted information about pond and aquarium care, followed closely by the University of Minnesota - Extension, the Minnesota Aquarium Society, and the Minnesota Water Garden Society.
- The Minnesota DNR is the most trusted source for information about AIS regulations.
- There are many potential partners for the distribution of information to hobbyists.
- Readily available information on which species to avoid would help hobbyists make responsible decisions and help them protect against the introduction and spread of invasive species.
- Hobbyists will commit to taking responsible action to prevent the spread of AIS.

12.3 Species Management

- Hobbyists want to responsibly manage their ponds and aquariums to avoid the spread of AIS.
- Hobbyists prefer to avoid AIS in their ponds and aquariums.
- Pond and aquarium owners do not want to release plant and animal species into the wild.
- While they would prefer to rehome species they no longer wanted or could no longer care for, most hobbyists would euthanize a species rather than release it into the wild if there were no other viable options.

13 Recommendations Summary

Recommendations have been made throughout this report in the context of the responses to specific questions in the survey. Some of the recommendations are very similar, even though they may have arisen from insights specific to just aquarium owners or pond owners or hobbyists with just plants or just animals. Those recommendations have been gathered in the recommendations list in Appendix A.

Generally, the survey results indicate that pond and aquarium hobbyists are knowledgeable about invasive species and want to do the right thing to mitigate the risks that AIS present. The recommendations throughout the report can be condensed into four overarching recommendations. Each recommendation is an initiative to help hobbyists do what they want to: protect Minnesota waters from aquatic invasive species.

The over-arching recommendations reflect the success of DNR's efforts to promote best practices in reducing the spread of invasive species through the aquarium and water garden pathways. The following recommendations are steps to leverage hobbyists' high level of awareness and intentions to take responsible action. Implementing the recommendations will make it easier for hobbyists to be responsible.

13.1 Create a Resource to Help Hobbyists Avoid Purchasing and Spreading Invasive Species

Pond and aquarium owners in Minnesota want to do the right thing and stop the spread of invasive species. They are aware of the risks, and they want to do their part. However, even though they know some prohibited aquatic invasive species are being sold in Minnesota, two-thirds report they do not know which species to avoid when acquiring pond and aquarium species.

The best place to stop someone from acquiring an AIS is where they are about to acquire it. The location may be a retail outlet, a hobby auction, online, or simply where they are sharing with friends or other hobbyists. Providing the right information at the right time in the right place is key to getting people to take proper action.

It is unlikely that all varied sources for aquatic plants and animals will develop and have the correct information. Those who develop their materials may make errors or may not update them when they are changed. One central source of information created and maintained by trusting experts is much less risky than several sources creating their materials.

The Minnesota DNR is recognized for its expertise and is trusted for information about AIS. As the regulator, the DNR knows better than any other organization what information needs to be conveyed about regulated and prohibited AIS.

Print material like brochures are ill-suited to communicating details such as species identification, are subject to becoming stale, and have become less popular in an increasingly digital world. A more accessible, current, and secure source would be an online resource

maintained by the DNR. A brochure could still be useful to promote the website resource and why hobbyists should use it. Aquarium and pond retailers, societies, and clubs could assist in distributing the brochures to their contacts.

The DNR already has an AIS website with information relevant to pond and aquarium owners. Half of the respondents say they have used the website, and most have found the information they were looking for. The website should be reviewed to ensure that it includes all of the information people need to make proper decisions when acquiring species for their ponds and aquariums. It should be user-friendly, so people can access it quickly when making decisions about aquatic species. The resource should be promoted widely, with the assistance of retailers, hobby groups, societies, and clubs. It should also be promoted with a social media campaign. Because the website can be accessed on a smartphone, it puts a lot of valuable information at people's fingertips.

The website should include, at minimum:

- Information about why people should never release aquatic species, plants or animals, from their ponds or aquariums.
- Information and photos about prohibited and regulated species;
- Information and photos about safe alternatives to prohibited and regulated species;
- Information about safe options when someone can no longer care for or no longer wants an aquatic species, such as rehoming or surrender options;
- Information on humane euthanasia solutions for cases where there are no other options available;

The DNR should develop brochures, vinyl cling stickers, posters, and other materials that would help promote the website. These resources could be made available to retailers and other in-person sources of aquatic species.

13.2 Turn Attention to the Development of Social Norms and Best Practices

There is a high level of awareness about AIS among the pond and aquarium hobbyist community. Pond and aquarium hobbyists want to do the right thing to protect Minnesota waters from AIS.

It is important to maintain the education efforts that have brought pond and aquarium hobbyists to this strong sense of stewardship. As new hobbyists emerge, they will also need to be educated about the risks of AIS and what they can do to mitigate them. However, with a strong foundation of awareness and attitude among hobbyists, it is time to move to the latter stages of a typical CBSM strategy and focus on developing social norms to increase participation in best practices.

Communications about pond and aquarium practices should indicate that most people are doing the right thing to mitigate the risks of AIS. The knowledge that others are doing the right thing will create some peer pressure that will help bring more people into compliance. It will also take advantage of the reach that hobbyist clubs and societies, retailers, friends, and

neighbors can provide. Communications materials should be action-oriented, showing people doing the right thing and compelling others to do their part as well.

13.3 Seek Commitments

Research in behavioral psychology shows that people who make commitments to take actions are much more likely to follow up with the actions than those who do not. Seeking commitments from pond aquarium hobbyists can move them from being aware of what they should be doing and even intending to take proper action to actually doing it.

The Minnesota DNR should develop branding and pledge forms to support people making commitments to taking action. Creating the branding and pledge forms should be done in conjunction with developing social norms and best practices. People committing to best practices should feel included in the majority, working together to protect Minnesota waters from AIS.

13.4 Create a Trusted Source Certification

The Minnesota DNR should work with retailers, hobbyists, societies, groups, and leaders like University of Minnesota - Extension to develop a state-wide trusted source certification. The involvement of these participants would help increase the level of awareness and education amongst retail staff and hobbyists and standardize a high level of knowledge and awareness amongst a larger group of experts. By engaging the target audience for the training in developing the certification, delivery methods that work for the audience can be identified and incorporated into the program.

A trusted source certification would help pond and aquarium hobbyists ensure that their sources for species and information have been vetted and are of high quality. This will help support pond and aquarium hobbyists and their desire to take responsible actions.

14 Conclusion

The purpose of the pond and aquarium hobbyists survey was to understand the attitudes, awareness, behaviors, and motivators of Minnesota's pond and aquarium hobbyists related to aquatic invasive species. The information gathered has been used to develop recommendations for the next steps in a Community-Based Social Marketing approach to fostering responsible behaviors that protect Minnesota waters from the introduction and spread of invasive species.

Appendix A – List of Recommendations

Recommendation *- Continue with communications and outreach.*

Recommendation *- Fine-tune communications and outreach.*

Recommendation – *Make a list of prohibited species as accessible as possible.*

Recommendation *- Make information readily available that would help hobbyists avoid prohibited species.*

Recommendation *- Establish a social norm of disposing of unwanted plants in the trash.*

Recommendation *- When developing communications and outreach programs, consider that a wide variety of options are available to hobbyists for acquiring aquatic plants and animals.*

Recommendation *- Outreach materials should stress both the convenience and the effectiveness of disposing of plants in the trash, which is the preferred disposal method for unwanted pond plants.*

Recommendation *- Create a social norm of placing unwanted plants in the trash.*

Recommendation *- Engage trusted messengers on euthanasia, as identified in* Section 8 – Communications.

Recommendation *- Communications should emphasize that many responsible hobbyists take steps to protect their aquariums and ponds from AIS.*

Recommendation *- There should be information available to people who find themselves in the position they may have to end an animal's life rather than let it go in the wild.*

Recommendation *- Equip watercraft inspectors and others who interact with the public on invasive species topics with information regarding ponds and aquariums.*

Recommendation *- Work with retailers to make access to information readily available when people choose what to purchase for their ponds and aquariums.*

Recommendation *- Collaborate with pet stores to help their customers by making the information accessible on a website.*

Recommendation *- Ensure retailers have information on what is invasive and what is not.*

***Recommendation** – Establish a state-wide invasive species prevention training and recognition program.*

***Recommendation** – Establish a pledge gathering program in cooperation with retailers, hobbyist groups, and societies.*

***Recommendation** – Review and modify the existing website to reflect the recommendations in this report.*

Appendix B - Table of Figures