



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

Template last updated February 2020

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

Classification Screening for Golden clam, *Corbicula fluminea*

Contents

| | |
|---|---|
| Classification Screening for Golden clam, <i>Corbicula fluminea</i> | 1 |
| Introduction..... | 1 |
| Species Summary..... | 2 |
| Eligibility Screening..... | 2 |
| Classification Screening | 3 |
| Summary..... | 6 |
| Appendix..... | 7 |
| References Cited..... | 7 |
| Additional References | 8 |

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) (<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: golden clam

Scientific name: *Corbicula fluminea*

Brief description: The golden clam is a small bivalve, an animal with two connected half shells, which is generally about one inch (25mm) although they can grow up to 2 inches (50mm). Their shells vary in color from light yellow or yellow-green to light brown, although some North American populations are darker brown. Their shells have raised concentric ridges, and the lateral teeth inside the shells on both anterior and posterior sides have many fine serrations.

Present classification in Minnesota: unlisted nonnative species

Proposed classification: prohibited invasive species

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. This species is native to tropical and temperate regions of the eastern Mediterranean extending west to southern Asia and Africa. Reports suggest its first occurrence in North America was on the Pacific Coast in the 1930's (Menninger; Sousa et al. 2008).
- 1.2. **Does the species naturally expand from its historic range into Minnesota?** No. The native range is not in 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?**
Yes. Corbicula clams may be used for food, bait and aquariums. Isolated populations of this species have been reported and confirmed from a few locations in major rivers in Minnesota, with reports occurring over multiple years. It is reasonable to expect that this species could be moved from these isolated groups.

How certain is this answer? Reasonably certain; distribution known from confirmed field reports.

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? Possibly. The occurrence of isolated persisting small populations in major rivers suggests that this species could survive in Minnesota waters. However, literature suggests that low temperatures (less than 2 degrees C) as well as low dissolved oxygen or high temperatures could result in mass mortality (Kramer-Wilt 2008). The occurrence of the scattered populations are near power plant locations, suggesting that other factors like warm water discharge, may create situations that allow for sustained populations. The lack of spread downstream from these isolated pools suggest that current seasonal conditions may not support spread.

However, a climate modelling study (McDowell et al. 2014), examining golden clam distribution in the future suggested that parts of southern Minnesota might become suitable for sustained population growth. Thus, while at this point this species may be limited in the state, this may change.

How certain is this answer? Reasonably certain; golden clam have been able to survive in parts of the state under current conditions and may be able to survive in more locations in the future.

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? Yes. Published literature documents the impacts of golden clam, including blocking intake pipes for power plants, water treatment plants and other industries that have intakes in waters with golden clam populations (Menninger 2013, Tiemann et al. 2017, Kramer-Wilt 2008, Foster et al. 2018).

How certain is this answer? Reasonably certain.

4.2. Does the species cause, or may it cause, environmental harm? Maybe. Literature suggests that dense accumulations of golden clam could prevent use of the substrate by native Unionids (freshwater mussels), or prevent juvenile Unionids from settling on suitable substrate to

develop (Sousa et al. 2008) although some of these potential impacts have not been sufficiently studied (Menninger 2013). Some researchers have also theorized that mass-die offs of golden clam during summer events could create ammonia and dissolved oxygen issues.

How certain is this answer? Reasonably certain.

4.3. Does the species cause, or may it cause, harm to human health? No published literature or reports document any impacts of introduced golden clam on human health in North America.

How certain is this answer? Moderately certain.

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

Unknown. Feeding on plankton by dense aggregations of this species may impact food chains in waters; however, there are no current reports of negative impacts to fisheries. Mass die-offs could create short-term dissolved oxygen issues, but this has not been reported in literature.

How certain is this answer? Reasonably uncertain.

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? Native freshwater mussels may be at risk of negative impacts from high-density golden clam populations.

How certain is this answer? Reasonably uncertain.

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? Unlikely. There is currently no control specific for golden clam in open water. Eradication of established widespread populations is very unlikely (Menninger 2013). Bottom barriers have been used in a trial in western U.S. to kill golden clam by creating anoxic conditions under the barriers. However, this control method is only feasible in small areas. The species may be killed by chemicals (copper, molluscicides) but due to the rapid reproductive capabilities and the hermaphroditic nature of this animal, only a very few individuals need to survive to repopulate an

area. A number of reports suggest that this species is adapted through this reproductive strategy to survive massive population crashes and recover rapidly.

How certain is this answer? Very certain.

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.

- Because golden clams may be in live trade for food, bait, and aquariums, classifying this species as a prohibited invasive species in Minnesota may help prevent their introduction and spread.
- Regulations in other jurisdictions:
 - *Corbicula fluminea* is regulated in the following Great Lakes jurisdictions (date): Indiana (1998); Wisconsin (2009); and New York (2014) (Tucker et al. 2017).

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: Populations of golden clams have already established in some Minnesota waters. This species may have negative economic impacts and may also have negative impacts on native mussel fauna. It is unclear whether the species would be likely to establish in all parts of the state under the current climate.

How certain is this classification summary, overall? Reasonably certain.

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.

References Cited

Foster, A.M., Fuller, P., Benson, A., Constant, S., Raikow, D., Larson, J., and Fusaro, A. 2018. *Corbicula fluminea* (O. F. Müller, 1774): U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, FL, <https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=92>

Kramer-Wilt, E. *Corbicula fluminea* (O.F. Muller, 1774) – Asian Clam. Unpublished - Aquatic Invasion Ecology Fall 2008.

McDowell, W. G., A. J. Benson, and J. E. Byers. 2014. Climate controls the distribution of a widespread invasive species: implications for future range expansion. *Freshwater Biology* (2014) 59, 847–857. doi:10.1111/fwb.12308

Menninger, H. 2013. The Asian clam, *Corbicula fluminea*: a brief literature review. Available at: http://vitalsignsme.org/sites/default/files/content/blog082511_asian_clam_brief_nyisri_2.pdf (accessed May 2018).

Sousa, R., C Antunes and L. Guilhermino. 2008. Ecology of the invasive Asian clam *Corbicula fluminea* (Müller, 1774) in aquatic ecosystems: an overview. *Ann. Limnol – Int. J. Lim.* 44(2): 85-94. Available at: <http://dx.doi.org/10.1051/limn:2008017>

Tiemann, J. S., A. E. Haponski, S. A. Douglass, T. Lee, K. S. Cummings, M. A. Davis, and D. O. Foighil. 2017. First record of a putative novel invasive *Corbicula* lineage discovered in the Illinois River, Illinois, USA. *BioInvasions Records* 6(2): 159-166. Available at: <https://doi.org/10.3391/bir.2017.6.2.12>

Tucker, Andrew; Chadderton, Lindsay; Hamilton, David; Jensen, Erika; and Weibert, Ceci. October 2017 Draft Paper: “Harmonizing Great Lakes Regulated Species: Progress towards reconciling a regional patchwork”.

Additional References

U.S. Fish and Wildlife Service (USFWS). 2015. Asian Clam (*Corbicula fluminea*) Ecological Risk Screening Summary, February 2011; Reviewed, September 2014 and July 2015. Available at: <https://www.fws.gov/fisheries/ans/erss/highrisk/Corbicula-fluminea-ERSS-revision-July2015.pdf>. Accessed May 11, 2018.