

# Washington Invasive Ranking System

Washington Natural Heritage Program

## *Myriophyllum spicatum* (Eurasian Watermilfoil)

Assessed by

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Ecological Impact Rank: **High** (80)

Confidence: **High** (92)

Management Difficulty Rank: Moderate (58)

Confidence: High (70)

Biological Characteristics of Invasiveness: High (92)

Confidence: High (67)

Concern Related to Distribution and Abundance: High (73)

Confidence: High (90)



**Photo Credit:** Thayne Tuason 2010, used under Creative Commons license (Burke Herbarium, University of Washington, 2024).

### Ranking Notes

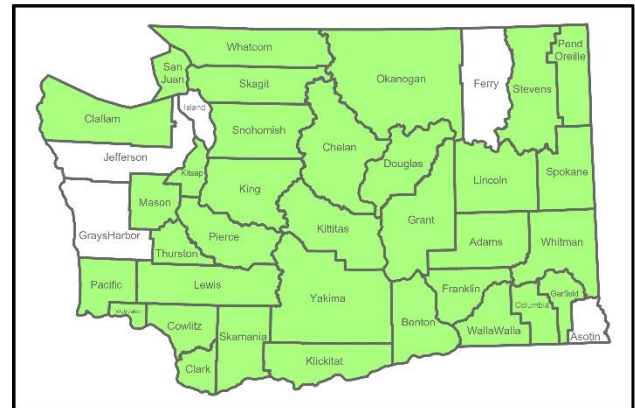
None.

### Legal Listings

[Washington State Weed Board](#): Class B, Washington State quarantine list

[Washington Invasive Species Council](#): Yes

### Section 1: Distribution and Abundance



**Figure 1.** Distribution of counties where *Myriophyllum spicatum* has been documented in Washington State (CPNWH, 2023; EDDMapS, 2023; iNaturalist Contributors, 2023).

### Q1: Current Range Size in Washington

Rating: High

Confidence: High

*Myriophyllum spicatum* is documented from 87% of counties in Washington State. We have good data on Eurasian watermilfoil locations in waterbodies throughout the state. The species often tops out on the water's surface, so it is easily recognized by surveyors and the public. Spatial data is copious (CPNWH, 2023; EDDMapS, 2023; iNaturalist Contributors,

2023; WSDA, 2023; Washington State Department of Ecology, 2023a).

Source: Herbarium records and other observations

### **Q2: Current Trend in Total Range**

Rating: High

Confidence: High

While the rate of spread seems to have slowed recently, a 20-year view still shows a steady increase in the number of lakes (and counties) colonized by Eurasian watermilfoil, with new lakes being discovered each year. Populations have been eradicated from some individual lakes, but the general range size has continued to grow steadily over the time span. Data collected by the Washington State Department of Ecology supports this range expansion (Washington State Department of Ecology, 2023a, 2023b).

Source: Professional expertise, Washington State Department of Ecology data

### **Q3: Proportion of Potential Range Currently Unoccupied**

Rating: Low

Confidence: High

In terms of counties, only a few have not reported any Eurasian watermilfoil. However, many lakes still remain free of Eurasian watermilfoil and could be easily colonized. This species can tolerate most water conditions and readily invades a variety of aquatic ecosystems (WSDA, 2023; Washington State Department of Ecology, 2023b, 2023a).

Source: Professional Expertise, Department of Ecology data

### **Q4: Local Range Expansion or Change in Abundance**

Rating: Low

Confidence: Moderate

While the Department of Ecology collects rough abundance data during lake surveys, these data are not fine-scale enough or collected frequently enough to determine accurate trends in abundance (Washington State Department of Agriculture (WSDA), 2023;

Washington State Department of Ecology, 2023a, 2023b). Across the state, familiarity with this species has led to quick management action where it is found. In some locations, populations have declined due to management, while other populations have expanded. The assessor estimates that there has been a net range expansion and abundance increase, but that it is overall low when examined across the state. However, we lack good state-wide data to support any strong conclusions.

Source: Professional expertise, Washington State Department of Ecology data

### **Q5: Diversity of Ecosystems Invaded**

Ecosystem types: Shallow Water Wetland (Aquatic)

Rating: Low

Confidence: High

This plant grows rooted to the bottom of freshwater lakes, rivers, and streams. It can tolerate a wide range of salinity and pH, but is not typically found in shallow marshes, salt marshes, bogs, or fens (Aiken et al., 1979; Smith & Barko, 1990).

Source: Published Research, Professional Expertise

## **Section 2: Biological Characteristics**

### **Q6: Aggressive Mode of Reproduction**

Rating: Yes

Confidence: High

Reproduces readily by fragments and seeds, both supported by many studies (Aiken et al., 1979; Madsen & Boylen, 1989, 1989; Smith & Barko, 1990; Hartleb et al., 1993; Madsen & Smith, 1997; Standifer & Madsen, 1997; Evans et al., 2011; Li et al., 2013; Wani & Arshid, 2013).

Source: Published research, Professional expertise

### **Q7: Innate Potential for Long-Distance Dispersal**

Rating: Yes

Confidence: High

Plant fragments are easily moved via water movement. Waterbirds can also disperse propagules

(Madsen et al., 1991; Madsen & Smith, 1997). See also studies cited for Q6.

Source: Published research, Professional expertise

**Q8: Potential to be Spread by Human Activities**

Rating: Yes

Confidence: High

There is clear evidence that boats move aquatic invasive species such as Eurasian watermilfoil and that Eurasian watermilfoil fragments moved by boaters can survive for several hours before dying (Evans et al., 2011; Jerde et al., 2012; Mcalarnen et al., 2012; Kao et al., 2021; Pfingsten et al., 2024).

Source: Published research, Informal publication, Professional expertise

**Q9: Allelopathy**

Rating: Not Rated

Confidence: Not Rated

Source:

**Q10: Competitive for Limiting Abiotic Factors**

Rating: Yes

Confidence: High

Eurasian watermilfoil can occur at deeper depths than other macrophytes, can grow quickly in the spring to reach the surface, and can photosynthesize at lower water temperatures than most native species, providing it with a competitive advantage (Smith & Barko, 1990; Glisson & Larkin, 2021). While most of the plant dies back, some green stems persist throughout the winter in the climates of both western and eastern Washington. The rate of photosynthesis slows substantially, but still occurs during winter months (Adams & McCracken, 1974).

Source: Published research, Professional expertise

**Q11: Growth Form**

Rating: Yes

Confidence: High

As a canopy-forming species, it reduces light for other species below (Aiken et al., 1979; Smith & Barko, 1990; Madsen et al., 1991; Boylen et al., 1999).

Source: Published research, Professional expertise

**Q12: Germination Requirements**

Rating: Yes

Confidence: Moderate

Most research has been in a lab setting and Eurasian watermilfoil seeds do have constraints to germination (Hartleb et al., 1993; Wani & Arshid, 2013). Hence, the ability of seeds to germinate under a range of different environmental conditions *in situ* is still not fully understood.

Source: Published research, Professional expertise

**Q13: Invasiveness of Other Plants in Genus**

Rating: Yes

Confidence: High

There are several *Myriophyllum* species that are known invasives both in North American and across the world. *Myriophyllum heterophyllum* is a Class A listed noxious weed (NWCB, 2023a) and *Myriophyllum aquaticum* is a Class B listed noxious weed in Washington State (NWCB, 2023b).

Source: Informal publication, Professional expertise

**Q14: Shade Tolerance**

Rating: High

Confidence: Moderate

This species thrives in lower light conditions and quickly becomes the canopy-forming species in aquatic environments.

Source: Professional expertise

**Q15: Disturbance Tolerance**

Rating: Yes

Confidence: High

The species can occur in low light conditions and on substrates where other species are unable to survive. It often invades following disturbance (Smith & Barko, 1990).

Source: Published Research, Professional Expertise

#### **Q16: Propagule Persistence**

Rating: >5 years

Confidence: Low

The assessor is not aware of research on the long-term longevity of propagule viability for Eurasian watermilfoil. Stem fragments likely do not persist for more than several months to a year. Studies suggest that seeds can remain viable for 3-7 years, but they may actually be viable for longer (Guppy, 1897; Patten, 1955; Aiken et al., 1979; Standifer & Madsen, 1997).

Source: Published research, Professional expertise

#### **Q17: Palatability**

Rating: Not Rated

Confidence: Not Rated

Source:

### **Section 3: Ecological Impact**

#### **Q18: Impact on Ecosystem Abiotic Processes**

Abiotic Processes: Hydrology, Light availability

Rating: Moderate

Confidence: High

There is a lot of evidence of Eurasian watermilfoil impacts to abiotic processes, but importantly, these are often reversible with milfoil management (Aiken et al., 1979; Smith & Barko, 1990; Madsen et al., 1991; Boylen et al., 1999).

Source: Published research, Professional expertise

#### **Q19: Impact on Ecosystem Structure**

Rating: Moderate

Confidence: High

This species creates a new aquatic plant canopy structure that is different than most native vegetation (Aiken et al., 1979; Smith & Barko, 1990; Madsen et al., 1991; Boylen et al., 1999).

Source: Published research, Professional expertise

#### **Q20: Impact on Ecosystem Composition**

Rating: Moderate

Confidence: Moderate

Eurasian watermilfoil invasion has been associated with declines in native species richness in several lakes where it has been studied intensively. However, when examining more colonized lakes across the landscape this relationship is not supported (Mikulyuk et al., 2020). Hence, the plant community response to Eurasian watermilfoil invasions varies by lake and is not always negative. Moreover, native macrophyte species declines can be associated with other environmental changes such as reductions in water quality and disturbance that promote concurrent Eurasian watermilfoil invasion (Aiken et al., 1979; Smith & Barko, 1990; Madsen et al., 1991; Boylen et al., 1999; Verhoeven, 2022).

Source: Published research, Professional expertise, Thesis

#### **Q21: Impact on Particular Native Species**

Rating: High

Confidence: High

Eurasian watermilfoil hybridizes readily with native northern watermilfoil (*Myriophyllum sibirium*) (Moody & Les, 2002; Eltawely et al., 2020; Thum et al., 2020). Many hybrid genotypes have been found, indicating routine hybridization events. Hybridization occurs in Washington and is likely more widespread than currently known. Continued spread of Eurasian watermilfoil and hybridization may deplete the pure gene pool of northern watermilfoil and ultimately cause local or regional extinction.

Source: Published research, Professional expertise

**Q22: Observed Ability to Invade Undisturbed Ecosystems**

Rating: High

Confidence: High

While Eurasian watermilfoil establishes most readily in recently disturbed areas, it can establish in mature plant beds (Aiken et al., 1979; Smith & Barko, 1990).

Source: Professional expertise

**Q23: Observed Ability to Invade Naturally Disturbed Ecosystems**

Rating: Yes

Confidence: High

Eurasian watermilfoil readily invades disturbed habitat and ecosystems (Aiken et al., 1979; Smith & Barko, 1990).

Source: Published research, Professional expertise

**Section 4: Management Difficulty**

**Q24: General Management Difficulty**

Rating: Moderate

Confidence: High

There has been a lot of research on the control of Eurasian watermilfoil and new compounds and methods have been developed that are much more effective than those used in the past (Hussner et al., 2017; Kujawa et al., 2017; Mikulyuk et al., 2020). Controlling the species to a reasonable level is relatively simple using current tools, but it still takes a long time and can be expensive. Complete eradication is still very difficult and rarely achieved.

Source: Published research, Professional expertise

**Q25: Minimum Time Commitment**

Rating: Moderate

Confidence: Moderate

This species will likely continue to spread in a waterbody unless eradication is achieved, which requires multiple years of management (Smith &

Barko, 1990; Kujawa et al., 2017; Mikulyuk et al., 2020). At a minimum, a low level of management is needed at most locations, but some populations may require greater than 10 years of treatment. On average, for a population of 2.5 acres, approximately 5 years of repeated management and surveys could result in an eradicated population, or control to the level that the population is low and follow-up treatments could only be needed every few years.

Source: Published research, Professional expertise

**Q26: Impacts of Management on Native Species**

Rating: Moderate

Confidence: Moderate

Recent research highlights that native plant richness and some individual species decline in response to Eurasian watermilfoil management with herbicides (Parsons et al., 2009; Kujawa et al., 2017; Mikulyuk et al., 2020). Several herbicides used for Eurasian watermilfoil management are not highly selective and can harm non-target native species. Recently developed herbicides such as florpypyrauxifen-benzyl are much better at targeting milfoil species but will likely negatively impact our native milfoils if they are found in the same waterbody.

Source: Published research, Professional expertise

**Q27: Inaccessibility of Invaded Areas**

Rating: Low

Confidence: Moderate

This is difficult to assess for a species that can occur at 30 ft of water depth. The Department of Ecology uses tools such as sonar and plant rakes to determine where Eurasian watermilfoil occurs in a deep or turbid waterbody, but these tools are imperfect. Most areas on colonized waterbodies are easy to access by boat, but the actual plants beneath the water may not be easy to target with management.

Source: Professional expertise

**Q28: Sociopolitical Implications of Management**

Rating: Insignificant

Confidence: High

For the most part, folks want to manage Eurasian watermilfoil where it occurs. However, there are different opinions of how best to manage the species and where and when herbicides should be used. Sometimes there is opposition to the most effective management approach.

Source: Professional Expertise

### Additional Comments

None

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