



Minnesota Department of Natural Resources (DNR) Classification Summary for Invasive Species

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DRAFT: Minnesota Department of Natural Resources Invasive Species Program, March 2020

Classification Screening for Tench, *Tinca tinca*

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Introduction

This document is a guide to the Minnesota DNR’s authority under *Minnesota Statutes*, chapter 84D, to designate invasive species as prohibited or regulated invasive species. The conclusions and recommendations in this document are for information purposes only and do not require the DNR or any other entity to take a specific action.

More information about classifications of invasive species can be found on the [DNR website](http://www.dnr.state.mn.us/invasives/laws.html) (<http://www.dnr.state.mn.us/invasives/laws.html>) and in *Minnesota Statutes*, [chapter 84D](#)

(<https://www.revisor.mn.gov/statutes/?id=84D>). Prohibited, regulated, and unregulated species are listed in Minnesota Rules, [chapter 6216](https://www.revisor.mn.gov/rules/?id=6216) (<https://www.revisor.mn.gov/rules/?id=6216>).

How to fill out this classification screening

For more detailed guidance on completing this document, see the DNR's "Guidance for Invasive Species Classification Summaries". The following is a brief guide:

- Fill out the Species Summary section with the species name and a brief description of the species and its current regulatory status in Minnesota.
- Answer the questions in the Eligibility Screening section to determine whether the species is eligible for regulation under *Minnesota Statutes*, chapter 84D.
- If the species is eligible for regulation under *Minnesota Statutes*, chapter 84D, continue to answer the questions in the Classification Screening section and characterize the certainty of the answer for each question.
- At the end of the classification screening questions, summarize the most important points from the answers and judge the overall certainty of the screening.
- Finally, you should make a recommendation for classifying the species, based on the findings of the classification screening.
- Update the table of contents when the document is completed.

Species Summary

Common name: tench

Scientific name: *Tinca tinca*

Brief description: Tench (Cyprinidae, Carp and minnow family) are fresh- and brackish-water fish native to Eurasia. They can grow up to 25 inches long, weigh up to 16 pounds, and live up to 20 years. They have small, olive-green to black scales and barbels at the corners of the mouth. They are tolerant of degraded, low-oxygen waters and are found in still to slow-moving bodies of water with vegetation (Bezmaternykh & Shcherbina 2018). Tench reproduce late spring or summer in dense vegetation. As juveniles they feed on zooplankton and as adults they feed on benthic invertebrates, crustaceans, mollusk, and insects (Bezmaternykh & Shcherbina 2018).

Present classification in Minnesota: unlisted nonnative species

Proposed classification: prohibited invasive species

Current distribution of species: Native in a majority of Western Europe (Freyhof 2016). Introduced to Asia, Australia, North America, and parts of Europe beyond their natural range (Nico et al. 2014). Tench were intentionally introduced to North America in 1877 and have since established self-sustaining populations in Quebec, Canada and the United States in Washington, California, Colorado, Maryland, Idaho, and Lake Champlain between New York and Vermont (Nico et al. 2014). In fall 2018, a tench was found in the Bay of Quinte in Lake Ontario, but it is unknown if it has established in Lake Ontario (Boissoneault 2019). Tench have not been detected in Minnesota as of March 2020.

Eligibility Screening

These three questions determine whether the DNR has authority to regulate the species under *Minnesota Statutes*, chapter 84D.

1. Is the species an aquatic plant or wild animal? For the purposes of this question, “species” includes “subspecies, genotypes, cultivars, hybrids, or genera” (*Minnesota Statutes*, section 84D.04 subd. 1).
 - Choose Yes or No; if yes, continue.
2. Is the species a pathogen or terrestrial arthropod regulated under *Minnesota Statutes*, sections 18G.01 to 18G.15? (*Minnesota Statutes*, section 84D.14(1))
 - Choose Yes or No; if no, continue.
3. Is the species a mammal or bird defined as livestock in statute? (*Minnesota Statutes*, section 84D.14(1)).
 - Choose Yes or No; if no, continue.

Classification Screening

Is it nonnative?

To be classified as an invasive species under *Minnesota Statutes*, the species must be “nonnative”; that is, not “native” as defined in *Minnesota Statutes*, section 84D.01, subd. 11. This has two components.

1. Is the species nonnative in Minnesota?

1.1. Is the species naturally present or reproducing in Minnesota? No. Tench are not naturally present or reproducing in Minnesota.

1.2. Does the species naturally expand from its historic range into Minnesota? No; tench are not native to North America.

How certain are these answers? Very certain, supported by peer-reviewed literature.

Likelihood of introduction

This is a criterion for classification of an invasive species under Minnesota Statutes, section 84D.04, subd. 2(1). The terms “introduce” and “introduction” are defined in Minnesota Statutes, section 84D.01.

2. Is the species likely to be introduced to Minnesota if it is allowed to enter or exist in the state?

Tench could be introduced to Minnesota by the following pathways:

- **Fishing:** Tench could potentially be introduced through fishing. Initial tench introductions in the United States were for sport and forage fishing. Sport fishing for tench exists in the United States, Europe, and New Zealand. Tench could be intentionally released for game fishing in the United States.
- **Aquaria:** Tench could potentially be introduced through aquaria. In the United Kingdom, tench is bought for aquariums and ornamental ponds. There may be interest in tench as an aquarium or ornamental fish in the United States and one could find them sold online.
- **Aquaculture:** Tench could potentially be introduced through aquaculture. Along with sport fishing, initial tench introductions were for aquaculture. However, the U.S. Fish Commission discontinued stocking tench around the early 1900s in favor of bass hatcheries (Baughman 1947). Europe continues rearing tench as a secondary species for aquaculture (Wedekind et al. 2003; Rennert et al. 2003; Gela et al. 2005). In Turkey, tench are also used in mineralizing aquatic systems in poly-cultures and cleaning carp pools (Innal & Erk’akan 2006).

Tench were introduced in Canada, in Quebec and Ontario, through aquaculture. In Quebec a fish farmer illegally stocked tench but could not find a market to sell them. He then drained the pond resulting in their release. In Ontario, a farm pond illegally stocked tench with other common bait fish (Avlijaš et al. 2018). It is believed that some tench escaped and established in the Humber River nearby (Avlijaš et al. 2018). Genetic analyses are being run to confirm this theory (Avlijaš et al. 2018). It is possible a similar event could occur in Minnesota.

- **Food markets:** Tench is unlikely to be introduced through food markets. Initial introductions to the United States were for creating a tench food market. Since the discontinued stocking by the U.S. Fish Commission, there has not been a large food market for tench. Though stocking was discontinued in the U.S., live tench were imported into the United States until 2013 (NOAA Fisheries 2017). Reports show that no live tench have been imported to the United States since 2013. Europe hosts a larger food market for tench, but it remains a secondary species for aquaculture in much of Europe (Wedekind et al. 2003; Rennert et al. 2003; Gela et al. 2005).
- **Range expansion:** There has not, as of March 2020, been any documented expansion of the tench from its nonnative range into Minnesota. The Great Lakes and Mississippi River Interbasin Study (GLMRIS) describes tench population growth rate and natural expansion rate as slow, but ranks the dispersal threat as medium (Veraldi et al. 2011). Tench introductions closest to Minnesota were in the northern border of Iowa, central Wisconsin, and eastern Michigan, but these stocked tench populations are listed under the Failed/Extirpated/Eradicated status (Nico et al. 2014). Despite this, tench have established in the Mississippi river basin (Hoff 2010) and occur within 75 miles of the Great Lakes and Mississippi River interbasin connection. They are considered an incoming threat to the Great Lakes basin (Avlijaš et al. 2018) because they have been observed in tributaries north and south of the Great Lakes and display tolerance to Great Lakes conditions (Avlijaš et al. 2018; GLMRIS 2011).

How certain is this answer? Moderately certain. Supported by some peer-reviewed articles, but research on some pathways is limited.

Likelihood of survival

This is a criterion for classification of an invasive species under Minnesota Statutes, section 84D.04, subd. 2(2). The term “naturalize” is defined in Minnesota Statutes, section 84D.01 as “to establish a self-sustaining population...in the wild.”

- 3. Is the species likely to naturalize in Minnesota if it were introduced?** Potentially. Tench are considered a warm water fish, but are reportedly tolerant to a wide-range of biotic factors such as low oxygen levels, pH, brackish water, turbidity, and water temperature (Rowe 2004). Tench can bury themselves in the mud and become dormant in winter, which may increase their likelihood of surviving Minnesota winters (GISD 2018). Their survival in Canada and the upper Mississippi River Basin indicate ability to survive in Minnesota’s waters. They feed on a variety of substances such as detritus, benthic animals, invertebrates, and plant materials. Additionally, they prefer shallow lakes with vegetation and mud, but can adapt to many habitats (EOL 2018). This adaptability and tolerance for a variety of conditions increases the likelihood that tench could naturalize in Minnesota. Our climate match assessment using the U.S. Fish and Wildlife Service’s Risk

Assessment Mapping Program (RAMP; Sanders et al. 2014) indicated that much of Minnesota was a mid-to-high climate match for tench establishment (Figure 1).

Previous observations have suggested that centrarchids, or fish from the sunfish family, may somehow slow or prevent the establishment of tench and that unknown environmental factors could also play a role in limiting their establishment (Baughman 1947; DeVaney et al. 2009).

How certain is this answer? Reasonably uncertain, supported by peer-reviewed literature but uncertain to environmental factors that reduce or extirpate tench populations.

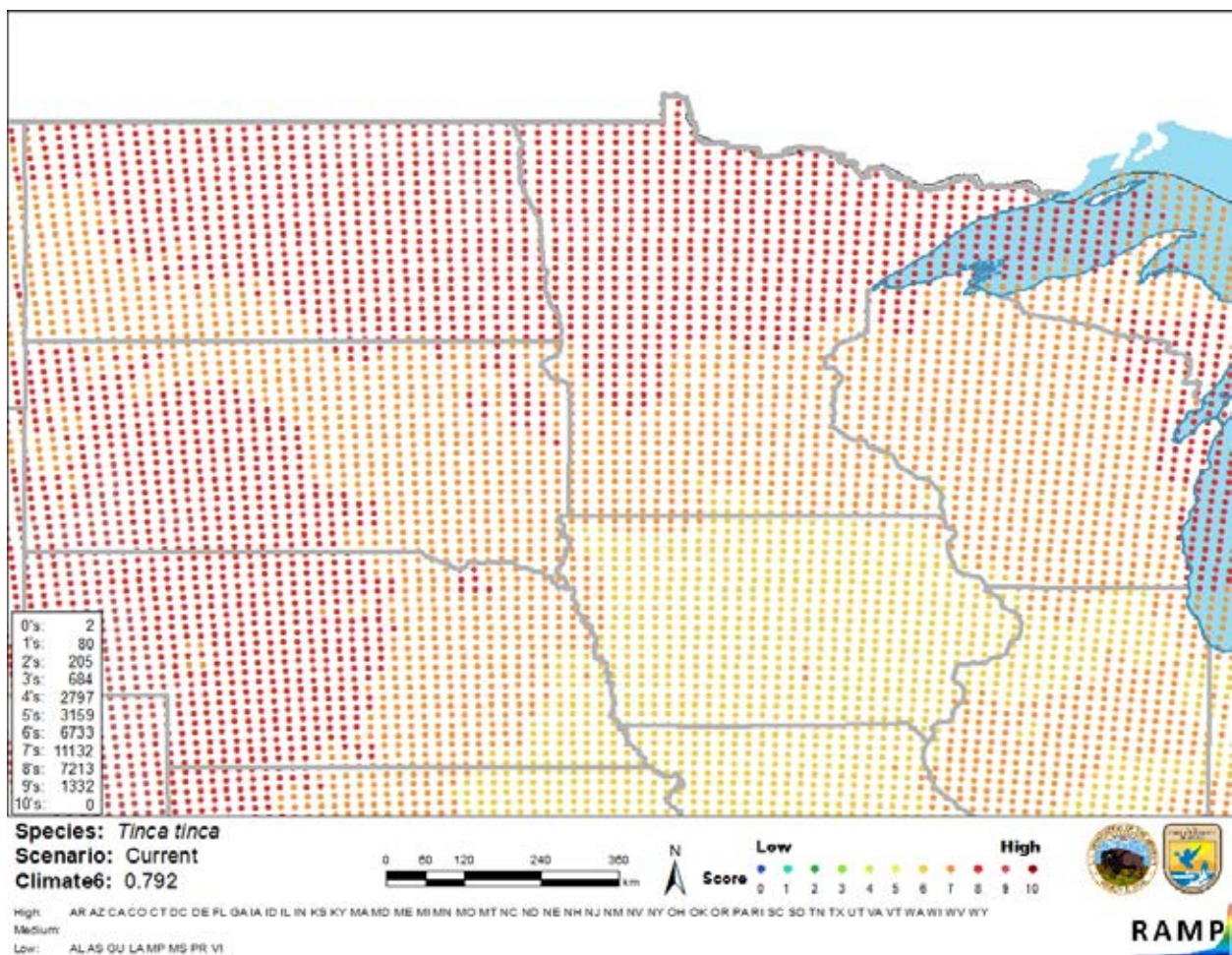


Figure 1. Risk Assessment Mapping Program (RAMP; Sanders et al. 2014) climate risk assessment for *Tinca tinca* in Minnesota and neighboring states. Assessment was conducted in 2019 using GBIF data, USGS NAS Database (Nico et al. 2019), and literature sources. 0 = Lowest Match, 10 = Highest match.

Potential negative impacts

For a nonnative species to be defined as “invasive” under Minnesota Statutes, section 84D.01, subd. 9a, the species must: cause, or have the potential to cause economic or environmental harm, harm to human health; or threaten or have the potential to threaten the use of natural resources in the state. This question has four components: economic, environmental, health, and natural resources.

4. Is the nonnative species an invasive species as defined under Minnesota law?

4.1. Does the species cause, or may it cause, economic harm? Uncertain. There is little evidence that tench cause economic harm. In Europe, it is popular for fishing and farmed for both food and ornamental value. In the United States it is popular as an amateur trophy fish, and may have impacts on the fishing industry, but the extent or severity of those effects is unclear. Tench carry parasites and may impact fishing and/or aquaculture as they would then infect native fish or stock.

How certain is this answer? Reasonably uncertain, lack of evidence or research.

4.2. Does the species cause, or may it cause, environmental harm? Yes. The impacts of invasive tench have not been widely studied in North America. In England, tench diet overlaps with native carps, eels, and waterfowl (Giles et al. 1990). In Canada, they have competitive interactions as molluscivores with other native benthic fishes (Avlijaš et al. 2018). If introduced to Minnesota, they may compete with our native benthic fish that feed on invertebrates, particularly mollusks. There is some evidence that tench have top-down food chain effects, especially at high densities (Rowe 2004). These food web effects have been implicated with declines in water quality (GISD 2018). In some studies, tench reduced macroinvertebrate populations, reduced zooplankton, and stimulated periphyton growth (Beklioglu and Moss 1998; Rowe 2004). Tench have also been attributed to degrading lake habitats (i.e. decreased clarity, reduced growth of submerged plants, increased algal growth) (Rowe 2004; Avlijaš et al. 2018).

Tench can transmit *Ligula intestinalis* which cause infertility in carp, *Valipora campylancristota* causing reduced growth and death to other minnows and carps (Marcogliese et al, 2009), a parasitic copepods *Ergasilus megaceros* (Marcogliese et al, 2009), and *Ergasilus sieboldi* which causes mortality in freshwater fisheries and considered a serious aquaculture pest (Kennedy and Fitzmaurice 1970; NFS no date).

How certain is this answer? Moderately certain, some peer-reviewed research.

4.3. Does the species cause, or may it cause, harm to human health? No. There is no evidence of tench causing harm to humans.

How certain is this answer? Reasonably certain, supported by peer-reviewed literature.

4.4. Does the species threaten, or may it threaten, the use of natural resources in the state?

Uncertain. Tench are considered invasive nuisance species in some countries where it has been introduced (GISD 2018). However, there is little research into the effects of tench on natural resources. They may affect aquatic communities by altering food webs through top-down or bottom-up influence (Rowe 2004). Tench have been associated with degraded aquatic ecosystems, but it is unclear whether tench were causing the degradation or if they were simply able to tolerate those environments (USFWS 2014).

How certain is this answer? Reasonably uncertain, lack of sufficient research.

Natural resource impacts

This is a criterion for classification of an invasive species under Minnesota Statutes, section 84D.04, subd. 2(3).

5. Would the species have potential adverse impacts in Minnesota, in particular on: native species, outdoor recreation, commercial fishing, and other uses of natural resources in the state?

- Choose Yes or No; if yes, continue to 5.1.

5.1. If so, what would be the magnitude of these adverse impacts? Tench have the potential to impact Minnesota native species' health, degrade water quality, outdoor recreation, and sport fishing. Tench would increase feeding competition with native benthic species, but it is unknown if they would be able to competitively exclude any species. Introductions of tench may also introduce aquatic parasites to native species that may not be equipped to tolerate (*Ligula intestinalis*, *Valipora campylancristota*, *Ergasilus megaceros*, and *Ergasilus sieboldi*). *Ergasilus sieboldi* in particular has been noted to be an aquaculture pest in the United Kingdom (Kennedy and Fitzmaurice 1970; NFS no date). These added pressures may compound with other environmental factors (i.e. degradation, changing climate) and create a larger negative impact on native benthic fish.

There is experimental evidence that high densities of tench would limit invertebrate populations and may lead to rapid growth of epiphytic plants that would then disrupt the growth of submerged plants (Brönmark 1994). Sediment disturbance from tench foraging, while not as detrimental as common carp foraging, will also contribute to declining water clarity and

submerged plant populations (de Moor and Bruton 1988). These impacts have the potential of shifting the aquatic ecosystem and lowering water quality for outdoor recreation and fishing. Historically in the United States, high densities of tench have been detrimental to sport fisheries (Avlijaš et al. 2018).

How certain is this answer? Reasonably uncertain, supported by some peer-reviewed literature, but much research does not focus solely on tench impacts but on tench in combination with other fish and thus it is hard to isolate tench impacts.

Management options

This is a criterion for classification of an invasive species under Minnesota Statutes, section 84D.04, subd. 2(4).

6. Would we be able to eradicate, or control the spread of, the species once it is introduced in Minnesota? Uncertain. Tench do not have a rapid expansion rate (Veraldi et al. 2001) and it may be possible to corral them for mechanical harvest. Populations may be controlled through predation by large predator fish such as largemouth bass (Rowe 2004) or interactions with sunfish (DeVaney et al. 2009). The extent that these control methods are successful is unknown as they are not widely utilized. Another possibility is that water temperatures in the winter prove lethal to the tench.

How certain is this answer? Reasonably uncertain, tench requirements and tolerances are supported by peer-reviewed literature, but little information is available on instances of eradication or control.

Other relevant information

This is a criterion for classification of an invasive species under Minnesota Statutes, section 84D.04, subd. 2(5). Information that may be included here includes, but is not limited to: economic impacts; regulations in other jurisdictions; and ongoing monitoring programs.

7. Are there other criteria the DNR commissioner deems appropriate? If so, discuss.

- Other considerations:
 - Tench have established in the Mississippi River and thus pose a threat via natural spread through waterways (Veraldi et al. 2011; Hoff 2010). Listing tench as a prohibited invasive species may help to stop the purchase and possession of tench, and subsequent accidental introductions via flooding or escape and the consequential spread through interconnected waterways.

- Regulations in other jurisdictions:
 - Tench is prohibited in the following Great Lakes jurisdictions: Michigan, New York, Ohio, and Wisconsin (Michigan Invasive Species Program 2019; NYCRR 2014; ODNR 2016; WDNR 2013). In Canada, Quebec and Ontario prohibit use of tench as live bait fish (Avlijaš et al. 2018, Ontario’s Invading Species Awareness Program 2012).
 - On May 4, 2018, the Great Lakes St. Lawrence Governors & Premiers announced five additions to the list of “least wanted” aquatic invasive species; tench was one of those species.

Summary

Summarize the findings of the screening form, including whether the species is nonnative and invasive as defined by Minnesota Statutes, chapter 84D, and characterize the overall certainty of the answers provided above.

Note that certain answers in the screening form may indicate that the species is not a good candidate for designating as a prohibited or regulated invasive species under *Minnesota Statutes*, chapter 84D:

- If you answered “Yes” to **either** 1a or 1b, the species is not “nonnative” as defined under *Minnesota Statutes*, chapter 84D; consider regulation under other authorities.
- If you answered “No” to **all** of 4a, 4b, 4c, and 4d, then the species is nonnative but may not be “invasive” as defined under *Minnesota Statutes*, chapter 84D; consider whether proposed introductions of this species should follow *Minnesota Rules*, part 6216.0290.

Summary: Tench is a member of the carp family that has a wide global distribution due to extensive introduction for recreational angling or fish pond stocking. It is a non-selective consumer that can tolerate a wide range of habitats. Little research has been conducted concerning the negative environmental or economic impacts of introduced tench. However, some studies suggest that tench can alter aquatic habitats through top-down or bottom-up effects on zooplankton and macroinvertebrates as well as increase competitive feeding pressure on native benthic species. Reduced water clarity and habitat degradation have been associated with tench. If introduced to Minnesota, it is likely that tench will establish and may affect natural resources in the state. The type or magnitude of these impacts is uncertain.

How certain is this classification summary, overall? Moderately certain, some peer-reviewed literature evidence.

Recommendation

The DNR may choose to recommend whether to designate the species as a prohibited invasive species, a regulated invasive species, or whether the species should be an unlisted nonnative species (Minnesota Statutes, section 84D.06). Briefly justify this recommendation and include any additional information such as recommended deadlines for updating this screening form and revisiting this decision and gaps in our knowledge that could be addressed by researchers.

Recommendation: Designate as a prohibited invasive species.

Appendix

Qualitative uncertainty ratings

Uncertainty rating	Description	Abbreviation
Very certain	As certain as I am going to get	VC
Reasonably certain	Reasonably certain	RC
Moderately certain	More certain than not	MC
Reasonably uncertain	Reasonably uncertain	RU
Very uncertain	A guess	VU

Uncertainty ratings from: “Generic Nonindigenous Aquatic Organisms Risk Analysis Review Process”, Risk Assessment and Management Committee report to the Aquatic Nuisance Species Task Force, 1996. Available [online](http://www.anstaskforce.gov/Documents/ANSTF_Risk_Analysis.pdf) (www.anstaskforce.gov/Documents/ANSTF_Risk_Analysis.pdf; accessed February 14, 2020).

Version notes

References to Minnesota Statutes are to the 2019 version.

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