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

Jay Cooke State Park. (Courtesy of the Minnesota DNR via mprnews.org)

Angler Survey Summary Report

August 12, 2019

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 better promote the adoption of desirable aquatic invasive species (AIS) prevention behaviors and create positive social norms around AIS prevention in Minnesota.

Tina Wolbers
Minnesota DNR Project Manager
tina.wolbers@state.mn.us
651-259-5146

Ken Donnelly
Consultant Team Lead
ken@beyondattitude.com
902-223-6123

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.

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 baseline survey was conducted amongst recreational anglers to better understanding the perceptions, behaviors, and motivators of anglers related to aquatic invasive species movement in Minnesota. The survey was delivered online to licensed Minnesota anglers that had email addresses on record.

A link to the survey was distributed via email to approximately 40,000 licensed anglers in Minnesota. A total of 1,965 respondents completed the survey.

Attitudes and Awareness

Awareness and knowledge of the AIS issue are reported to be high and reported attitudes are positive towards managing them. These are all positive indicators that most anglers seem to have the right attitude towards AIS, and the efforts required to manage their spread.

Key findings on attitude and awareness include:

- Anglers are well aware of invasive species and the risks associated with them and are confident in their knowledge;
- Information is readily available and communication efforts have had a good market reach but more people need to become familiar with the necessary actions to stop the spread of AIS; and
- Anglers have the right attitude towards aquatic invasive species and the efforts required to manage their spread, however; there is a gap between having the right attitude and doing the right thing.

Use of Live Bait

Use of live bait for fishing is commonplace in Minnesota. In general, people seem to want to do, and believe they are doing, the right thing; however, appropriate live bait handling behaviors are not being practiced consistently. Almost one-third of anglers report releasing live bait at least some of the time. Live bait is released with good intentions, primarily driven by emotions.

Improper disposal techniques for unused live bait are also being practiced. Respondents report mixed knowledge and practices around proper disposal techniques and for transfer/disposal of bait water. On the positive side, barriers to proper disposal behaviors are not strong. Anglers could benefit from behavioral nudges to encourage the desired behaviors. The strongest motivators to encourage proper disposal of unused live bait is knowing that action can make a difference.

Use of Boats

Use of boats for fishing is very common amongst anglers – uptake of the desired boating behaviors can be improved. While anglers report inspecting and removing visible debris from boats and trailer and proper draining activities frequently, they are not performing other cleaning activities nearly as frequently, either before or after launching or removing their boat.

Barriers to engaging in the right behaviors are not strong, however; access to running water, tools/equipment, and cleaning space is preventing some anglers from engaging in cleaning activities. Access to these things would motivate them.

Communication Preferences

A strong preference was expressed to receive information at physical locations, such as bait shops, boat launches, and piers and access points. An advantage of these locations is that some are at points of key decisions which is conducive for prompting the correct behavior, and others require interaction with someone, providing opportunities for face-to-face interactions. The DNR is the most trusted source of information on invasive species.

Next Steps

Strong attitudes and awareness are a solid foundation for a successful behavior change program because they are often the hardest elements to foster. Still, strong positive attitudes and awareness are not sufficient on their own to drive change. Applying behavioral change strategies can leverage a good foundation to target the desired behaviors, achieving action more consistently and by more people.

Future programs and materials should focus on the social motivators identified to be the most effective in this survey, the literature, and behavioral science in general:

- The injunctive norm that “it’s the right thing to do” (which was identified as the top motivators in this survey), and
- The descriptive norm that everyone else is doing it (which respondents reported is happening most of the time).

The second phase of this project will focus on development of strategies to foster target behaviors, as well as implementation and evaluation of those strategies. The DNR will use the results to promote adoption of desirable AIS prevention behaviors and create positive social norms around aquatic invasive species prevention in Minnesota.

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 purpose of the project is to apply behavioral psychology techniques to address the human behaviors that contribute to the introduction and spread of AIS in Minnesota waters.

The project is being delivered in two phases: the first phase is focused on the identification and prioritization of behaviors to target to most effectively manage AIS in Minnesota and on the identification of the barriers and benefits to one or more of those target behaviors. The second phase will focus on development of strategies to foster target behaviors, and the implementation and evaluation of those strategies. The DNR will use the results to promote adoption of desirable AIS prevention behaviors and create positive social norms around AIS prevention.

1.2. Purpose of the Angler Survey

Anglers have been identified as one of the key audiences to explore given the suite of high priority behaviors identified through initial phases of research that are applicable to anglers. As part of the broader project, a baseline survey was delivered to recreational anglers with fishing licenses in Minnesota to better understand the perceptions, behaviors, and motivators of anglers related to aquatic invasive species movement in Minnesota.

Specifically, the survey research is intended to:

- Build an understanding and establish a baseline of current behaviors related to the use and disposal of live bait, as well as the cleaning and draining of angler equipment (including boats);
- Gauge attitudes and awareness levels related to AIS, their movement, and prevention steps;
- Identify actual and perceived barriers to engaging in desired behaviors (i.e. proper disposal and cleaning practices);

- Gauge willingness or acceptance of modifying behaviors to reduce the spread of invasive species;
- Understand incentives and motivators to foster desired behaviors that reduce the spread of AIS; and
- Understand communication and engagement preferences including both preferred communication channels and trusted messengers.

1.3. Research Method

The voluntary survey was conducted in May and June of 2019. It was offered online and distributed by email to a random sample of approximately 40,000 of the over 168,000 licensed anglers in Minnesota that had email addresses on record. The survey was open to any licensed angler that was 18 or over and that has fished (excluding ice fishing) in Minnesota within the last two years. A total of 1,965 respondents completed the survey from start to finish.

If this was a random sample determined through a random digit telephone dialing system, the survey results would have a confidence interval of +/-2.2% at a confidence level of 95%. In other words, if this survey was administered to a random sample 20 times, 19 of those surveys would have results within plus or minus 2.2% of the responses to this survey. Since it was an online survey, 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 were comfortable taking the survey, the survey avoided sensitive questions that they might not want to answer. In addition, the importance of the survey to anglers was articulated. Participants were also assured that the survey software was protecting anonymity by not collecting any personal data, such as location, that could identify them. To assist in the ability of respondents to accurately recall information, the participants were asked to think about the 2018 calendar year when formulating their responses.

1.4. Purpose of the Summary Report

This report provides a summary of survey responses, including frequency charts, analysis of findings, and highlights of interesting data arising from the analysis. In particular, CBSM-related findings are reported, including barriers, motivators and predictors, level of knowledge and awareness, communication channels, and reported behavior, as a baseline.

2. Attitudes and Awareness

2.1. Overview

While CBSM teaches us that awareness and attitude does not translate into behavior, it is still important that people have a strong awareness of issues and the appropriate attitude about it. For anglers, it is important that they understand the risks presented by AIS and the laws and regulations that apply. They should also believe that it is important that they not take actions that could introduce or spread invasive species, and that they should make efforts to prevent the introduction and spread. The behavioral psychology that is employed through CBSM is much more likely to be effective if anglers have the desired mindset about AIS and are ready to take action.

The survey tested awareness and attitudes by asking respondents about how often they have seen information on AIS, how knowledgeable they were about relevant laws and regulations, and their attitudes to a series of AIS related issues.

2.2. Attitudes and Human Behavior

Concern amongst respondents about AIS is high: 95% report that they agree or strongly agree that AIS are a concern. There is also strong reported agreement that individuals contribute to the spread of AIS (89% agree or strongly agree) and that preventing the spread is the right thing to do (96% agree or strongly agree). While most respondents report that they agree or strongly agree (95%) that individuals have a role to play in preventing the spread, fewer (80%) reported that they know people that are helping to prevent the spread of AIS.

Table 1: Q5. How strongly do you agree with each of the following statements?

	1 Strongly Disagree	2 Disagree	3 Neither Disagree or Agree	4 Agree	5 Strongly Agree	Weighted Average
I am concerned about aquatic invasive species in Minnesota	2%	1%	3%	28%	67%	4.57
Individuals are contributing to the spread of aquatic invasive species	2%	2%	8%	39%	50%	4.35

	1 Strongly Disagree	2 Disagree	3 Neither Disagree or Agree	4 Agree	5 Strongly Agree	Weighted Average
Individuals have a role to play in preventing the spread of aquatic invasive species	1%	1%	3%	28%	67%	4.60
People I know are helping to prevent the spread of aquatic invasive species	2%	3%	15%	40%	39%	4.13
Preventing the spread of aquatic invasive species is the right thing to do	1%	0%	2%	18%	76%	4.70

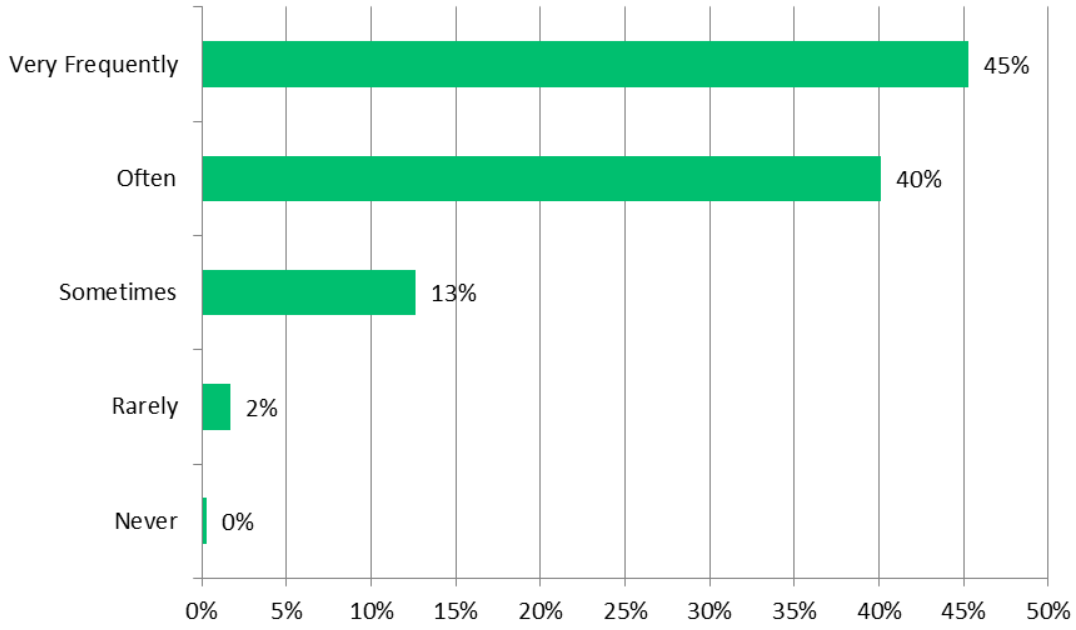
Asking people about others they know doing something perceived as negative is often used as a proxy for sensitive questions, such as if they themselves are doing that negative thing. In this case, comparing the 80% of respondents that report knowing others that are contributing to the spread of AIS to the 96% that think preventing AIS is the right thing to do, is a good indication that there is a gap between having the right attitude and doing the right thing.

Another interesting observation is that people that are confident about their knowledge of the statement would choose strongly agree. Few people choose strongly agree for "individuals contribute" and "people I know". This may indicate they take less ownership of it even though they tend to think it is the right thing to do.

2.3. Awareness

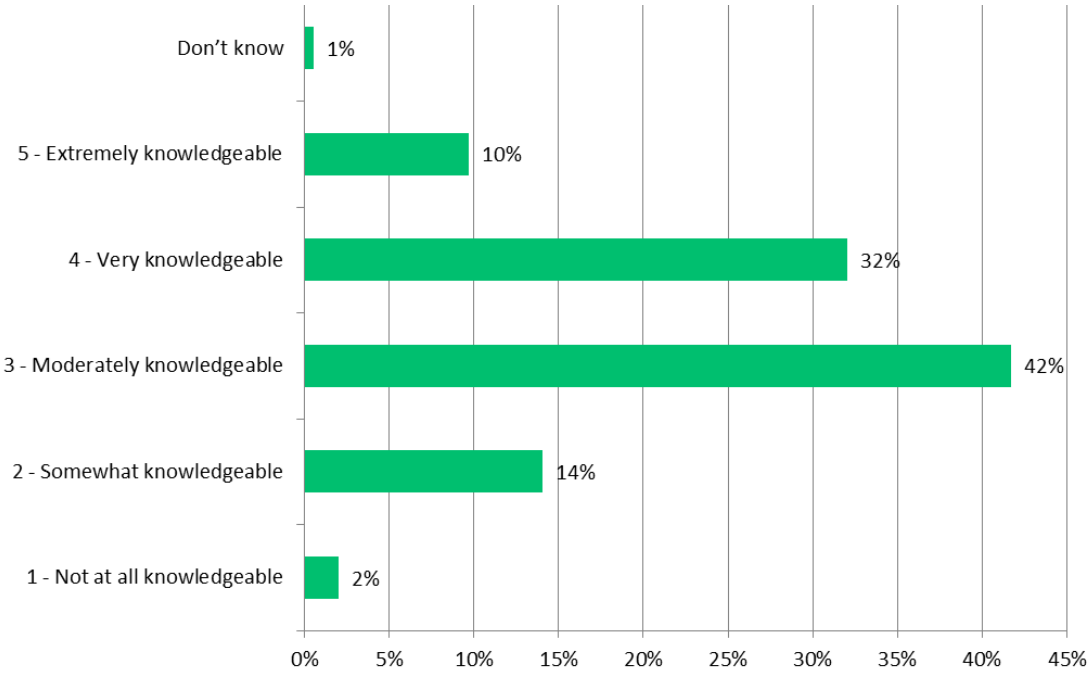
Most respondents report being very aware of AIS; 45% hear, see, or read information about AIS very frequently and 40% do so often. Only 2% of respondents have never or rarely heard of AIS (39 out of 1965 respondents).

Figure 1: Q4. Prior to taking this survey, how often have you heard, seen, or read information about aquatic invasive species?



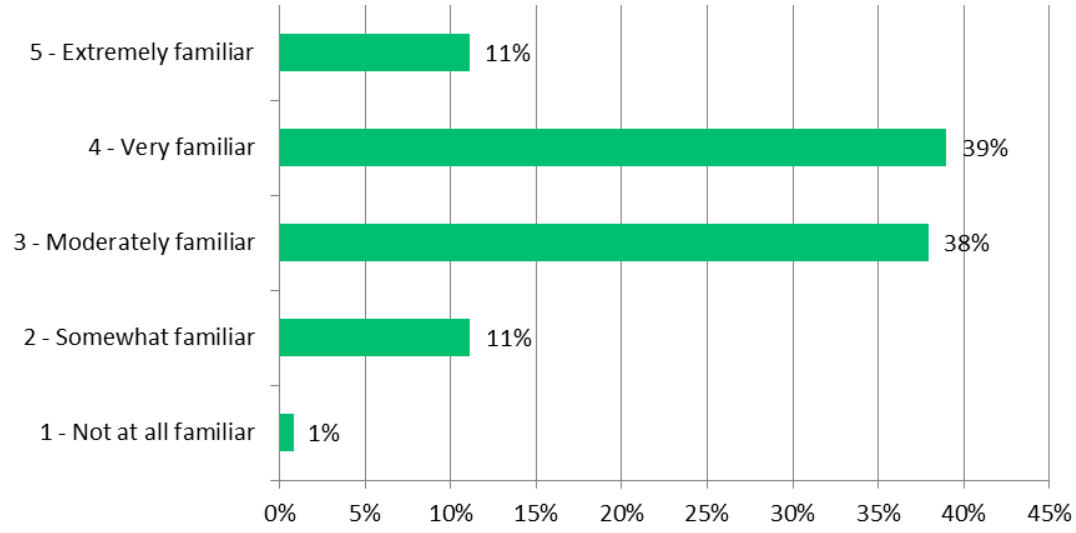
Respondents report a high level of knowledge of the laws and regulations related to aquatic invasive species. The majority of respondents (42%) identify as moderately knowledgeable while another 42% identify as extremely knowledgeable or very knowledgeable. Only 2% identify as not knowledgeable at all.

Figure 2: Q6. How knowledgeable are you about the laws and regulations?



Similar to knowledge levels related to laws and regulations, respondents report being very knowledgeable about the actions that individuals can take to prevent the spread of aquatic invasive species. Half (50%) identify as being extremely familiar or very familiar with the actions and 38% identify as being moderately familiar. Only less than 1% identify as not at all familiar.

Figure 3: Q8. How familiar are you with actions you can take to prevent the spread of aquatic invasive species?



The finding that anglers report being highly aware of AIS may indicate that information is readily available and communication efforts have had a good market reach. There may be some inflating of awareness and knowledge due to self-reporting biases. Also, the other 50% that indicate they are moderately familiar or less, demonstrates that there is room for improvement.

To further explore reported knowledge levels on activities that can contribute to the spread of aquatic invasive species, respondents completed a knowledge testing quiz. Respondents were provided with a list of eight activities and asked to identify which ones contributed to the spread of AIS. In the table below, behaviors shaded green contribute to the spread of AIS while orange do not.

The highest correct responses are associated with the movement of boats from one body of water to another (96% correct) and the movement of docks, boat lifts, and other equipment from one body of water to another (91% correct). Of note in relation to anglers, only 45% of respondents indicated that using fishing gear and equipment in more than one body of water could contribute to the spread of invasive species. Similarly, pets and other animals swimming in waters with aquatic invasive species, score low (24% selected) as a perceived contributor to invasive species.

Table 2: Q7. Which of the following activities do you think contribute to the spread of aquatic invasive species?

Answer Choice	Correct Answer	Responses
Moving boats from one body of water to another	True	96%
Moving docks, boat lifts, or other equipment from one body of water to another	True	91%
Releasing unwanted aquarium fish into lakes or rivers	True	74%
Releasing unused live bait when fishing	True	72%
Using fishing gear and equipment (e.g. tackle, waders, etc.) in more than one body of water	True	45%
Pets and other animals swimming in waters that contain aquatic invasive species	False	24%
Keeping a boat in the water when not in use	False	22%

Answer Choice	Correct Answer	Responses
People swimming in waters that contain invasive species	False	8%

The knowledge test shows that there is a gap between peoples' perceived expertise and application of knowledge. This may be related to how heavily specific behaviors have been promoted. Ideally, 100% of respondents would select the green choices and 0% would select the orange responses. Since that did not happen, there is room for improvement on communicating how invasive species spread.

Interestingly for angler audience are the knowledge levels related to angler activities. Releasing live bait is understood to be a problem by 72% of anglers, while only 45% understand that using fishing gear and equipment in more than one body of water can spread invasive species.

2.4. Awareness and Attitude Findings

A strong majority of anglers report high awareness and attitude levels, a strong foundation for a behavior change program. However, there is room for improvement on awareness of the actions that can be taken to stop the spread of invasive species, with 50% of respondents indicating that they are only moderately or somewhat familiar with what they can do. There is also room for improvement on knowing the legal implications of not following best practices related to AIS.

The findings in this section based on the answers of the respondents indicate that:

1. Anglers are well aware of invasive species and the risks associated with them and are confident in their knowledge.
2. Information is readily available and communication efforts have had a good market reach, but more people need to become familiar with the necessary actions to stop the spread of AIS.
3. Anglers have the right attitude towards aquatic invasive species and the efforts required to manage their spread, however; there is a gap between having the right attitude and doing the right thing.

3. Live Bait

3.1. Overview

Research shows that substantial pathways for the spread of aquatic invasive species through angling activities are the release of live bait, bait water release, contaminated bait, and packaging. The survey sought to understand the current practices related to the use of live bait for fishing, including what type of live bait anglers use, where they get it, and what they do with it.

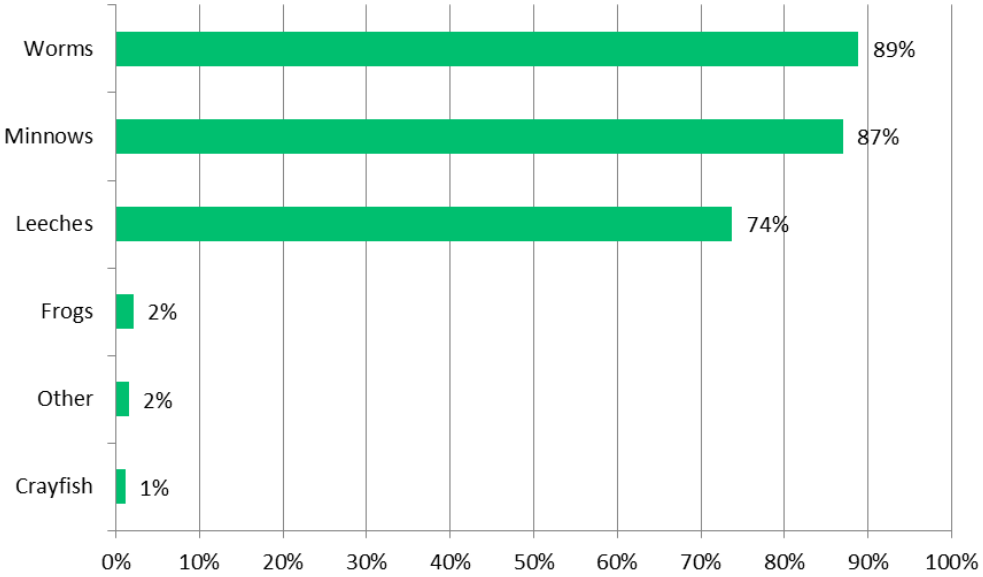
3.2. Use of Live Bait

Use of live bait for fishing is common place in Minnesota. The vast majority (92%) of respondents indicate that they use live bait for fishing. The common types of live bait used are minnows, worms, and leeches. Crayfish and frogs were reported to be used by a very small segment of the respondents. Use of waxworms was also commonly identified in the "other" category, although by less than 1% of respondents that use live bait.

Table 3: Q9. Do you ever fish with live bait (e.g. worms, minnows, etc.)?

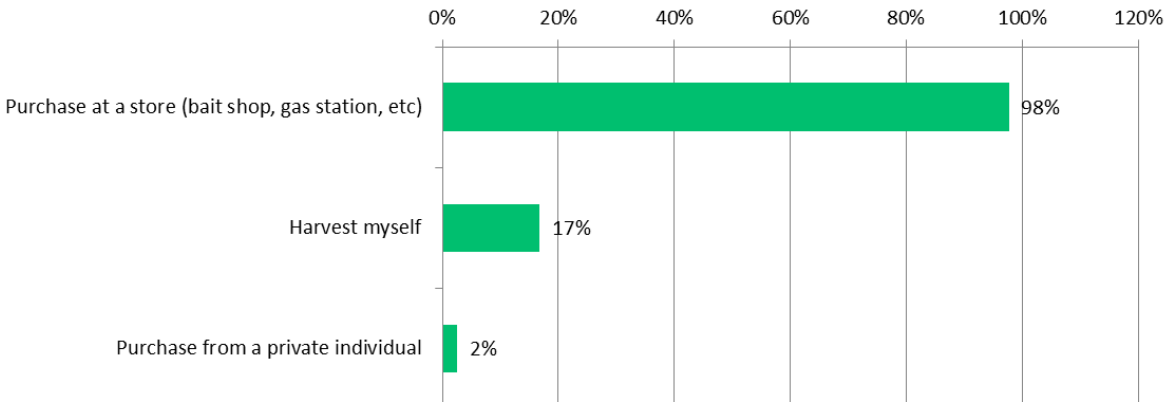
Answer Choices	Responses
Yes	92%
No	8%

Figure 4: Q10. What of these live baits do you typically use?



Of those anglers that use live bait, almost all (98%) indicate that they purchase live bait at a store, such as a bait shop or gas station. Two respondents note that they get their bait from the resort at which they stay. The second most popular method of acquiring live bait is by harvesting it themselves, which is done by 17% of respondents. Just over 2% of respondents indicate that they get live bait from someone else. Two respondents note they order live bait online.

Figure 5: Q11. Where do you typically get your live bait?



Given that almost all respondents report that they purchase bait indicates that they cannot confidently know from where the bait originated. In addition, respondents may assume that live bait purchased from a retailer would not include aquatic invasive species (which may account for over one quarter of respondents not knowing that releasing live bait into waters can lead to the spread of aquatic invasive species in Question 7).

Respondents were asked about how they dispose of any leftover live bait that does not get used while they are fishing. Responses are summarized in the chart below and discussed in the subsequent sections.

Table 4: Q12. If you have any unused live bait left over at the end of the day, what do you do with it?

Answer Choices	1 Never	2 Rarely	3 Sometimes	4 Often	5 Always	N/A
I dispose of it in the garbage	24%	14%	28%	21%	12%	2%
I dispose of it on land	22%	13%	27%	22%	16%	1%
I release it into the water	69%	16%	10%	4%	1%	1%
I give it to someone else	22%	21%	40%	14%	2%	1%
I take it home to use next time	19%	11%	31%	29%	8%	1%

3.3. Release of Live Bait

While over two-thirds of respondents (69%) report never releasing live bait into the water, almost one-third report doing so: 5% of respondents report always or often releasing their live bait and 26% sometimes or rarely releasing their live bait. This creates a risk because even releasing live bait once could contribute to the spread of aquatic invasive species. It is also plausible that people underreport behaviors that they either already know are illegal or that they have learned are not the right thing to do through the process of completing the survey.

Table 5: Q15. Have you ever released any live bait into a lake or river at any point during a fishing trip?

Answer Choices	Responses
Yes	36%
No	60%
Don't know	4%

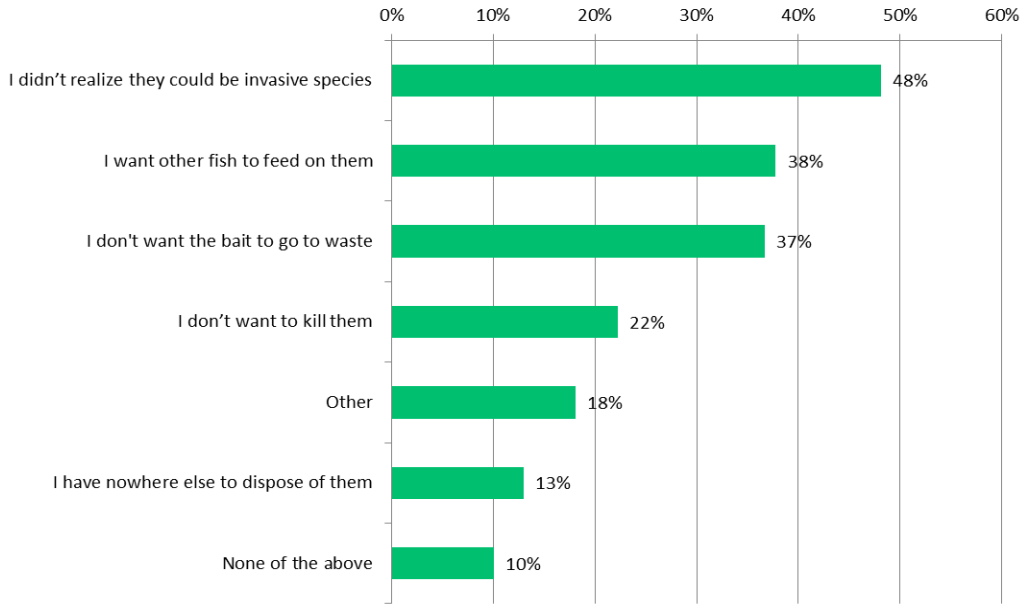
Of the one-third of respondents (36%) that indicate they have released live bait into a lake or river during a fishing trip, the main reasons reported for doing so are not realizing they could

be invasive species (48%), wanting other fish to feed on them (38%), not wanting the bait to go to waste (37%), and not wanting to kill them (22%). Just over 18% of respondents indicate that they have released live bait for other reasons, which include the following common themes:

- Former practice before knowing about aquatic invasive species;
- Accidental spilling of bait buckets/containers or loss off of hook;
- Released in same body of water that the bait originated;
- Skepticism of the risks and need for regulations; and
- Confidence that the bait being used is not invasive.

The barriers identified indicate good intentions – in general, people seem to want to do, and believe they are doing, the right thing. Also, importantly, much of the reasoning for releasing live bait is emotionally driven – people are thinking about the bait, other fish, and not wasting. This could be leveraged to encourage reducing risk to all fish and the ecosystem through proper techniques.

Figure 6: Q16. Are there any particular reasons that you choose to release unused live bait?



3.4. Taking Unused Bait Home

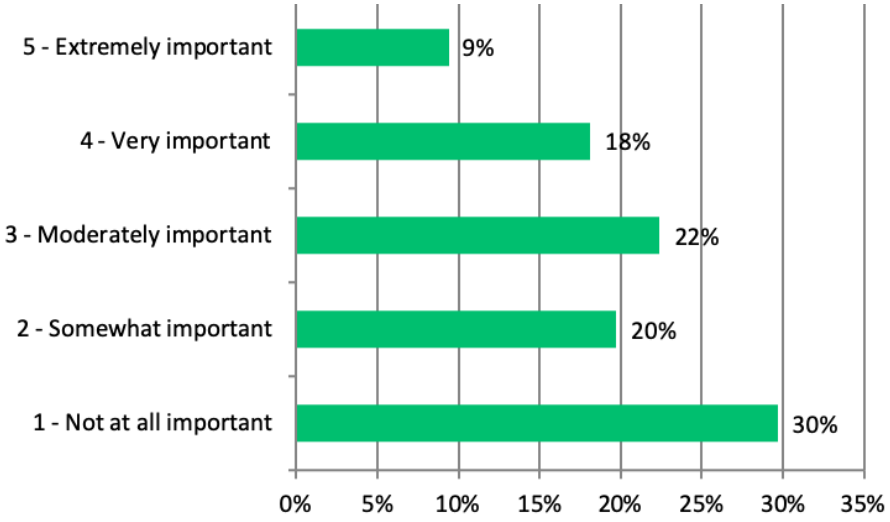
Referring back to Q12, more than two-thirds of respondents (69%) report that they take unused live bait home with them for future use at least sometimes. When probed about awareness on how live bait should be taken home in Q13 – draining the container on the ground at the lake access and refilling it with bottled or tap water – only 58% are aware of the

proper practice. About 28% of respondents feel strongly that it is important to be able to bring unused live bait home to use again, while 50% feel that it is not important (Q14).

Table 6: Q13. Are you aware that you may take live bait home to use on another fishing trip, as long as you drain the container on the ground at the lake access and refill it with bottled or tap water?

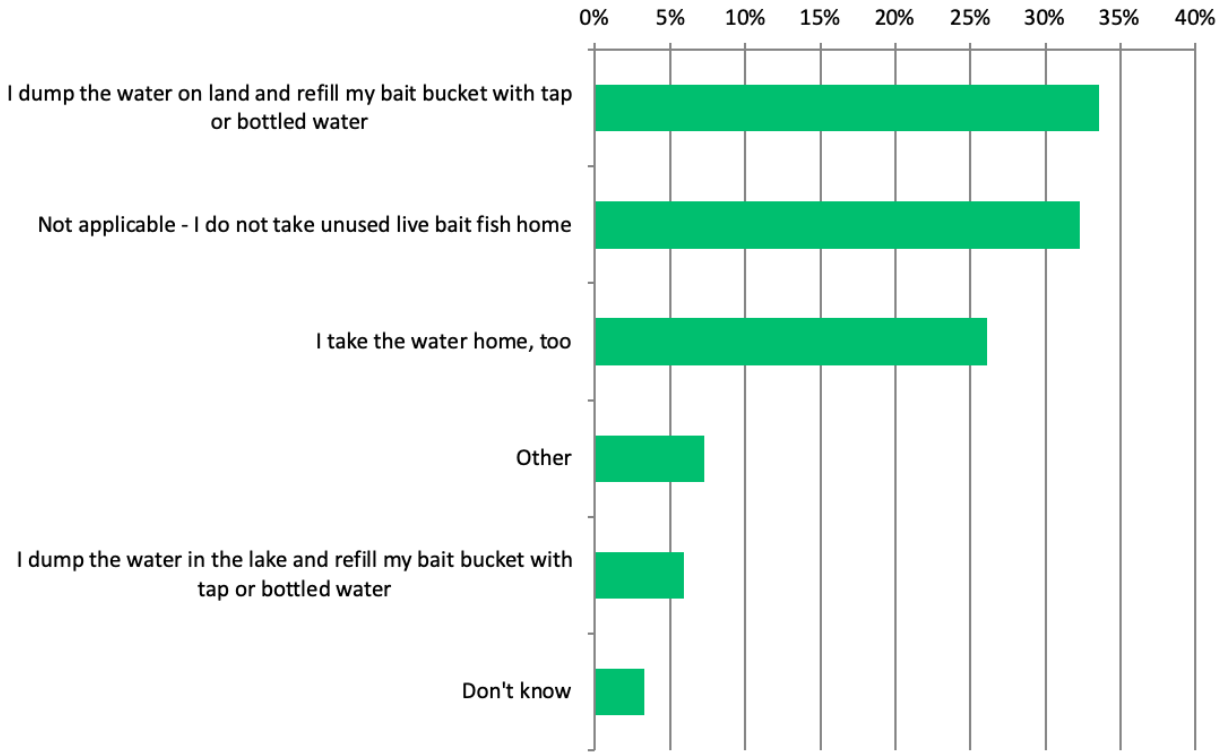
Answer Choices	Responses
Yes	58%
No	32%
Don't know	9%

Figure 7: Q14. How important is it to you that you can take live bait home to use on another fishing trip?



For those respondents that take unused bait home with them, 34% report that they dump the water on land and refill their bait bucket with tap or bottled water, 26% report that they take the water home as well (Q17). Six percent report that they dump the water in the lake and refill their bait bucket with tap or bottled water – this defeats the purpose and represents a misinterpretation of the appropriate practice. Other responses provided by respondents primarily relate to closed water systems where the water is taken home and no water being involved for worms.

Figure 8: Q17. If you take unused live bait home with you, what do you do with the water in the bait container?



3.5. Other Bait Disposal Methods

Referring back to Q12, respondents' stated frequency of disposal through other means, such as disposing in the garbage or on land, is fairly equally distributed between never doing it to always doing it. Taking home unused bait to bury in gardens was noted by several respondents in the other comments. Giving extra live bait to someone else if it is not being used is an occasional practice that respondents state only happens sometimes (41% of respondents). Only 16% of respondents report doing this always or often, while 44% report never or rarely giving live bait to someone else.

3.6. Barriers and Motivators to Proper Disposal of Unused Live Bait

Respondents report being very willing to drain water on land (away from the body of water) before leaving (83% very or extremely willing) and to dispose of unused live bait and packaging in the garbage if available on-site (76% very or extremely willing) (Q18). Respondents report being less willing to take unused live bait and packaging home to place in the garbage. Only about 55% of respondents report being very or extremely willing to do this, about 20% report being not willing, and 24% report being somewhat willing.

Table 7: Q18. If you have unused and unwanted live bait left over at the end of the day, please indicate on a scale of 1 to 5 how willing you are to take each of the following actions.

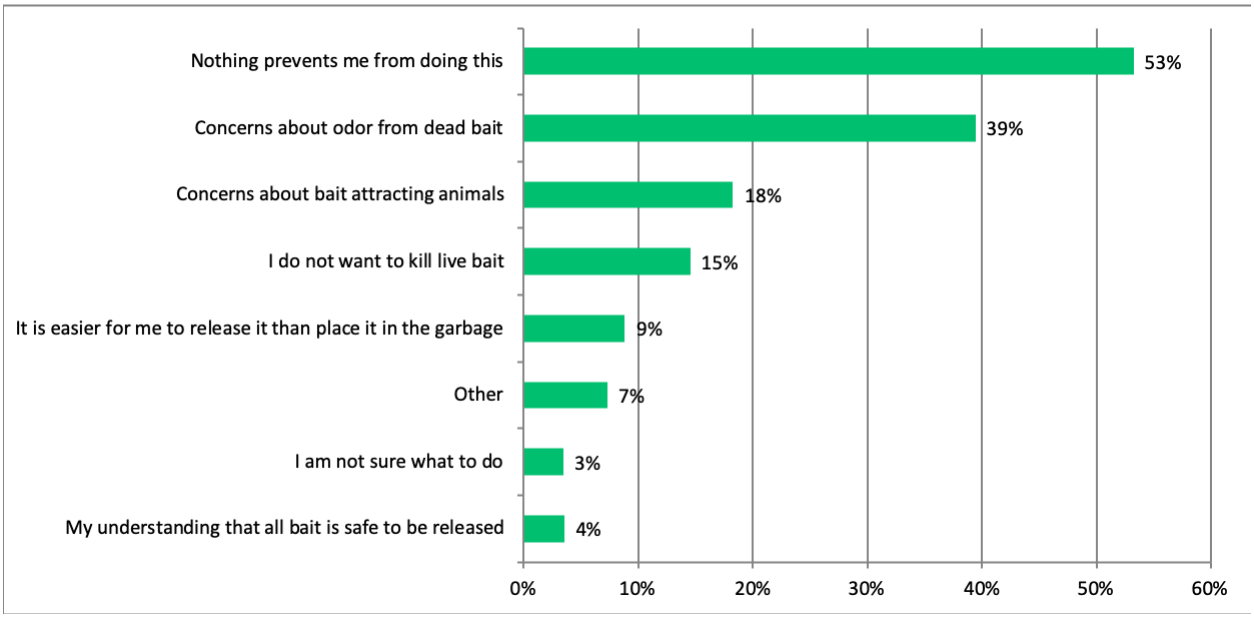
Answer Choices	1 Not at all willing	2 Hardly willing	3 Somewhat willing	4 Very willing	5 Extremely willing	N/A
Dispose of unused live bait and packaging in the garbage (if available on-site)	3%	5%	16%	39%	36%	1%
Take unused live bait and packaging home to place in the garbage	9%	12%	23%	31%	23%	2%
If the bait container has water in it, drain bait bucket water on land (away from the body of water) before leaving	2%	3%	12%	41%	40%	3%

More than half of the respondents (53%) indicate that nothing prevents them from taking unused bait home for disposal (Q19). Having unclear reasons for not doing something indicates that barriers are not strong and that respondents could benefit from a behavioral nudge to encourage the desired behavior.

The top concerns expressed about taking unused bait home for disposal relate to odor (39%), attracting animals (18%), not wanting to kill live bait (15%), and it being easier to release live bait (9%). Additional barriers identified in the "other" category, include:

- Not seeing a clear reason to do so;
- People dispose of bait when leaving the water or on the way home;
- Long travel time home makes it impractical; and
- Some save bait for future use.

Figure 9: Q19. What, if anything, would prevent you from taking unused live bait and packaging home and placing it in the garbage?



The strongest motivators to encourage proper disposal of unused live bait is knowing that action can make a difference (Q20). This is not surprising given the positive attitudes noted in previous questions. Almost 71% of respondents report that they would be motivated by knowing that they are helping to stop the spread of invasive species and 61% by knowing that they are making a positive impact on their community and the environment. Respondents also report being motivated by knowing that it is illegal to release live bait in Minnesota (54%) and knowing that they could receive a fine (39%). This is also consistent with self-reported high knowledge levels related to the regulations (note: the survey does not test actual knowledge of regulations); the identification of knowledge-based motivators indicates that there is room for improvement.

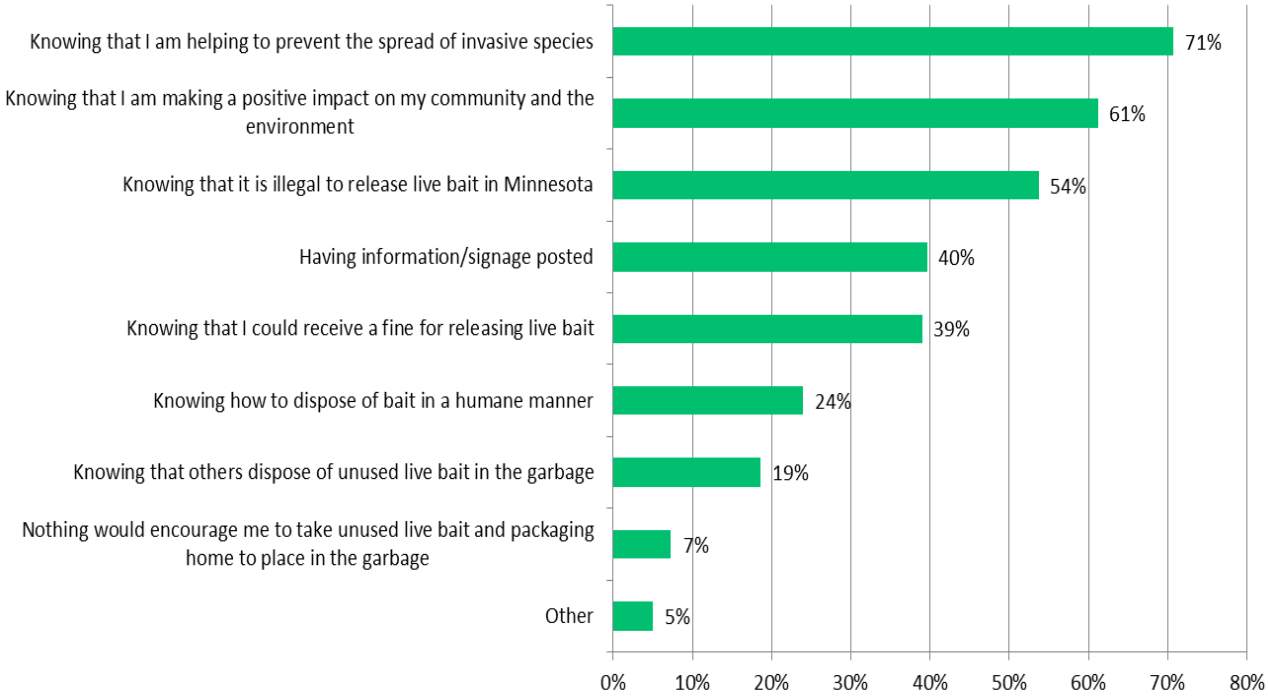
Knowledge and information on what to do is also reported as an important motivator for proper disposal practices, such as: having information/signage posted was identified by 40% of respondents and knowing how to dispose of bait in a humane manner was identified by 24%. It is an interesting finding that knowledge on proper disposal practices are not the strongest reported motivators but there is a need, evidenced by the results of the testing quiz. This does, however, reflect anglers' perceptions of being highly knowledgeable about AIS.

It is clear through respondents' other comments that strictly asking anglers to take unused live bait home with them for disposal in the garbage is problematic. Some confusion is expressed about the need to put it in the garbage versus burying it in the garden, composting, or saving for reuse. There is a clear preference expressed throughout respondent comments

to dispose of unused live bait on-site if garbage or other facilities are present rather than taking it home. This is validated in Q18 through respondent preferences for disposal of unused bait and packaging, where garbage containers on-site are supported by 83% of respondents, followed by at-home garbage supported by 25%.

The responses indicate that one proper disposal technique should not be narrowly defined – options should be encouraged so that people can select what works best for them. Respondents appear to want clear rule and guidelines and want to do the right thing.

Figure 10: Q20. What would encourage you to take unused live bait and packaging home to place in the garbage? Please select all that apply.



3.7. Live Bait Findings

Use of live bait for fishing is commonplace in Minnesota. Three problems emerge from the research:

1. Appropriate live bait handling behaviors are not being practiced consistently. Almost one-third of anglers report releasing live bait at least some of the time.
2. Improper disposal techniques are being practiced. Respondents report mixed knowledge and practices around proper disposal techniques and for transfer/disposal of bait water.

3. Anglers report that their bait is not an AIS risk because they know where it comes from, however almost all respondents purchase their bait from retailers and cannot confidently know where the bait originated.

The findings in this section indicate that:

- In general, people seem to want to do, and believe they are doing, the right thing. Live bait is released with good intentions, primarily being driven by emotions.
- Barriers to proper disposal behaviors are not strong. Anglers could benefit from behavioral nudges to encourage the desired behaviors.
- The strongest motivators to encourage proper disposal of unused live bait is knowing that action can make a difference.
- Anglers perceive themselves to be very knowledgeable about AIS and are not motivated by knowing more, but there is a gap between perceived knowledge and actual knowledge.
- One proper disposal technique should not be narrowly defined. The majority of respondents prefer to dispose of unused live bait on-site but about 28% feel strongly that it is important to be able to bring unused live bait home to use again. Options should be clearly defined so that people can select what works best for them.
- Respondents want clear rules and guidelines and want to do the right thing.

4. Use of Boats

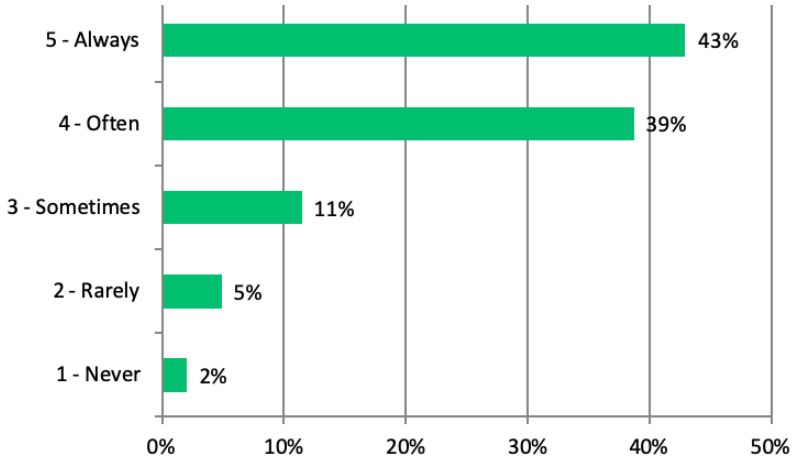
4.1. Overview

Numerous research studies indicate that recreational boating is a major pathway for the spread of AIS. This pathway can generally be categorized into overland transport and movement on water. Within this pathway, there are a number of sub-paths including: hull fouling, bilge water, livewells, trailers, and other standing water.

4.2. Use of Boats While Fishing

Most respondents (82%) report using a boat always or often while fishing and only 2% report never using a boat. The finding that most anglers are also boaters confirms that cross-promotion of information and behavioral approaches can reasonably be applied.

Figure 11: Q22. On a scale of 1 to 5, how often do you use a boat when you are fishing?



From Q23, about three-quarters of respondents (73%) indicate they own a boat and 25% rent. Almost 6% of respondents selected the "other" category and primarily indicated they either fished with family or friends or borrowed their boats. This could present some challenges of ownership over the boater related behaviors.

4.3. Current Practices

In Q24, anglers that use boats indicate that they typically inspect the boat and trailer and remove visual debris before leaving a boat launch (96% always or often), but do not conduct other cleaning activities nearly as frequently. For instance, washing boats and trailers with high pressure ***before leaving a boat launch*** is reported to be done regularly by 15% of respondents and never or rarely by 66%. Similarly, rinsing the boat and trailer with cold water is reported to be done regularly by 21% and washing with hot water by 6% of respondents.

Table 8: Q24. Please indicate how often, on a scale of 1 to 5, you do each of the following before leaving a boat launch.

Answer Choices	1 Never	2 Rarely	3 Sometimes	4 Often	5 Always	N/A
I inspect the boat and trailer and remove any visible debris	1%	1%	2%	7%	78%	12%
I wash the boat and trailer with high pressure	39%	17%	16%	7%	6%	16%
I rinse the boat and trailer with cold water	32%	17%	17%	8%	10%	17%
I rinse the boat and trailer with hot water	51%	17%	9%	3%	3%	18%

Answer Choices	1 Never	2 Rarely	3 Sometimes	4 Often	5 Always	N/A
I drain the live well	1%	0%	1%	3%	69%	26%
I remove the drain plug	2%	1%	1%	2%	80%	15%
I drain the bilge	2%	1%	2%	4%	69%	22%
I tip and drain the motor	3%	2%	3%	8%	68%	16%

Q25 shows comparable results for washing behaviors that are reported to occur ***after leaving a boat launch but before launching the boat again****, such as*: washing with high pressure is reported to be done regularly by 18% of respondents, rinsing with cold water done regularly by 27%, and washing with hot water regularly by 7%. The table below provides a summary of the main washing behaviors that are not done frequently, both before and after leaving boat launches. People report ***not*** doing these behaviors more often than not. The survey only addressed whether or not the washing behaviors were reported to occur, it did not address whether or not washing was necessary. Sometimes cleaning and draining actions are sufficient to remove AIS and in those cases, washing behaviors are a recommended precaution. The barriers and motivations are explored in the next section.

Table 9: Summary of Q24. How often do you do each of the following before leaving a boat launch?

Answer Choices	Never/Rarely	Always/Often
Wash boat/trailer with high pressure	66%	15%
Rinse boat/trailer with cold water	59%	21%
Rinse boat/trailer with hot water	83%	6%

Table 10: Q25. How often do you do each of the following after leaving a boat launch but before launching the boat again?

Answer Choices	Never/Rarely	Always/Often
Wash boat/trailer with high pressure	61%	18%
Rinse boat/trailer with cold water	50%	27%
Rinse boat/trailer with hot water	80%	7%

Respondents report very frequently engaging in draining activities before leaving a boat launch. Almost all report that they drain live wells (97%), remove drain plugs (96%), and drain

bilges (94%) always or often. Only very small percentages of respondents report that they do not do these things.

Air drying boats and trailers for at least 5 days before using again is reported to be done always or often by 71% of respondents and never or rarely by 11%.

4.4. Barriers and Motivators

Almost half of respondents (49%) report that nothing would prevent them from cleaning and draining their boat and trailer when leaving a lake or river. Similar to bait disposal barriers, most anglers do not report facing strong barriers to cleaning and draining their boats.

The most common reported barriers to cleaning and draining boats and trailers are structural:

- Not having the equipment/tools needed (27%),
- Too much boat traffic at launches (25%), and
- Not enough space at launches (22%).

Sixteen percent of respondents selected the "other" category to provide reasoning for not cleaning and draining boats between uses. The main comments indicated that their boats:

- Stay in the water or on a lift and are not trailered,
- Are only ever used on one body of water, and
- Are not owned by the respondents.

The additional main barrier identified is the lack of access to running water at launches to facilitate cleaning of boats.

Notable reported motivators to cleaning and draining boats and trailers when leaving a lake or river relate to equipment, such as:

- Having access to running water (63%),
- Having staffed decontamination units (hot water, high pressure) available (52%), and
- Having cleaning tools (sponges, towels, brushes, grabbers) available (44%).

Other major motivators are internal to the individual, such as knowing that:

- They are helping prevent the spread of invasive species (60%),
- They are making a positive impact on the community and environment (50%),
- It is illegal to transport aquatic invasive species (38%),
- It is good maintenance practice for the boat (36%), and
- They could receive a fine (34%).

Figure 12: Q26. What would prevent you from cleaning and draining your boat and trailer when leaving a lake or river?

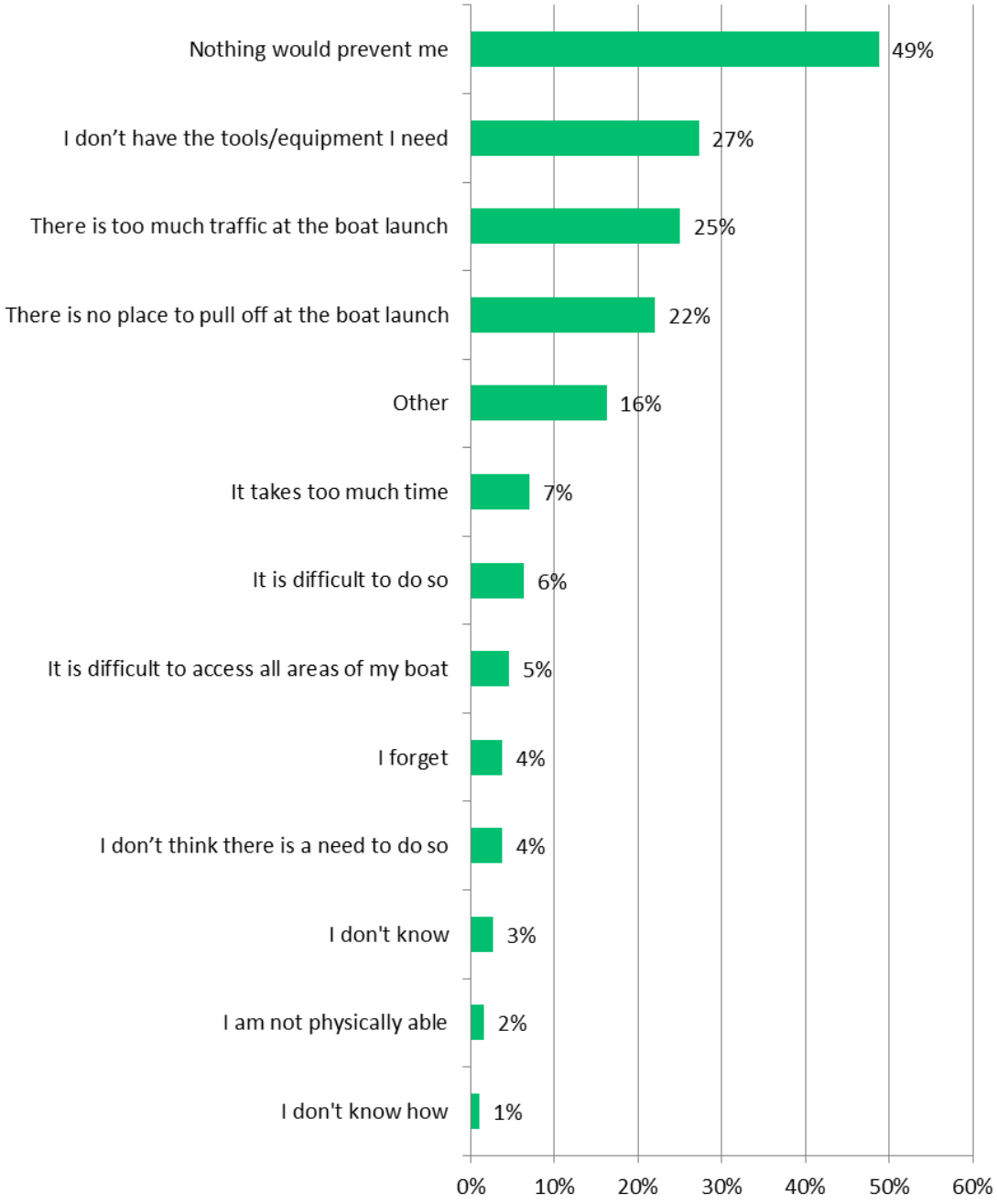
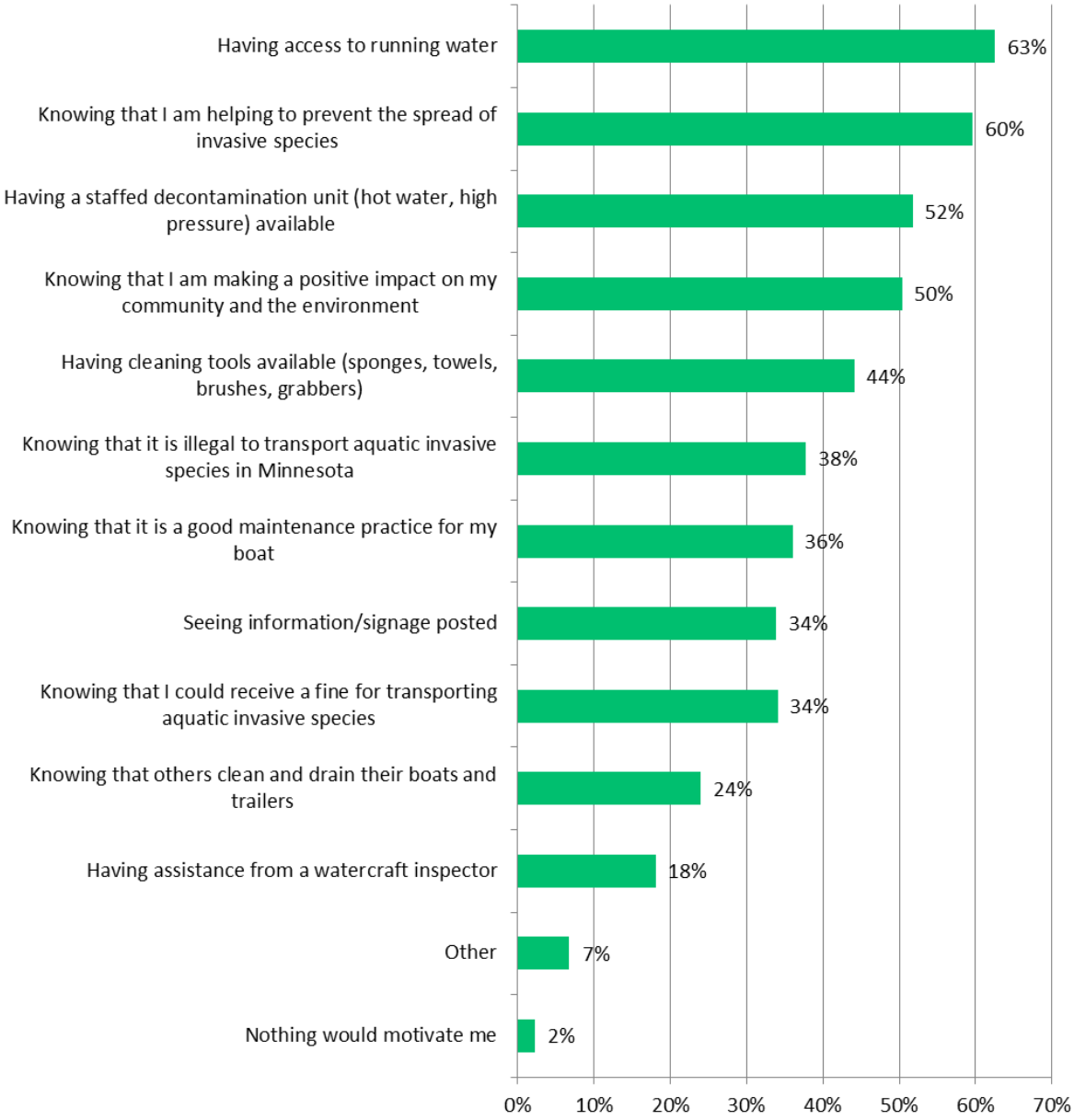


Figure 13: Q27. What would motivate you to clean and drain your boat and trailer when leaving a lake or river?



4.5. Boat Findings

Use of boats for fishing is very common amongst anglers, which offers an opportunity to target boating behaviors amongst anglers as well.

The findings in this section based on the answers of the respondents indicate that:

- Uptake of the desired boating behaviors can be improved. While anglers report inspecting and removing visible debris from boats and trailer and proper draining activities very frequently, they are not doing other cleaning activities nearly as frequently, either before or after launching or removing their boat.
- Anglers are motivated by doing the right thing. Information and behavioral nudges could be effective to encourage anglers.
- Barriers to engaging in the right behaviors are not strong, however access to running water, tools/equipment, and cleaning space is preventing some anglers from engaging in cleaning activities. Access to these things would motivate them.

5. Sources of Information

Respondents were asked questions that were designed to determine:

- Their current and past sources of information;
- How they would prefer to receive information; and
- Who they trust for information.

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

Finally, we asked which organizations respondents trust most as sources for information.

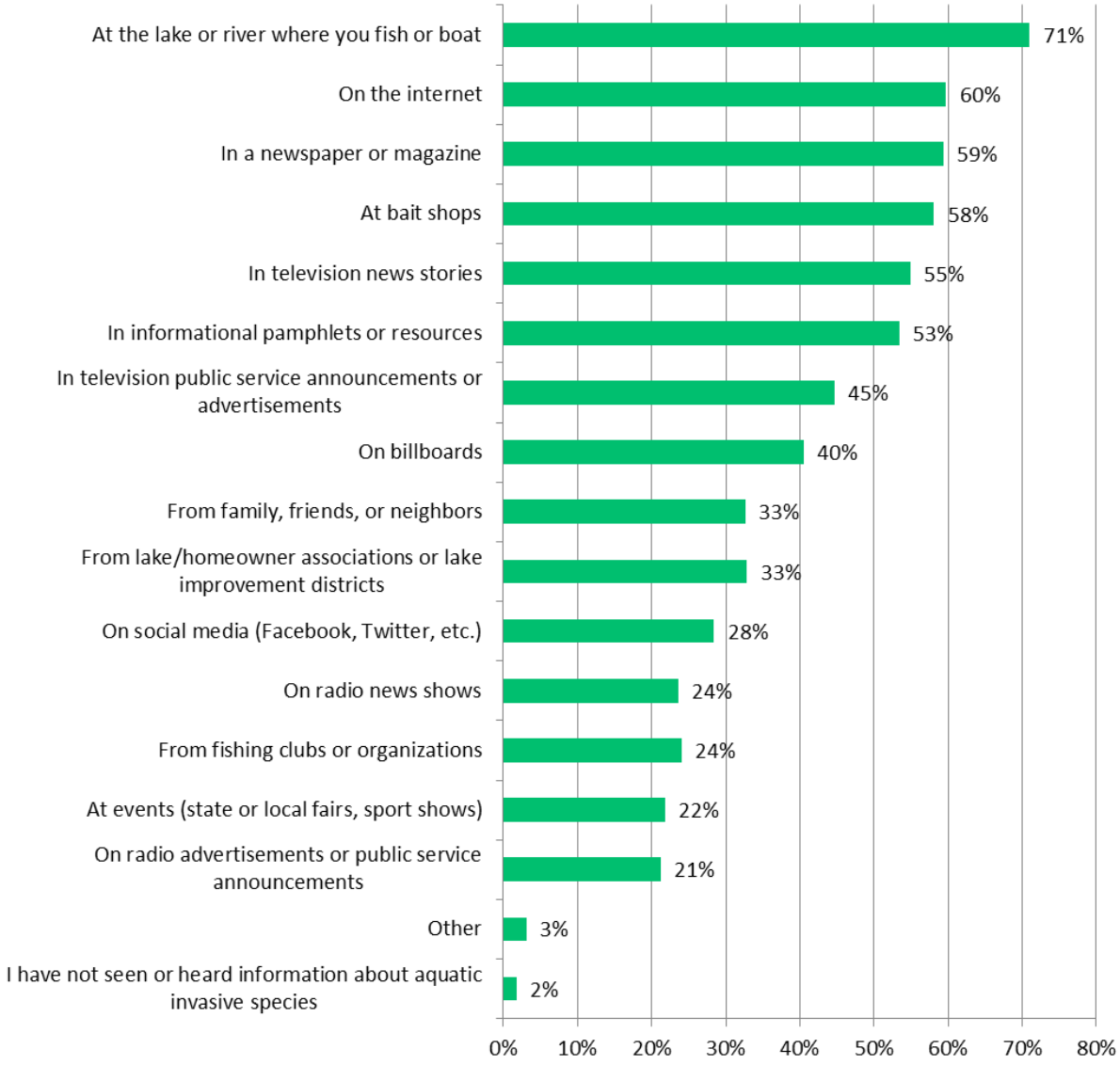
With this information, communications efforts can be designed to be most effective for the target audience, using trusted sources of information delivered through preferred communications channels.

5.1. Current Sources of Information

The majority of respondents (71%) report that they have heard or seen information about aquatic invasive species over the last year at the lake or river at which they fish or boat (Q28). Other reported top sources of information include:

- The internet (60%),
- Newspapers/magazines (59%),
- Bait shops (59%),
- Television news stories (55%),
- Informational pamphlets/resources (53%), and
- Traditional advertising, including television public service announcements or advertisements (45%), and billboards (40%).

Figure 14: Q28. Over the past year, where have you seen or heard information about aquatic invasive species? Please select all that apply.



5.2. Communication Preferences

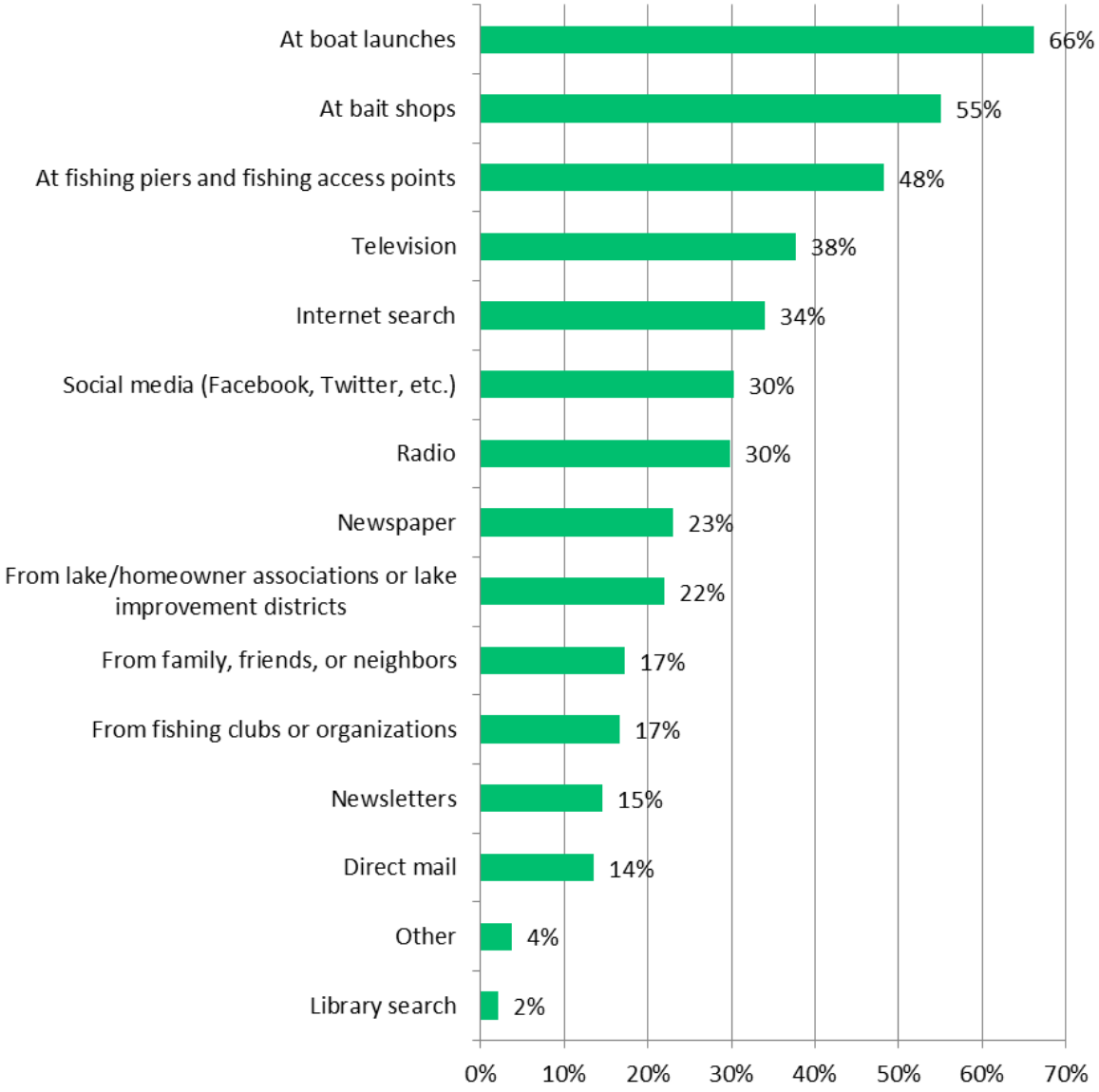
No one communication preference stood out as the dominant choice. Respondents reported that they prefer to receive information at physical locations, such as at boat launches (66%), bait shops (55%), and fishing piers and access points (48%) (Q29). This is encouraging from a behavioral perspective because it places the information as close to the decision point as possible.

These are followed by preferences for traditional communication channels, such as:

- Television (38%),
- Internet (34%),
- Social media (30%),
- Radio (30%), and
- Newspaper (23%).

Amongst the 4% of respondents that provided comments in the "other" category, email communication was the dominant response.

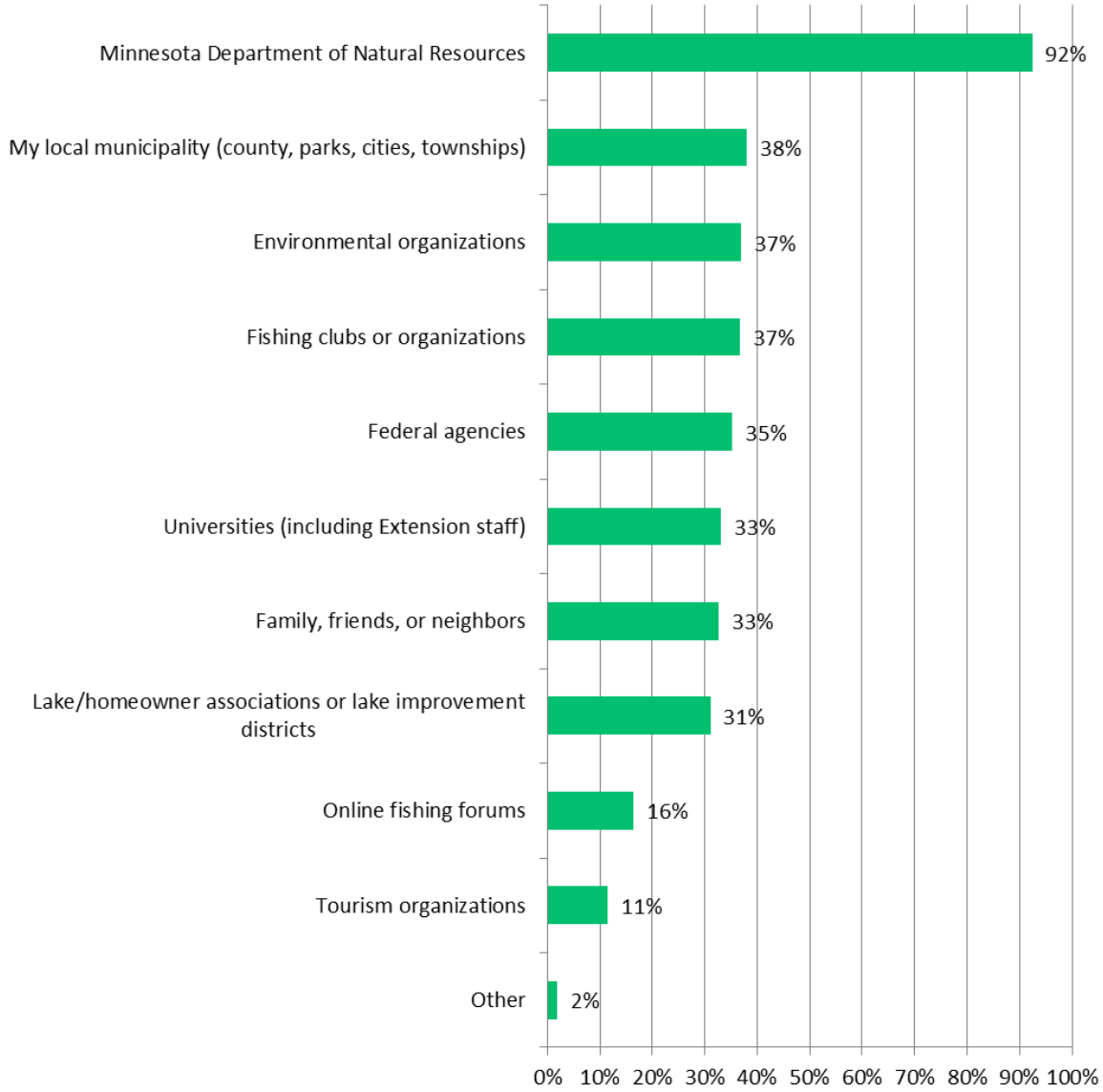
Figure 15: Q29. How do you prefer to receive information? Please select all that apply.



The most trusted source of information reported about fishing, natural areas, water, and invasive species is by far the Minnesota Department of Natural Resources as selected by 92% of respondents (Q30). Secondary reported trusted sources included,

- Local municipalities (38%),
- Environmental organizations (37%),
- Fishing clubs and organizations (37%),
- Federal agencies (35%), and
- Universities, including extension staff (33%).

Figure 16: Q30. Who do you trust for information about fishing, natural areas, water, and invasive species?



5.3. Communication Findings

The findings on current sources of information, along with the high reported awareness levels, indicate that current communication channels are effective at reaching the audience. There are several communications channels that people prefer and trust. In particular, anglers trust the Minnesota DNR, local municipalities, and local clubs/organizations. A collaborative effort with consistent information from the trusted sources delivered through the preferred channels would be the best approach to reaching people and providing the information they need.

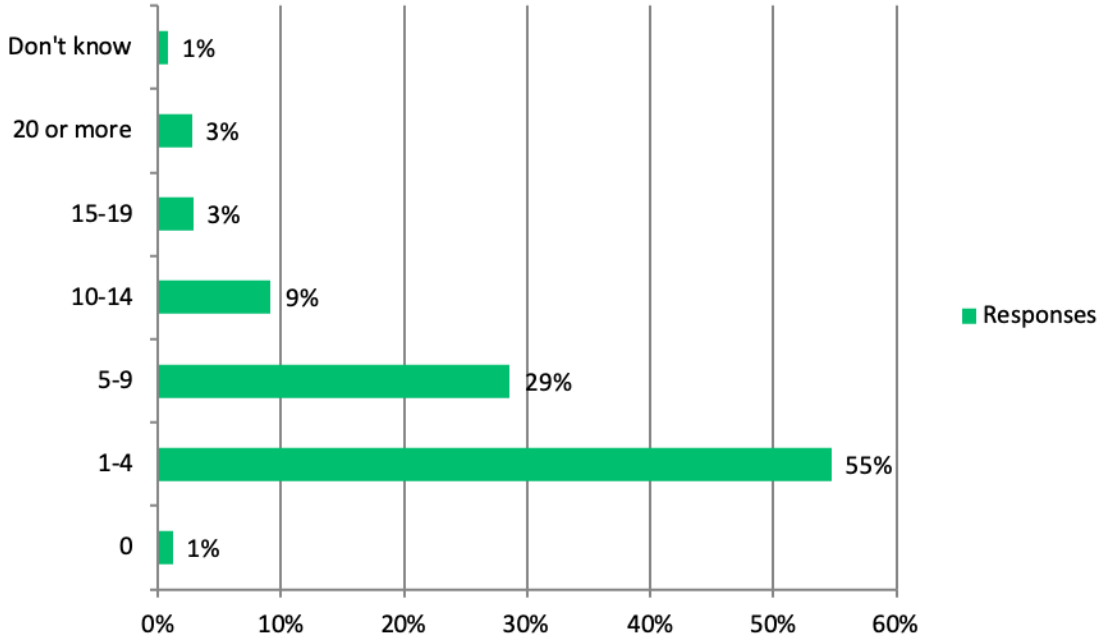
From a CBSM perspective, there is an opportunity to gather commitments and develop social norms by combining trusted sources with communications channels that involve face-to-face communications. As an example, DNR Watercraft Inspectors are in a very good position to not only disseminate information, but to also remove barriers and obtain commitments from anglers and others they may meet when at landings. Similarly, training bait shop and marina staff could allow them to be even more effective than they already are. Peer-to-peer relationships are usually very effective in gathering commitments and developing social norms.

Email was also identified as an important communication channel. Given that DNR is most trusted for information, DNR would be well positioned to utilize email for important messaging targeted specifically to anglers in Minnesota.

6. About the Respondents

All of the 1965 respondents that completed the survey indicate they have fished (other than ice fishing) in Minnesota within the last two years (Q3). Most respondents report that they fish regularly. The majority (55%) report that they fish 1 to 4 times per month during the open-water season and 29% fish 5 to 9 times per month. Almost 15% report that they fish 10 times or more per month.

Figure 17: Q3. During the open-water season, how many days do you fish in a typical month?



6.1. Demographics

Reported age distributions of respondents skew towards "middle aged", between 30 and 69, including 36% between 30 and 49, and 42% between 50 and 69. Those under 30 make up 9%, while those 70 and above represent 11% of respondent's reported age. The majority of respondents (87%) identify as male and 12% as female.

Table 9: Q31. Which of the following age groups would you classify yourself as?

Answer Choices	Responses
18 – 29	9%
30 – 49	36%
50 – 69	42%
70 or above	11%
Prefer not to say	1%

7. Key Findings Summary

The following is a summary of key research findings.

7.1. Gap Between Awareness, Self-Reported Behavior, and Doing

Awareness and knowledge of the AIS issue are reported to be high and attitudes are reported positive towards managing them. These are all positive indicators that most anglers seem to have the right attitude towards AIS and the efforts required to manage their spread. It is important to consider that social desirability bias is likely to be impacting respondent answers, because humans have a natural tendency to answer questions in a socially acceptable fashion rather than answering truthfully. Humans also have a tendency to overestimate their good qualities. The survey was designed to accommodate for this bias in several places.

For instance, there is a gap between reported knowledge of the issue and the specific behaviors that people engage in to help stop the spread of invasive species. This is evidenced by:

- The knowledge test results, and
- The sizable portion of anglers that
    - Release live bait,
    - Are unclear on the appropriate disposal practices, and
    - Do not clean their boats and trailers when leaving the water.

In addition, social desirability bias can be detected by asking respondents to answer for other people instead of themselves. In Q5, respondents were asked if people they know are helping to stop the spread aquatic invasive species. In this format, fewer respondents selected strongly agree with responses moving over to the agree option more often. This indicates a gap between what people say they are doing and what they are actually doing.

Another finding is that while many anglers report that they actively engage in specific behaviors to help stop the spread of AIS, a portion does not engage in these behaviors at all and another portion does not do them all the time.

Strong attitudes and awareness are a solid foundation for a successful behavior change program because they are often the hardest elements to foster. 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.

7.2. Barriers to Action are Not Insurmountable

Approximately half of the respondents acknowledge that nothing prevents them from engaging in the desired angler behaviors. This indicates that there is opportunity to influence behavior since there are less actual or perceived barriers to overcome.

This is compounded by the high knowledge and strong attitudes noted above that provide positive context for changing behavior. Motivators in many cases are also related to how people perceive their actions. As an example, the strongest motivators to encourage proper disposal of unused live bait is knowing that action can make a difference and is the right thing to do (i.e., the behavior contributes to controlling aquatic invasive species and has a positive impact to community and environment).

Future programs and materials should focus on the social motivators identified to be the most effective in this survey, the literature review, and behavioral science in general:

- The injunctive norm that "it's the right thing to do" (which was identified as the top motivators in this survey), and
- The descriptive norm that everyone else is doing it (which respondents reported is happening most of the time).

While some important barriers were identified (e.g. availability of running water, cleaning equipment), focusing efforts on addressing the appropriate behaviors and reinforcing those behaviors is important for consistent application and sustainment over the long-term. The real barriers of access to water and cleaning equipment should be explored to help facilitate this.

7.3. Target Behaviors

Given that almost all anglers report using live bait, the handling of bait and the disposal of unused live bait are important focus areas. Three areas in particular have opportunity for improvement through focused efforts:

- **Release of live bait**. Almost one-third of anglers report that they release live bait. For the 26% that report that they occasionally release live bait, there is opportunity to encourage proper disposal all the time. For the 5% that report that they always release live bait, there is opportunity to encourage them to begin and always property dispose of unused live bait.
- **Taking home unused live bait**. More than two-thirds of anglers report that they take unused live bait home with them for future use at least sometimes. Many different approaches are reported with how people transition the live bait to their vehicle and how they take it home. Knowledge of how to legally transfer live bait (drain the water on land and refill the bait container with tap/bottled water before leaving the access)

is mixed. There is opportunity to clarify the proper approaches and encourage consistent application.

- **Clear rules and guidelines for disposal options**. Anglers report many different reasons for what they do with unused live bait. For example, some report that they take it home and save for reuse, others report that they take it home to compost or for fertilizer, and others report that they want to dispose of it on-site so that they do not have to take it home. One proper disposal technique should not be narrowly defined. The majority of respondents prefer to dispose of unused live bait on-site but many also want to be able to bring unused live bait home to use again. Options should be clearly defined so that people can select what works best for them.

Similarly, since the majority of anglers (82%) report regularly use a boat while fishing, proper boating practices should be focused towards anglers. There are high reported uptake levels on inspecting and removing visible debris and draining practices, but additional boat and trailer cleaning practices are only common reported amongst about half of anglers. This is an opportunity to leverage the good initiatives people are already doing to refocus efforts on additional cleaning behaviors (e.g. spray, rinse, dry).

7.4. Target Audience

Based on respondent demographics, males aged 30 to 69 are a clear target demographic for anglers' behaviors.

Anglers are also boaters, but boaters may not necessarily be anglers. This provides an opportunity to promote multiple activities to anglers that also apply to boaters. Also, since anglers fish quite frequently their actions could be more impactful. Anglers can play an important leadership role by championing proper behaviors amongst boaters that don't fish.

A strong preference was expressed to receive information at physical locations, such as bait shops, boat launches, and piers and access points. An advantage of these locations is that some are at points of key decisions which is conducive for prompting the correct behavior, and others require interaction with someone, providing opportunities for face-to-face interactions. Face-to-face interactions are more effective at delivering a message and more memorable. Face-to-face interactions at bait shops could be leveraged, and also extended to marinas and boat rental facilities.

Anglers also identified email as an important communication channel and that they trust the DNR the most for information on fishing and aquatic invasive species. Email contact information of fishing licensees could be leveraged for important messaging targeted specifically to anglers in Minnesota.

8. Conclusion

The purpose of the survey was to build an understanding of the perceptions, behaviors, and motivators of anglers related to aquatic invasive species movement in Minnesota. The second phase of this project will focus on development of strategies to foster target behaviors, as well as implementation and evaluation of those strategies. The DNR will use the results to promote adoption of desirable AIS prevention behaviors and create positive social norms around aquatic invasive species prevention in Minnesota.