



Figure 1: *Ceratopteris thalictroides* (water sprite). Photo by Shaun Winterton, Aquarium and Pond Plants of the World, Edition 3, USDA APHIS PPQ, Bugwood.org

California Pest Rating Proposal for

Ceratopteris thalictroides (L.) Brongniart: water sprite

Family: Pteridaceae

Current Pest Rating: B

Proposed Pest Rating: D

Comment Period: **10/02/2019 through 11/16/2019**

Initiating Event:

This plant has been included on the CDFA noxious weed list [3 CCR § 4500] as a B-rated plant pest. However, water sprite has not been reviewed under the current pest rating system. A pest rating proposal is required to evaluate the current rating and status of water sprite in the state of California.

History & Status:

Background: Water sprite (*Ceratopteris thalictroides*) is an obligate wetland fern. It is a perennial plant whose natural habitat is still and sluggish waters and the margins of lakes, rivers, ponds, and swamps. Water sprite has a compact stem bearing numerous roots (Winterton, 2018). Its leaf shapes are highly variable in shape and habit on the same plant. Some leaves are emersed and others are floating. The floating leaves are often thick and fleshy with deep lobes on the margins. One form of emersed leaf is somewhat wide and relatively flat. Another form of emersed leaf is stiff, finely divided, and frilly, resembling thick needles (CAIP, 2018). These frilly leaves are the reproductive leaves and have ball-shaped sporangia on the undersides. The sporangia are the structures in which spores are produced (CAIP, 2018). Water sprite can be dispersed by spores, plantlets, and leaf fragments (Winterton, 2018). Water sprite does not produce flowers.

Water sprite is a popular aquarium plant that is prized for its versatility. It can be used both as a floating plant and a plant that can be rooted in the substrate.

Worldwide Distribution: Water sprite is native to China, Japan, northern Australia, the Philippines, and India. It has been introduced to many areas and is found worldwide in tropical areas except Africa (Lloyd, 1993). In the United States it is a common invasive in central and southern Florida but rare elsewhere (Lloyd, 1993). It is found in a few locations in Texas (Bowles and Bowles, 2017), Louisiana (Neyland, 2011), and Hawaii (Wilson, 1996).

Official Control: Water sprite has been included on the CDFA noxious weed list [3 CCR § 4500] as a B-rated plant pest. It is a Tier II invasive weed in Louisiana. It does not appear to be regulated in any other locations.

California Distribution: There was a single population of water sprite in Southern California that appears to have been a recent introduction, but this did not persist (Lloyd, 1993; CalFlora, 2019).

California Interceptions: There have been six interceptions by county inspectors of water sprite in shipments of aquatic plants to pet stores, aquariums, and aquatic nurseries by Los Angeles, San Francisco, and Contra Costa County inspectors since 2003.

The risk water sprite would pose to California is evaluated below.

Consequences of Introduction:

- 1) Climate/Host Interaction:** The preferred habitat for water sprite is swampy areas, marshes, and the edges of natural and man-made ponds. A study in India showed that water sprite grew preferentially
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in areas of high rainfall and humidity, but not in areas with annual rainfall below (3000 mm) or mean humidity below 70% (Patil et al., 2016). Since California is quite dry, this would suggest that water sprite is unlikely to establish widely in the state. Therefore, water sprite receives a **Low (1)** in this category.

Evaluate if the pest would have suitable hosts and climate to establish in California.

Score: 1

- **Low (1) Not likely to establish in California; or likely to establish in very limited areas.**
- Medium (2) may be able to establish in a larger but limited part of California.
- High (3) likely to establish a widespread distribution in California.

- 2) Known Pest Host Range:** Risk is **High (3)** as weeds do not require any one host, but grow wherever ecological conditions are favorable.

Evaluate the host range of the pest.

Score: 3

- Low (1) has a very limited host range.
- Medium (2) has a moderate host range.
- **High (3) has a wide host range.**

- 3) Pest Dispersal Potential:** Water sprite can be dispersed by spores, plantlets, and leaf fragments. The spores germinate readily on muddy soils. Water sprite receives a **Medium (2)** in this category.

Evaluate the natural and artificial dispersal potential of the pest.

Score: 2

- Low (1) does not have high reproductive or dispersal potential.
- **Medium (2) has either high reproductive or dispersal potential.**
- High (3) has both high reproduction and dispersal potential.

- 4) Economic Impact:** Water sprite can grow along the edges of drainage and water supply ditches. Water sprite can occur in floating patches or mats of other vegetation or mixed in with other vegetation rooted in shallow water. It could potentially interfere with the delivery or supply of water. Water sprite receives a **Low (1)** in this category.

Evaluate the economic impact of the pest to California using the criteria below.

Economic Impact: G

- A. The pest could lower crop yield.
 - B. The pest could lower crop value (includes increasing crop production costs).
 - C. The pest could trigger the loss of markets (includes quarantines).
 - D. The pest could negatively change normal cultural practices.
 - E. The pest can vector, or is vectored, by another pestiferous organism.
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- F. The organism is injurious or poisonous to agriculturally important animals.
- G. **The organism can interfere with the delivery or supply of water for agricultural uses.**

Economic Impact Score: 1

- **Low (1) causes 0 or 1 of these impacts.**
- Medium (2) causes 2 of these impacts.
- High (3) causes 3 or more of these impacts.

5) Environmental Impact: In areas similar to California where water sprite has invaded, it has not formed monocultures, but rather has become a minor part of the shoreline ecosystem. In Texas, water sprite was first introduced in 1963, but by 2001, it made up less than 0.5% of the shoreline vegetation sampled along the San Marcos River (Owens, et al., 2001) and it is only a minor invasive in two of five spring systems surveyed in that state between 1982 and 2011 (Bowles and Bowles, 2017). It also was introduced to Louisiana, but is considered to be rare (Neyland, 2011). Therefore, it receives a **Low (1)** in this category.

Environmental Impact: None

- A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.
- B. The pest could directly affect threatened or endangered species.
- C. The pest could impact threatened or endangered species by disrupting critical habitats.
- D. The pest could trigger additional official or private treatment programs.
- E. The pest significantly impacts cultural practices, home/urban gardening or ornamental plantings.

Environmental Impact Score:

- **Low (1) causes none of the above to occur.**
- Medium (2) causes one of the above to occur.
- High (3) causes two or more of the above to occur.

Consequences of Introduction to California for water sprite: Low (8)

Add up the total score and include it here.

-Low = 5-8 points

-Medium = 9-12 points

-High = 13-15 points

6) Post Entry Distribution and Survey Information: There was a single population of water sprite in Southern California. This appears to have been a recent introduction and it did not persist (Lloyd, 1993). It receives a **Not established (0)** in this category.

Score: 0

-Not established (0) Pest never detected in California or known only from incursions.

-Low (-1) Pest has a localized distribution in California or is established in one suitable climate/host area (region).

-Medium (-2) Pest is widespread in California but not fully established in the endangered area, or pest established in two contiguous suitable climate/host areas.

-High (-3) Pest has fully established in the endangered area, or pest is reported in more than two contiguous or non-contiguous suitable climate/host areas.

7) The final score is the consequences of introduction score minus the post entry distribution and survey information score:

Final Score: Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information = Low (8)

Uncertainty:

Water sprite's ability to invade appears to depend on climate. It has successfully colonized central and southern Florida, but has not grown particularly well anywhere else in the United States. This may possibly be due to variations in humidity or other climatic factors.

Conclusion and Rating Justification:

Water sprite is an old aquarium plant and was most likely introduced to California aquaculture in the early 20th century. It was first detected in California in the wild in 1985 (CalFlora, 2019), but has not established a viable population. The climate of California does not appear to be conducive to the spread of this plant, therefore, a "D" rating is justified.

References:

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***Comment Period: 10/02/2019 through 11/16/2019**

***NOTE:**

You must be registered and logged in to post a comment. If you have registered and have not received the registration confirmation, please contact us at plant.health[@]cdfa.ca.gov.

Comment Format:

- ❖ Comments should refer to the appropriate California Pest Rating Proposal Form subsection(s) being commented on, as shown below.

Example Comment:

Consequences of Introduction: 1. Climate/Host Interaction: [Your comment that relates to “Climate/Host Interaction” here.]

- ❖ Posted comments will not be able to be viewed immediately.
 - ❖ Comments may not be posted if they:
 - Contain inappropriate language which is not germane to the pest rating proposal;
 - Contains defamatory, false, inaccurate, abusive, obscene, pornographic, sexually oriented, threatening, racially offensive, discriminatory or illegal material;
 - Violates agency regulations prohibiting sexual harassment or other forms of discrimination;
 - Violates agency regulations prohibiting workplace violence, including threats.
 - ❖ Comments may be edited prior to posting to ensure they are entirely germane.
 - ❖ Posted comments shall be those which have been approved in content and posted to the website to be viewed, not just submitted.
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Proposed Pest Rating: D
