



Ensuring a Viable Minnesota Grown Bait Supply Legislative Report

As required by Minnesota Session Law 2023, Chapter 60, Article 4, Sec. 109

January 15, 2024

Report to the Minnesota Legislature

Minnesota Department of Natural Resources

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Pursuant to Minnesota Statutes, Section 3.197, the estimated cost to produce this report is approximately \$4,600. This includes staff time for drafting and reviewing the report.

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The 2023 Minnesota Legislature directed the Department of Natural Resources to submit recommendations to ensure a viable Minnesota-grown bait supply. The statutory requirements for this report, as mandated in Minnesota Session Law 2023, Chapter 60, Article 4, Sec. 109 are:

By January 15, 2024, the commissioner, in consultation with bait producers, bait harvesters, retailers, and other fishing interest groups, must submit recommendations to the chairs and ranking minority members of the house of representatives and senate committees and divisions with jurisdiction over environment and natural resources to ensure a viable Minnesota-grown bait supply and sustainable bait industry for anglers of Minnesota that minimizes the risk of spreading aquatic invasive species or fish disease in Minnesota .

This report fulfills the requirement.

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Executive Summary

To prepare this report, the Department of Natural Resources (DNR) engaged with affected parties, drew on past reports and considered recommendations from members of the bait industry for increasing and stabilizing bait supply. This report builds off ongoing collaboration between members of the bait industry and DNR. Although no one action can fully resolve the concerns surrounding Minnesota-sourced bait supplies, we believe that the recommendations listed in this report have the greatest potential to improve bait availability.

Because most Minnesota bait is wild caught, bait supplies vary annually. Historic causes of supply variability include winterkill, drought, floods, and access to minnow production areas. These factors have been exacerbated by land-use practices and bait harvest restrictions aimed at preventing spread of fish disease and invasive species. Increasing bait demand, especially due to an increase in winter angling, has caused some seasonal bait shortages.

The DNR provides regulatory framework and has responsibility for over-arching management of Minnesota's natural resources. As such, the DNR desires to support the private bait industry so that a Minnesota-grown bait supply can be secured to meet angler demands. To better understand bait supply concerns and determine how the DNR can support the bait industry, three meetings were held with bait producers, harvesters, and retailers, and other fishing interest groups. Discussions resulted in the following recommendations, including some that would require changes in rule and/or permitting procedure by the DNR.

- Explore opportunities to utilize artificial ponds and other minnow rearing techniques to supplement wild harvest.
- Continue watershed-based VHS testing to maintain VHS-free zones to facilitate minnow harvest.
- Increase availability of white sucker eggs to licensed producers.
- Maximize minnow harvest while maintaining minimal zebra mussel transfer risk.
- Facilitate minnow-harvest access to areas that may have been previously restricted or underutilized, such as trout waters, wildlife management areas, or other units of the Outdoor Recreation Act.
- Remove non-target species from minnow ponds.
- Consider expanding the types of gear or gear configurations to increase harvest efficiency and harvest in waters where current gear is ineffective.
- Establish and maintain regular communication between DNR and minnow harvesters and dealers.
- Research factors related to leech harvest decline.

Introduction

Live bait is critically important to the \$4 billion contribution recreational angling makes each year to Minnesota's economy. More than 70% of Minnesota anglers report use of live minnows (McEachran et al. 2022). The bait industry retails approximately \$1.6 million worth of minnows annually in Minnesota (USDA Aquaculture Census 2018). Since the early 1900s, the Minnesota bait industry has grown and evolved to supply live bait to anglers. Because most minnows and leeches are wild caught, supply can vary annually due to natural environmental factors. Bait supply is impacted by winterkill, drought, floods, waterbody access, fish disease, invasive species, land use practices and the number of harvesters. Total minnow harvest dipped below the 10-year average in 2014 through 2016, rebounded from 2017 through 2019, and again fell below the 10-year average in recent years. As a result of increasing demand and variable harvests, there have been reports of seasonal minnow shortages in Minnesota for the past several years. The DNR desires to collaborate with bait industry and angling partners to help ensure bait availability. The primary objective of this report is to provide recommendations for ensuring a viable and stable Minnesota grown bait supply.

Background

The DNR has historically worked with the bait industry to enhance bait supplies. DNR Investigational Report No. 256, "Rearing Suckers for Bait in Minnesota," was published in 1972 and synthesized analytical information that was collected by the DNR's Fisheries Research Unit from the mid-1940s to the mid-1950s on propagating suckers in rearing ponds. According to the report, information was provided to the bait industry on the type of ponds most suited for sucker production, the factors affecting the growth rate of suckers, and data on sucker food habits.

The research unit also operated as a clearing house for information on holding minnows, disease treatments, and sources of equipment needed in hatchery and pond work. DNR Investigational Report No. 367, "Minnesota Live Bait Industry Assessment Study," published in 1980, was the first comprehensive report on the live bait industry in Minnesota. The report included recommendations for improving bait supply, such as permitting of minnow harvest on waters that were closed to access (e.g., shorelines owned by city, county, state, or federal governments) and encouraging the propagation of suckers and golden shiners. Other recommendations focused on improving handling techniques during minnow harvest and transport and shallow pond water quality management.

Also in 1980, the DNR published Investigational Report No. 357, "Management of Ponds for Bait Leeches in Minnesota." This report provided information concerning life history, ecology and experimental stocking of leeches. The report provided several recommendations for improving the supply of bait leeches in Minnesota.

Harvest Information on Shiners, Fathead Minnows, and Leeches in Minnesota

Shiners

The top four shiner species harvested for bait in Minnesota (and their 10-year average harvest per year) are spottails (6,700 gallons), emeralds (4,700 gallons), goldens (9,200 gallons) and commons (1,500 gallons; Figure 1). Minnesota anglers prefer spottail shiners for the walleye fishing opener. Almost all shiner harvest is from the wild and affected by weather conditions. Late ice-off can impact the timing of shiner spawning runs, sometimes delaying shiner availability until after the fishing opener. Regulations designed to protect fish populations from pathogens such as viral hemorrhagic septicemia (VHS) have historically limited waters where shiners can be harvested due to fish health testing requirements. Finally, invasive species impact shiner harvest as more waterbodies where shiners are harvested become infested with invasive species, particularly zebra mussels. Permit conditions aimed at limiting the spread of zebra mussels close harvest from May 23 through October 15 each year and restrict harvest gear.

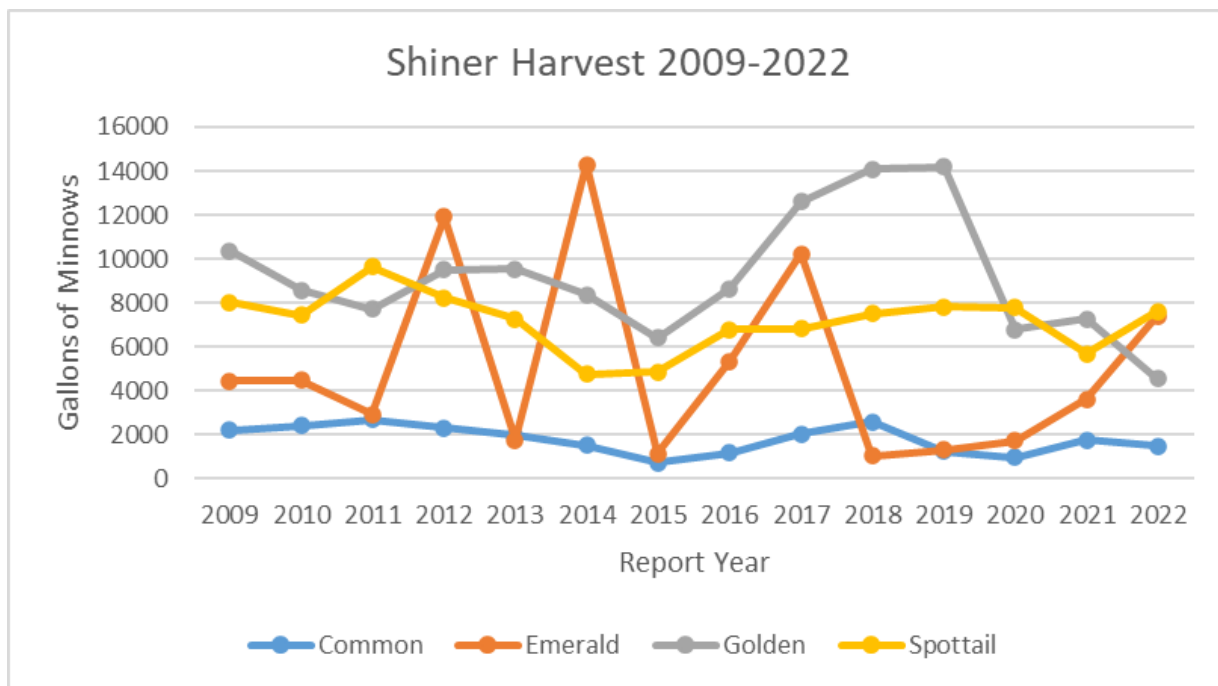


Figure 1. Total annual shiner harvest from 2009 to 2022 report year. Note: the report year is for harvest that took place during the previous year. Minnow harvest is listed in gallons.

Fathead minnows

Minnesota minnow harvesters typically harvest between 150,000 and 200,000 gallons of fathead minnows a year (Figure 2). The 10-year average is 173,000 gallons. Minnesota also exports between 50,000 and 140,000 gallons of fathead minnows each year (10-year average is 85,000 gallons; Figure 3). Fathead minnow harvest takes place both in aquaculture-licensed waters and wild waters. Loss of harvestable waters and weather have been contributing factors to reductions in fathead minnow harvest. Specifically, winterkill can impact fathead minnow populations. Most years, fathead minnows will bounce back by mid-summer. However, in 2021 and 2022 drought impacted the ability of fathead minnow populations to rebound and shortages were reported during those years. Reports from minnow dealers in 2023 suggest that fathead minnows rebounded by late August. Despite reported shortages of fathead minnows in 2021 and 2022 minnow dealers exported over 56,000 gallons of fathead minnows each year.

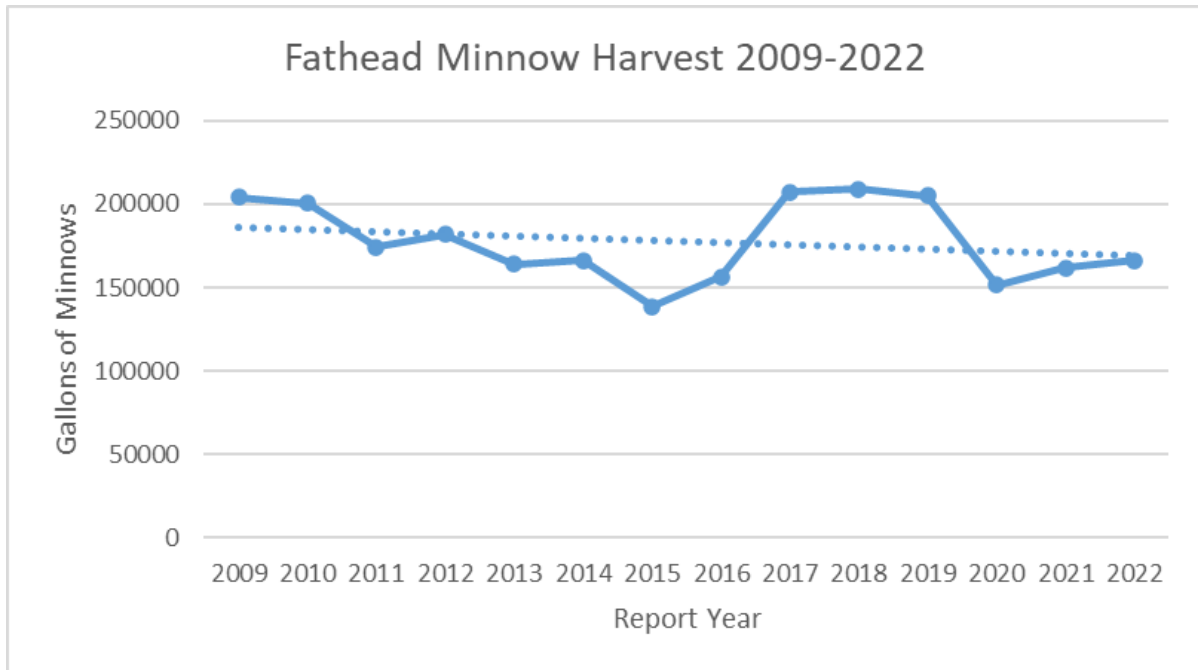


Figure 2. Total fathead minnow harvest from 2009 to 2022 report year. Note: the report year is for harvest that took place during the previous year. Minnow harvest is listed in gallons.

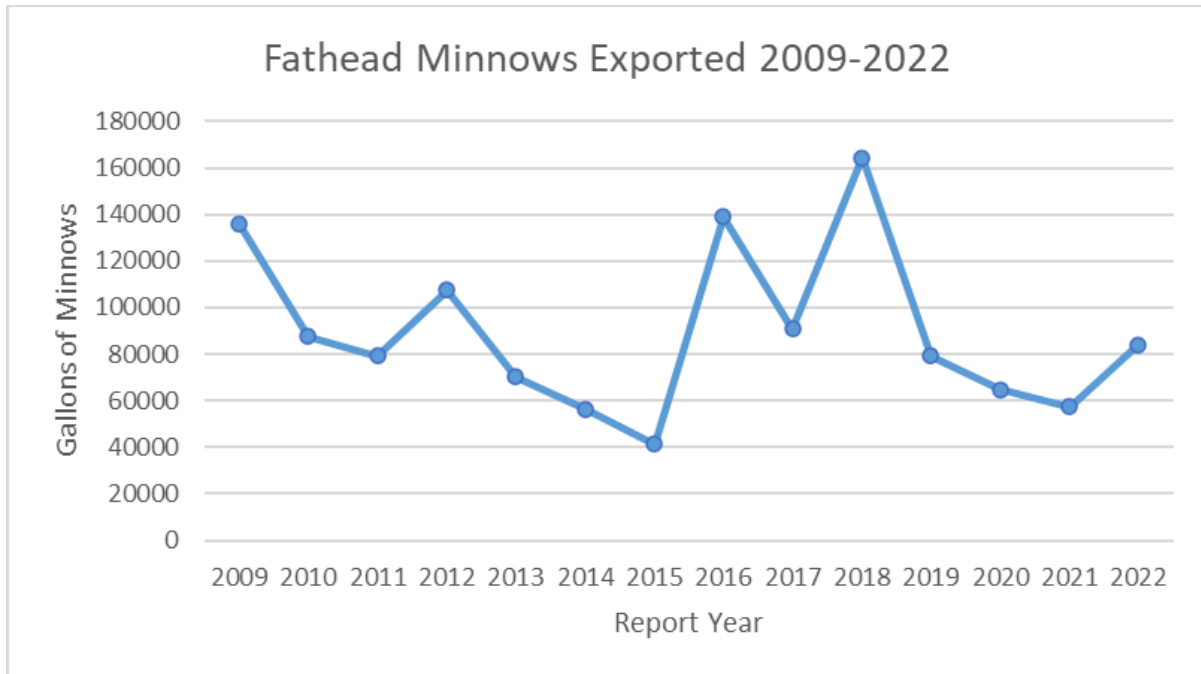


Figure 3. Total fathead minnows exported out of Minnesota from 2009 to 2022 report year. Note: the report year is for exports that took place during the previous year. Minnow exports are listed in gallons.

Leeches

For this report, the term “minnows” includes leeches. Minnesota minnow harvesters typically harvest between 100,000 and 200,000 pounds of leeches annually (Figure 4), with a 10-year average of 148,000 pounds. Minnesota exports between 50,000 and 100,000 pounds of leeches each year (Figure 5). Leech harvest is mostly from wild sources. Leech harvest reports indicate that harvest has declined by nearly 70% since 2009. Minnow harvesters have expressed concerns that changes in the agricultural landscape and the use of agricultural chemicals impact leech populations. Other contributing factors identified by harvesters include the loss of harvestable waters, invasive species, and weather.

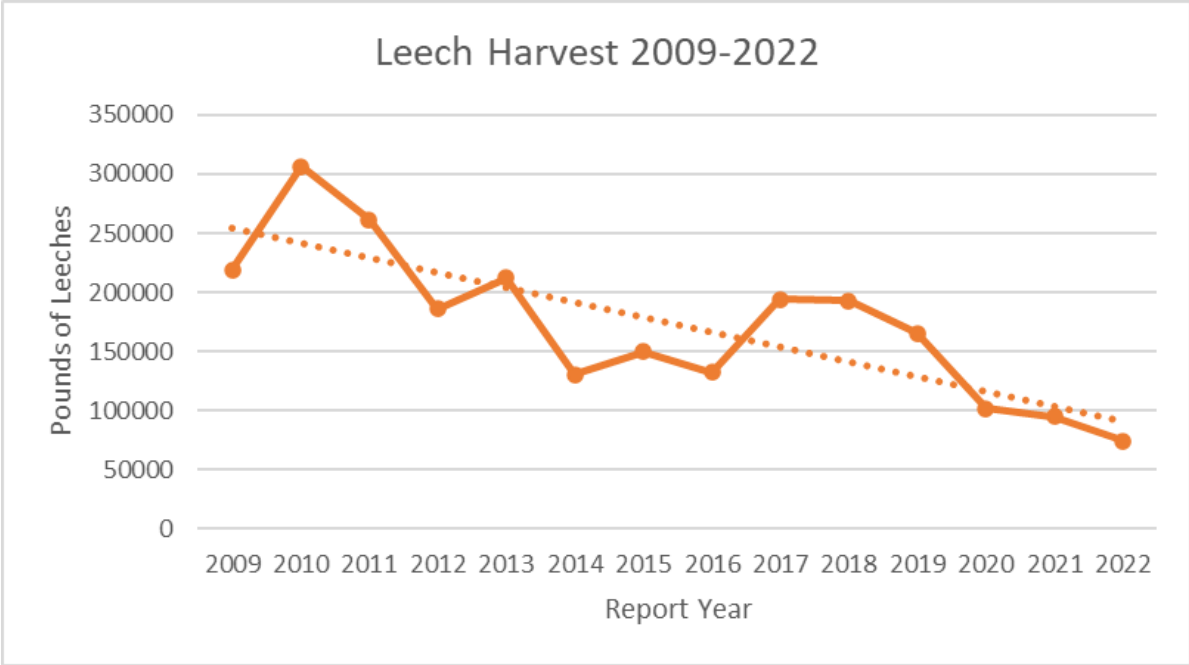


Figure 4. Total leech harvest from 2009 to 2022 report year. Note: the report year is for harvest that took place during the previous year.

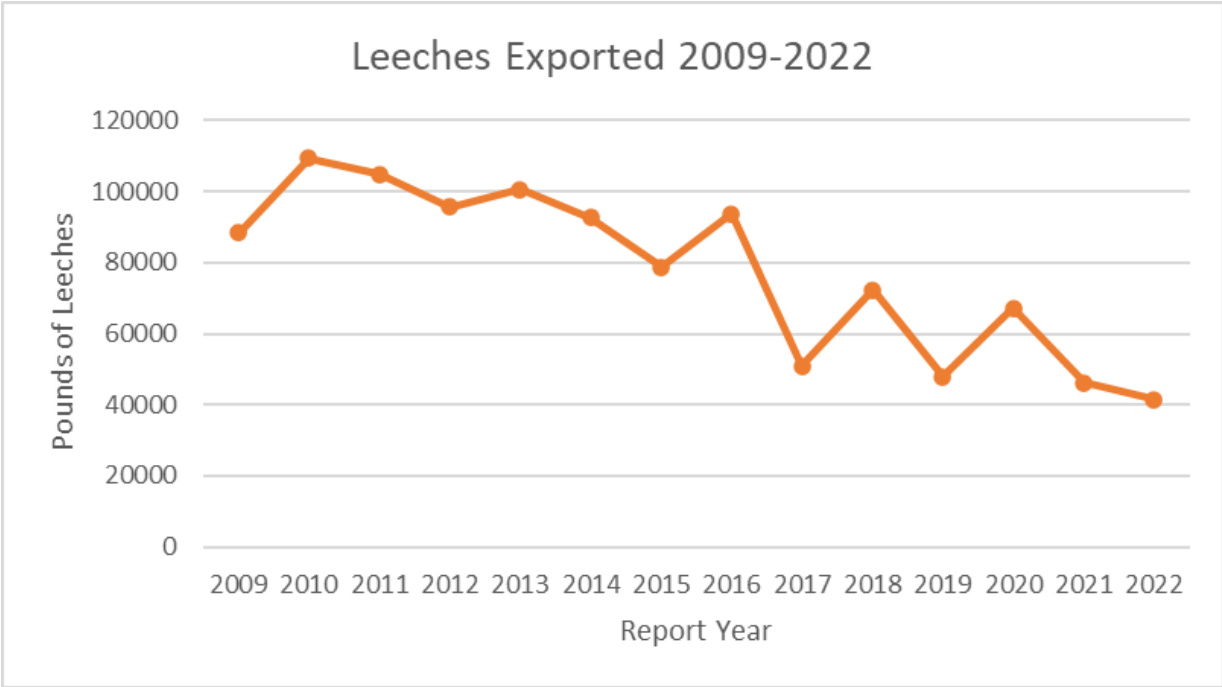


Figure 5: Total leeches exported out of Minnesota from 2009 to 2022 report year. Note: the report year is for exports that took place during the previous year.

Meeting with Bait Harvesters and Retailers

DNR staff met with minnow harvesters, dealers, retailers, and angler groups to discuss minnow availability (participants are identified in Appendix A). Three meetings were held between October 2022 and October 2023 to engage in conversations about minnow shortages and potential causes, and to provide recommendations intended to create a viable and sustainable Minnesota-grown bait supply. Emails were sent to a minnow dealer mailing list between each meeting to facilitate broader communications and receive recommendations from as many bait producers as possible. A summary of the written comments and recommendations DNR received is included in Appendix B.

There was consensus among bait industry representatives that there has been a decline in the number of waterbodies that produce minnows or are available for harvest making it difficult to provide enough minnows to meet current angler demand. Factors identified as significant contributors to minnow availability include winterkill, drought, summerkill, connectivity between water basins that allows introduction of undesirable species, presence of non-target species, and agriculture practices that affect water quality and quantity. Additional factors identified include waters managed to promote fishless conditions for the benefit of waterfowl, road construction, water management projects, and wetland restoration projects that include easements that restrict minnow harvest. Changes in riparian land ownership can limit access or result in changes in how a waterbody is managed (e.g., stocking gamefish in lakes). The DNR also uses public waters to raise walleye and muskellunge that could be used to raise minnows. Finally, representatives described loss of access to harvestable water due to regulations designed to reduce the spread of invasive species or fish disease, changes in vehicle access to waters, and changes in ownership or administration of basins.

Recommendations and Actions

Recommendation

- Explore opportunities to utilize artificial ponds and other minnow rearing techniques to supplement wild bait harvest.

Rationale

- Natural waterbodies are producing fewer minnows because of development, watershed changes, and weather conditions.
- Utilizing artificial ponds with aeration and other controls are less dependent on changes in weather and help to prevent winterkill and summerkill losses.
- Artificial ponds can be designed to include spawning structures that increase minnow production.
- New suppliers can be brought in for minnow production, such as aquaponics facilities or other groups interested in culture of minnows as opposed to wild harvest.
- Artificial ponds and indoor facilities are less likely to be affected by invasive species than natural basins.

Actions Taken/Next Steps

- The DNR is currently working with Sea Grant and the minnow industry on a project funded by the Legislative-Citizen Commission on Minnesota Resources focused on raising golden shiners in constructed ponds. Initial results are promising, with golden shiners spawning indoors year-round. Golden shiners are being raised in constructed ponds, recirculating aquaculture systems, and aquaponics systems. As a result of this project, golden shiner fry are available for those interested in stocking ponds.
- DNR, Sea Grant, and the minnow industry will continue to refine golden shiner production protocols and increase awareness of golden shiner culture among bait producers.
- DNR and representatives from the bait industry will meet with Minnesota Department of Agriculture to explore incentives to start an aquaculture operation or switch from wild harvest to minnow culture.

Recommendation

- Continue watershed-based VHS testing to maintain VHS-free zones that facilitate the harvest of VHS-susceptible species, such as spottail shiners, emerald shiners, and fathead minnows.

Rationale

- VHS testing was identified as a barrier to harvesting VHS-susceptible species such as spottail shiner, emerald shiner and fathead minnows.
- Without VHS-free zones, harvesters would be required to test bait for VHS from each water body.

Actions Taken/Next Steps

- The DNR updated the minnow testing requirements for VHS by establishing VHS-free zones in 2022. By doing so, more waters became available to harvest for VHS-susceptible species without the need for further testing.
- DNR sent a letter to all aquaculture and minnow dealer license holders regarding the VHS-free zones and has posted information on the DNR website.
- The DNR will work with the bait industry to ensure that all bait harvesters are aware that VHS-free zones are in place and there are fewer restrictions in place on the harvest of VHS-susceptible minnow species.

Recommendation

- Make white sucker eggs more available to licensed sucker producers to increase the number of white suckers being produced and made available to Minnesota anglers.

Rationale

- Aquaculture licensees that rear suckers noted that white sucker harvest in 2022 was impacted by spring flooding.
- Park Rapids Area Fisheries staff collect white sucker eggs for DNR muskie propagation program muskies and there are typically surplus eggs.
- Permits can be issued to allow for white sucker egg harvest from waters of the state.

Actions Taken/Next Steps

- The DNR notified sucker producers in 2023 that surplus white sucker eggs were available from the Park Rapids Area Fisheries Office and provided surplus white sucker eggs to licensed aquaculturists.
- The DNR will continue to notify sucker producers when surplus white sucker eggs are available.
- The DNR will evaluate options to minimize risk in issuing permits to harvest white sucker eggs safely from waters infested with nonnative aquatic species.

Recommendation

- Maximize minnow harvest while mitigating zebra mussel transfer risk by continuing a pilot project evaluation of general permit conditions.

Rationale

- Harvest restrictions on infested waters have been identified as a barrier that limits bait availability, especially of spottail shiners in the spring. Because of the tight harvest restrictions, bait harvesters tend to avoid infested waterbodies unless there is a high value minnow present such as spottail or emerald shiners.
- Zebra mussel infestation currently leads to gear restrictions (no traps) and seasonal closures from May 23 through October 15 that are intended to reduce the risk of spreading zebra mussels to non-infested waters.
- Most harvest in zebra mussel waters targets spottail shiners. However, minnow dealers have commented that the DNR is sometimes closing minnow harvest during or even before the shiner run. The demand for spottail shiner is highest during the first couple weeks of the fishing season in mid to late May and begins to taper off as temperatures rise in mid to late June.
- Minnow harvesters requested that the close date be adjusted until after the Memorial Day weekend to allow more harvest opportunity.
- Minnow harvesters would like to bring gear back to their facilities to decontaminate rather than attempting to clean gear of zebra mussels before leaving a waterbody. Minnow harvesters report they cannot guarantee all zebra mussels are completely removed from their gear before leaving the waterbody and are concerned they would be cited for transporting a prohibited invasive species.

Actions Taken/Next Steps

- The DNR and harvesters are collaborating on a pilot project designed to assess the use of traps in zebra mussel infested waters. Minnow harvesters and dealers requested adding lakes to the pilot project, so in 2023 the project was expanded to include a total of nine lakes. Conditions were added to permits to mitigate the risk of spreading invasive species (i.e., lake-specific traps, inspections, and temperature monitoring).
- The DNR allowed harvest until after the Memorial Day weekend for pilot project lakes in 2023 and implemented temperature monitoring and collected veliger samples to evaluate risks associated with this change.
- The DNR will evaluate pilot project data to determine if the conditions set forth increased shiner harvest and sufficiently mitigated zebra mussel transfer risk.
- If the pilot project data are promising, expand the number of lakes in the pilot project offering infested water permits (making even more waters available).
- Based on results of the pilot project, evaluate the potential to consistently allow shiner harvest in zebra mussel infested waters until after Memorial Day weekend or later.
- The DNR will assess the potential to issue a general permit to allow for the transport of gear used in zebra mussels infested waters to a designated cleaning location.

Recommendation

- Work with public land managers to facilitate minnow-harvest access to areas that may have been previously restricted or underutilized, such as trout waters, wildlife management areas, or other units of the Outdoor Recreation Act.

Rationale

- Increasing the number of waters that bait harvesters can access will increase the number of potential areas where minnows can be harvested.
- Opening these additional waters would only be considered if minnow harvest can be completed with minimal impact to the main managed species and habitats.
- Gates and general prohibitions on motor vehicle access limit waterbody availability.

Actions Taken/Next Steps

- In 2023, DNR encouraged harvesters to approach their local DNR Fisheries and Wildlife offices to identify opportunities for harvest within designated trout waters and Wildlife Management Areas.
- DNR will continue to evaluate the potential availability of waters currently underutilized for bait production, communicate the availability of these waters to bait harvesters, and continue to encourage harvesters to connect with public land managers to identify harvest opportunities and barriers to access.

Recommendation

- Remove non-target species from minnow ponds by using piscicides and temporary drawdowns.

Rationale

- Minnow ponds that have an overabundance of nontarget species like stickleback, mudminnows, and black bullheads produce fewer minnows. Connectivity to other waterbodies can allow non-target fish and predators into a minnow pond and reduce production. Partial winterkill and summerkills can kill minnows in a pond and leave behind species that are more tolerant of low dissolved oxygen like bullheads and mudminnows. The ability to remove nontarget species from a pond can help increase minnow production.
- Responsible use of piscicides can eliminate fish to allow restocking with minnows and increase minnow production.
- Temporary draw down of ponds can eliminate undesirable fish species in ponds and can greatly increase minnow production. Temporary draw down is a cost-effective method and would eliminate the use of piscicides.

Actions Taken/Next Steps

- The DNR will provide information to bait harvesters on how to apply for a permit to utilize piscicides to kill non-target fish from a minnow rearing pond.
- The DNR will provide information on registered piscicides such as rotenone and CO₂ treatments. CO₂-Carp is registered with the US EPA and labeled for use against invasive carps or as an under-ice treatment to enhance winter kill and allow for a "reset" of a pond.
- The DNR will provide information about stocking a rearing pond following treatment or winterkill. Licensed aquaculture ponds can be stocked with listed species without additional approvals from the DNR. Unregistered ponds require a "live fish transportation, importation, and stocking" permit to stock minnows.
- The DNR will work with producers to increase understanding of regulations related to temporary draw downs and identify and clarify the steps needed to initiate a draw down. Draw down of water bodies is regulated by M.S. 103G.408.
- Research is needed to explore additional methods to maintain minnow ponds. Research could include evaluating barrier effectiveness to restrict non-target species introductions, effectiveness of aerating ponds to prevent partial winterkill or summerkill, and effectiveness of temporary winter drawdowns to promote a complete winterkill followed by spring stocking. DNR will work with partners to identify opportunities to find or conduct research on minnow production in rearing ponds.

Recommendation

- Consider expanding the types of gear or gear configurations to increase harvest efficiency and harvest in waters where current gear is ineffective.

Rationale

- Minnow dealers offered some new gear configurations that may help harvest minnows. Any gear changes require a change to Minnesota Rules.
- Minnow harvesters have suggested that shiner harvest could be improved by allowing taller and longer seines and purse seines.

Actions Taken/Next Steps

- The DNR will consult with minnow harvesters to review gear types and evaluate proposed gear and gear configurations. Any gear changes must be updated through the rulemaking process.

Recommendation

- To address ongoing and emerging concerns and opportunities, build off recent collaboration with the bait industry to establish and maintain regular communication between DNR and minnow harvesters and dealers.

Rationale

- Establishing and maintaining regular communication between DNR and the bait industry will help reduce actual and perceived conflicts and allow for continued cooperation and improvements to bait availability.

Actions Taken/Next Steps

- Establish an ongoing working group with DNR and minnow harvesters, retailers, and other minnow suppliers that would meet on a regular basis to increase communication and collaboration. This group could be similar in form and function to fish species citizen work groups.
- DNR will notify minnow harvesters when new water bodies are being considered to raise walleye fingerlings and when walleye pond use is discontinued.
- The DNR will work with minnow harvesters to identify water bodies they are using for harvesting minnows and avoid these waters for other purposes.

Recommendation

- Collaborate on research to identify factors related to leech harvest decline.

Rationale

- Minnow harvesters offered their observations that agriculture practices may have impacts on leech populations. Specifically, minnow harvesters report leeches disappearing after nearby fields had been sprayed with pesticides. Other contributing factors harvesters have noted include loss of harvestable waters, invasive species, and weather.

Actions Taken/Next Steps

- DNR will continue to monitor leech harvest.
- DNR will support research proposals that investigate factors that may impact leech populations.
- DNR will continue to communicate with bait harvesters and obtain more detailed information on leech harvest.

References:

Census of Aquaculture 2018. Volume 3 Special Studies Part 2. USDA National Agriculture Statistics Service.

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Appendix A. Advisory Group

Minnow Dealers

William Powell

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Lucus Norgren

Sean Peck

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Minnow Retailer

Grant Prokop

Other Groups

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Mark Holsten (MNFISH)

Nathan Wesenberg (State Senator)

Don Schreiner (MN Sea Grant)

Minnesota DNR

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Adam Doll

Leslie George

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Kelly Pennington

Pat Rivers

Sean Sisler

Neil Vanderbosch

Kelly Wilder

Heidi Wolf

Appendix B. Summary of Minnow Dealer Comment and Recommendations

Written feedback with recommendations were received from four individuals involved in the bait industry. The section below highlights the main themes of that feedback.

- Bait harvest restrictions
 - Work with the bait industry to review current restrictions.
 - Continue to determine protocols that would allow few restrictions on harvest in zebra mussel infested waters.
 - Allow use of traps in infested water with permits to haul equipment back to clean and dry out.
 - Revise outdated equipment rules such as trap sizes, net types and lengths, gear configurations, and disallowing cast nets, trawls, and purse seines.
 - Re-establish allowance for the harvest and sale of salamanders as bait.

- Increase access to minnow production waters
 - Open up Wildlife Management Areas to bait harvest.
 - Reduce competition with DNR for production waters (walleye rearing).
 - Allow local bait harvester input before stocking new fish rearing waters and return some existing rearing waters back to bait industry use.
 - Review county and state forestry rules about water access using motorized vehicles.
 - Open up restricted areas and trails and give permits for wildlife management areas, to open waters for live bait harvest.
 - Allow minnow pond access through snowmobile trails and fire roads that are closed by gates during summer months.
 - Allow bait harvest in trout lakes and streams, many of which are overrun with bait minnows.
 - Designate some waters as “historic minnow waters” and reserve those waters for that specific use.

- Increase communication and aquaculture advancement
 - Provide assistance in funding and directives to enable the Minnesota Aquaculture Association to advocate for and modernize the bait industry.
 - Have the legislature recommend to the University of Minnesota develop and establish an aquaculture program dedicated to research and development of Aquaculture and bait culture in Minnesota for Minnesota.
 - Ask the legislature to allocate funds to develop a research and development fund dedicated to systems and methodology that would make bait culture a new branch of aquaculture in MN.
 - Ask that the legislature to create an office within MNDNR headed by an industry professional that could coordinate with Fisheries and the Commissioner on how the industry operates and how regulation will affect the industry.

- General comments and recommendations
 - Bait availability is a serious problem, but we have all the minnows we need here in Minnesota.
 - Wild harvest is the backbone of the live bait industry.
 - Be considerate of the live bait industry which is hanging on by a thread.
 - Stop treating minnows like an invasive species – we need them.
 - Let some lakes be managed for minnow production.
 - Follow up on illegal stocking of game fish.
 - Facilitate bait-industry involvement when DNR is establishing AIS and waters use policies.