Minnesota Department of Natural Resources AIS CBSM Project

Literature Scan Summary Memo

September 30, 2018

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.

Task Summary

The goal of the Literature Scan Task is to gather information from published sources to identify research that has been conducted on aquatic invasive species (AIS), particularly behavior-change approaches. The purpose is to outline the anthropogenic sources of AIS relevant to Minnesota; the key Pathways that could contribute to the spread of invasive species, the range of potential target audiences, and interventions undertaken locally and elsewhere. Findings from the Scan will guide subsequent tasks by providing a basis for initial discussions with key experts and will be a resource for more in-depth exploration of best practices, behaviors, barriers, and motivators.

The project team scanned 150+published academic and grey literature, case studies, and technical reports, and summarized the 93 most relevant sources as a means to determine the most important AIS Pathways that could be addressed by a CBSM effort in Minnesota. For the purposes of this work, Pathways refers to the mode of transport for an AIS to spread and Sector refers to the group or audience that contributes to the spread of AIS via a Pathway. Pathways may have more than one Sector than can contribute to the spread.

The Literature Review sources were categorized into the following groups:

1. Recreational Watercraft (Motorized and Non-Motorized)
2. Recreational Diving
3. Movement of Docks, Lifts, and Equipment (Lake Service Providers)
4. Live Bait Use by Anglers
5. Commercial Bait Trade (Bait Shops, Dealers, Harvesters)
6. Illegal Fish Stocking
7. Aquarium Trade (Stores and Online)
8. Water Garden Trade
9. Live Food Trade
10. Research and Education
11. General Assessment of Pathways

Summary of Findings

Findings from the Literature Scan indicate that the majority of research on anthropogenic Pathways for the introduction and spread of AIS relevant to Minnesota (i.e. excluding major global Pathways such as shipping and canal building) can be grouped into five primary Pathways. Below are the five primary Pathways identified, including a brief description and notable findings from the scan.

The project team acknowledges that there may be gaps in this list, since literature may not exist or may not be readily available for some potential Pathways and sectors at this time. The absence of literature does not necessarily mean that a Pathway or sector does not present a substantial risk. Additional experts will be consulted for unpublished data and an expert panel will be convened and consulted in an attempt to fill in these potential gaps in knowledge.

Recreational Watercraft

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

Notable Findings:

- Some research documents spread of AIS on smaller boats and non-motorized watercraft that are more likely to be moved between multiple lakes (e.g. canoes, kayaks).
- Research has also looked at boating activities contributing to the spread of AIS between connected waterways and frequent draining of standing water to prevent spread.
- Significant research on target behaviours related to this Pathway (surveys, interviews, etc.).
- Behaviors related to Boaters may also be relevant to activities of Lake Service Providers, such as movement and storage of boats and other equipment.

Live Bait (Bait Shops, Dealers, Harvesters, Anglers)

Rationale: Research shows the main Pathways are: release of live bait, bait water release, contaminated bait, packaging for worms. Pathways associated with live bait can be categorized into angler activity (primarily recreational) and commercial trade.

Notable Findings:

- Significant research on target behaviours related to this Pathway\Some research has also identified disposal of worms on shorelines contributing to spread of AIS.
- Angler equipment is also a sub-path, offering the opportunity to address anglers with bait and boating behaviors together.

Gear and Equipment

Rationale: Across many of the sectors reviewed in the literature, a common Pathway for the spread of AIS is through various gear and equipment. Sectors include hunters, anglers, divers, lake service providers, researchers/academics, and other recreationalists. The common element is that AIS may attach to gear and equipment and transport from one area to another, either overland or within bodies of water.

Notable Findings:

- Gear and equipment is often a sub-path associated with an audience that is also a high risk of spreading AIS through other Pathways.
- Common behavioral approaches related to gear and equipment is the need to diligently inspect and clean equipment.

Docks/Lifts/Rafts and Associated Equipment

Rationale: Minnesota is a leader in addressing equipment such as docks, lifts and rafts as a Pathway. The Lake Service Provider program addresses this through a certification program for people who work with shoreline equipment.

Notable Findings:

- There is little research available on this type of equipment as a Pathway or Lake Service Providers as a sector.

- Nonetheless, it is intuitively obvious that equipment situated in a lake can potentially harbor invasive species, and moving the equipment can move the species as well.
- Although there is little information available on behaviors, we can learn more by speaking with service providers and studying similarities with behaviors for watercraft owners.

Aquarium Trade

Rationale: The aquarium trade is one of the top Pathways for AIS identified globally. Research documented AIS being sold in large number of stores in numerous jurisdictions in the Great Lakes region, including Minnesota. This Pathway would include addressing behaviors for aquarium shop owners/workers and consumers' decision-making and purchases.

Notable Findings:

- Industry regulation poses a challenge for addressing this Pathway.
- Limited research is available on behaviours related to managing spread of AIS through the aquarium trade.
- Most research related to aquarium industry related behaviors seems to focus on education (shops, consumers) and labeling.

Retail Plant Trade

Rationale: Research documented AIS plants readily sold in stores and available for purchase online, as well as other issues such as mislabeling of plants. The live plant trade includes aquarium plants and water garden or ornamental plants

Notable Findings:

- Limited research available on behaviors associated with preventing the spread of invasive aquatic plants through the aquarium and live plant trade.

Live Seafood Trade

Rationale: Research documented AIS sold as live food species and also found in packaging material/water.

Notable Findings:

- Some research has explored human behaviors associated with live seafood and various paths for AIS.
- Key barriers include mislabeling of live food, customer knowledge.

Prioritization of Pathways

The general Literature Scan findings need to be viewed in the context of Minnesota's specific conditions, concerns, and priorities before further narrowing the list to identify target behaviors to address with CBSM approaches. Of particular importance, is identification of Minnesota specific audiences within the main AIS Pathways identified, such as river users, tournament anglers, rental properties, etc.

Additional Opportunity

Another notable finding from the literature scan is that most research and programs are focused specifically on aquatic invasive species and particular Pathways; there appears to be little research on target audiences that could contribute to the spread of AIS and what is of value to them more broadly. An important element of CBSM is promoting the benefits or motivators associated with behaviors, which are not necessarily the same as those interests of program planners. For example, common motivators for recreational boaters to clean their boats are often related to good boat maintenance rather than the desire to not spread AIS.

Research on motivators associated with AIS and specific behaviors has been conducted in several jurisdictions; however, from the perspective of broadly understanding a particular audience, perceptions and motivators are not well understood. Regardless of how individual audiences are motivated, the behaviors are the important outcomes. Importantly, understanding motivators for various audiences could allow more holistic approaches to preventative AIS behaviors that could be integrated into other programs and initiatives (e.g. lake association activities, lake cleanups, land or water stewardship programs, etc). Applying a holistic approach allows the leveraging of those programs and targeting new people in new ways, acting as gateway activities to help control the spread of AIS.

Next Steps

1. It is anticipated that the Minnesota DNR team will provide a Minnesota perspective to the identified Pathways and identify top priorities for further exploration.

2. Building on the Literature Scan and input from the Minnesota DNR Team, the project team will further review the literature to build a long-list of potential behaviors and target audiences per Pathway as part of Task 1.4. Particular attention will be paid to identify specific audiences per Pathway identified as relevant to Minnesota.
3. The Literature Scan and long-list of behaviors and target audience will be shared with the Expert Panel for further insights as part of Task 1.3.
4. Findings from the Literature Scan and input from the Expert Panel will inform the AIS Behavioral Discussion Paper and the Probability-Impact Analysis (Task 1.5).