



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

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## Classification Screening for yellow floating heart, *Nymphoides peltata*

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### Contents

Classification Screening for yellow floating heart, <i>Nymphoides peltata</i> .....	1
Introduction.....	1
Species Summary.....	2
Eligibility Screening.....	3
Classification Screening.....	3
Summary.....	7
Appendix.....	8
References Cited.....	9

### Introduction

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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

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**Common name:** Yellow floating heart

**Scientific name:** *Nymphoides peltata*

**Brief description:** Yellow floating heart is a bottom-rooted aquatic plant. It has round or oval floating leaves and yellow flowers that rise above the water's surface. It can reproduce through both seeds and broken off stem fragments. It is a popular plant in the water garden industry, and is often sold through aquarium industries. Yellow floating heart has been introduced throughout parts of Europe as well as a number of states in the United States where it is considered a nuisance or invasive weed (CABI 2018; McFarland et al. 1998).

**Present classification in Minnesota:** unlisted nonnative species

**Proposed classification:** prohibited invasive species

**Current distribution:** Yellow floating heart is distributed throughout much of the world and the United States. It occurs in a number of Great Lakes states such as Wisconsin, Ohio, New York, Illinois, and

Michigan. There are no known populations nor have there been discoveries of yellow floating heart in Minnesota.

## Eligibility Screening

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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

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### 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. Yellow floating heart is native to southern Europe and parts of Asia. It has been introduced to a number of locations for cultivation in water gardens, but it originates from parts of Europe, England, and the Baltic region (Stuckey 1974).
- 1.2. **Does the species naturally expand from its historic range into Minnesota?** No. The historic range of yellow floating heart includes Europe and parts of Asia. Any populations that could

expand into Minnesota are non-indigenous or previously introduced populations (Stuckey 1974).

**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. Yellow floating heart is popular in the water garden industry, and has a high potential for escape. Many other introductions in the United States occurred from the escape of the plant or propagating parts of the plant into natural waterways. Plants can easily propagate through stem fragments, so even just a single plant can produce over a hundred new plants in the period of a few months (Stuckey 1974; CABI 2018).

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

## 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?** Yes. Yellow floating heart survives well in lakes, ponds, canals, ditches, and backwater areas. Its native range is similar in climate to Minnesota, and it has already become established in many areas beyond its native range that have a climate similar to Minnesota such as Sweden, Wisconsin, and Michigan (McFarland et al. 1998)

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

## 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. If yellow floating heart were to establish in Minnesota, cost of control measures could be high. In Sweden, approximately \$3-8 million USD is spent to control invasive yellow floating heart (Gren et al. 2007).

**How certain is this answer?** Reasonably uncertain, lack of peer-reviewed evidence.

**4.2. Does the species cause, or may it cause, environmental harm?** The effects of invasive yellow floating heart on ecosystem functions have not been fully studied; however, preliminary studies reveal that this species could negatively impact and outcompete native plants. Yellow floating heart leaves that float on the water's surface can create dense monotypic patches that reduce or block sunlight from reaching other plants and organisms on the lake bottom. One study found that natives such as coontail and Canadian waterweed suffered reduced growth from competition with moderate densities of yellow floating heart (Larson 2006).

The mats formed by yellow floating heart may also change nutrient cycling, restrain water flow, create stagnant and low-oxygen conditions, and displace fish and wildlife (Gren et al. 2007; USGS 2018).

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

**4.3. Does the species cause, or may it cause, harm to human health?** No definitive harmful effects to humans were found. There are some theories that yellow floating heart patches may provide breeding grounds for mosquitos that could carry diseases, but further research is needed to test these theories (USGS 2018).

**How certain is this answer?** Reasonably uncertain, lack of peer-reviewed evidence.

**4.4. Does the species threaten, or may it threaten, the use of natural resources in the state?** Yellow floating heart may negatively impact aquatic ecosystems by altering light availability, oxygen levels, and nutrient cycles. This could indirectly impact fish, invertebrate, and native plant populations (CABI 2018).

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

## 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?** Evidence from yellow floating heart introductions suggest that this species can significantly interfere with water recreation. By forming dense mats of floating leaves, this species can prohibit boat traffic and interfere with fishing, swimming, canoeing, water skiing, and kayaking. It can also lower the aesthetic value of a waterbody, which may diminish water recreation and tourism. The magnitude of these impacts could vary from a mild inconvenience to a significant interference depending on the size and type of both the lake and the population (Gren et al. 2007; CABI 2018).

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

## 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?** There are no known examples of a successful eradication of yellow floating heart, however there are examples of chemical and mechanical methods utilized to control this species.

Chemical control using the herbicides dichlobenil and glyphosate has been used to reduce populations of yellow floating heart. Trials of these herbicides show relative effectiveness for reducing yellow floating heart. However, multiple treatments are often required, and the cost may be significant (CABI 2018, Gren et al. 2007).

Mechanical cutting and removal of yellow floating heart has also been attempted. However, due to this species' ability to reproduce from single stem fragments and rhizomes, mechanical harvesting often fails or even facilitates further spread of the plant. Indeed, in Sweden, rhizomes and roots of yellow floating heart survived mechanical harvesting, and plant fragments left behind from the harvesting rooted and increased the plants' distribution (Josefsson and Andersson 2001).

**How certain is this answer?** Moderately certain, supported by some peer-reviewed literature.

## 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.**

- On May 4, 2018, the Great Lakes St. Lawrence Governors & Premiers announced five additions to the list of “least wanted” aquatic invasive species; yellow floating heart was one of those species (<http://www.gsgp.org/news/great-lakes-st-lawrence-governors-premiers-add-five-least-wanted-ais/>; accessed May 11, 2018).
- Regulations in other jurisdictions: Yellow floating heart is regulated in the following Great Lakes jurisdictions (date): Michigan (2005); Wisconsin (2009, prohibited); Indiana (2012); Illinois (2013); and New York (2014) (Tucker et al. 2017). It is currently present in the environment in Michigan, Wisconsin, Ohio, Illinois, and New York.
- Evidence suggests that other exotic plants could hitchhike in shipments of yellow floating heart for water garden cultivation. In particular, *Hydrilla verticillata*, a prohibited invasive species in Minnesota, could enter the state through contaminated shipments of yellow floating heart (USGS 2018). Yellow floating heart is a popular plant for cultivating in the water garden industry. Listing this species as prohibited in Minnesota may impact local water garden trade.

## Summary

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*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:** Yellow floating heart is an emergent aquatic plant that is native to parts of Europe and Asia, but has been introduced throughout parts of the United States and Europe beyond its native range. Evidence from Sweden and other Great Lakes states suggests that it can survive well in cold-temperate climates like Minnesota. A single stem or root fragment is capable of growing and reproducing to establish a new population. Therefore the likelihood this species could establish if introduced to the state is high. Yellow floating heart creates mats of floating leaves on the water’s surface that interfere with water recreation and watercraft, as well as limit light availability for submerged aquatic plants. This plant can also affect nutrient and oxygen levels in aquatic ecosystems, potentially negatively

impacting native species. There are some methods for controlling yellow floating heart, but none of these have proven successful at completely eradicating this plant.

**How certain is this classification summary, overall?** Reasonably certain, supported by peer-reviewed literature.

## 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

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### 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

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