Weed Risk Assessment for

Onopordum acaulon L.

Stemless thistle

Addendum to a report, Analysis and Assessment of the Invasive risk of *Onopordum acaulon*, submitted by Sarah Reichard and Lizbeth Seebacher, University of Washington, College of Forest Resources, Center for Urban Horticulture.
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Addendum to a report, Analysis and Assessment of the Invasive risk of *Onopordum acaulon*, submitted by Sarah Reichard and Lizbeth Seebacher, University of Washington, College of Forest Resources, Center for Urban Horticulture.

This addendum provides a risk assessment that conforms to the USDA, Animal and Plant Health Inspection Service (APHIS) format for weed risk assessment (WRA). The information from the report was adapted to this format and risk ratings were assigned by Polly Lehtonen, USDA, APHIS, Plant Protection and Quarantine.

Stage 1: Initiating Weed Risk Assessment (WRA) Process

Step 1. Document the Initiating Event(s) for the WRA.

This assessment is part of Plant Protection and Quarantine's continuous effort to identify potential Federal noxious weeds. The attached report was the product of a USDA Invasive Species Coordination initiative, a contract with Dr. Sarah Reichard of the University of Washington. The WRA area is the United States.

Step 2. Identify and Cite Previous Risk Assessments.

This is the first USDA weed risk assessment for this species.

Step 3. Establish Identity of Weed.

Scientific Name: Order, Family, Genus, and species:

Asterales, Asteraceae, *Onopordum acaulon* L.

Synonym(s): None.

Common name(s): stemless thistle, horse thistle, stemless onopordum

Description, general morphology:

Onopordum acaulon is a prostrate annual or (rarely) biennial herb, which is stemless or nearly so, with the stalks rarely exceeding four inches in length. The short-stalked leaves are six inches to 15 inches long and deeply dissected into spine-toothed lobes and are narrow and oblong, gray or white-hairy on both surfaces. The flower heads are white or purple, and form at the center of the basal rosettes of foliage (Everett, 1981). Seeds are gray-brown and about 4 mm long. They are four-sided, pitted and ridged lengthwise, with a pappus of cream-colored barbed hairs about .....

25mm long (Parsons and Cuthbertson, 1992; Agriculture Western Australia web site).

Pertinent information regarding life history, including growth, development, means of reproduction and dispersal:

In Australia, stemless thistles germinate from seed mainly in the autumn. Plants develop during winter into small rosettes, which grow rapidly in spring. They flower from October to November and then die in summer. Some seeds germinate during winter and spring, but most of the resulting plants do not develop sufficiently to flower before dying. Under favorable conditions, some of these plants do survive and flower in the second summer, thus becoming biennial. Reproduction is by seeds only (Parsons and Cuthbertson, 1992; Agriculture Western Australia web site).

Preferred habitat and climatic tolerance:

Stemless thistles are usually found in steppes, stony slopes, fallow fields and any disturbed grounds (Brickell, 1996). They thrive in full sun or part-shade (Everett, 1981). They are found on sandy to heavy soils and calcareous loams (Reed, 1977). In Australia, they occur sporadically in high rainfall regions, but extensive infestations occur in drier regions (Auld and Medd, 1992).

Native distribution:

Africa: Algeria, Morocco, and Tunisia
Europe: France and Spain

Current world distribution beyond native distribution:

Naturalized in Australia

Stage 2: Assessing pest risk of the weed

Step 4. Geographic and Regulatory Information:

Onopordum acaulon is not recorded in the United States.

Step 5. Assess Economic and Environmental Importance: Consequences of Introduction.

After each of the four risk elements (A-D) in step 5, we discuss the rationale for the rating and the level of certainty.

A. Establishment potential or habitat suitability in the protected area. Estimate the potential

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range in the United States, considering suitable climate conditions.

Assign rating as follows:

Rating	Numerical Score	Explanation: A suitable climate and habitats would permit the weed to survive and establish:
High	3	In most or all of the United States (generally, in more than four plant hardiness zones).
Medium T	2 T	Approximately one-third to two thirds of the United States (generally, in three or four plant hardiness zones).
Low	1	Approximately one third or less of the United States (one or two plant hardiness zones).
Negligible	0	No potential to survive and become established in the WRA area.

Rationale for the rating and the level of certainty:

Based on the Climate prediction model using known locations within the species distribution, the climatic correlation is very high throughout the southeast and within the states of Texas, California and Arizona.

Level of certainty = Uncertain. The prediction is based on climate preference and documented distribution in other parts of the world.

B. Spread potential after establishment, Dispersal Potential

Check each of the following that apply:

- Consistent and prolific seed production
- Rapid growth to reproductive maturity
- High germination rate under a wide range of conditions
- Ability to suppress the growth of other plants by releasing a chemical inhibitor
- Ability to persist as dormant long-lived propagules or underground parts, such as rhizomes, tubers, turions or stolons
- Seed dormancy T
- Stress tolerance, including ability to resist herbicides
- Ability to colonize a wide variety of habitats
- Lack of natural control agents
- Well-developed storage tissue (for example, tap root) T
- Dispersal by windT, waterT, machinery T, animals T, and/or humans T

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Assign rating as follows:

Rating	Numerical score	Explanation
High	3	Weed has potential for rapid natural spread throughout its potential range in the WRA area (*e.g.*, high reproductive potential ***AND*** highly mobile propagules).
Medium T	2 T	Weed has potential for natural spread throughout a physiographic region of the WRA within a year (*e.g.*, it has either high reproductive potential ***OR*** highly mobile propagules).
Low	1	Weed has potential for natural spread locally in the WRA area within a year (some reproductive potential and/or some mobility of propagules).
Negligible	0	Weed has no potential for natural spread in the WRA area.

Rationale for the rating and the level of certainty:

Stemless thistles produce seeds, which are primarily dispersed by wind. They may also be spread by vehicles, contaminated produce, wild animals, stock, and probably along channels with water movement. Seeds survive in the soil for several years (Parsons and Cuthbertson, 1992; Agriculture Western Australia website).

Human-assisted movement is evidenced by the introduction of Onopordums into Australia on many occasions as ornamentals and as agricultural contaminants.

Stemless thistles have taproots with numerous laterals (Parsons and Cuthbertson, 1992).

Level of certainty = Somewhat uncertain. A medium rating is supported by the available evidence, but the rating could be higher.

C. Economic Impact.

Discuss the potential economic importance of the species in the WRA area. Consider three primary types of damage:

1. Reduced crop yield (*e.g.*, by parasitism, competition, or by harboring other pests).
2. Lower commodity value (e.g., by increasing costs of production, lowering market price, or a combination); or if not an agricultural weed, by increasing costs of control.T
3. Loss of markets (foreign or domestic) due to presence of a new quarantine pest.T

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Assign ratings as follows:

Rating	Numerical score	Explanation
High	3	Weed causes all three of the above impacts, or causes any two impacts over a wide range (over 5 types) of economic plants, plant products, or animals.
Medium T	2 T	Weed causes any two of the above impacts, or causes any one impact to a wide range (over 5 types) of economic plants, plant products, or animals.
Low	1	Weed causes any one of the above impacts.
Negligible	0	Weed causes none of the above impacts.

Rationale for the rating and the level of certainty:

Rarely eaten by stock except when it is wilting, *Onopordum acaulon* reduces the carrying capacity of heavily infested paddocks. Hungry stock forced to eat stemless thistle suffer from stomach impaction. Sometimes liver and kidney damage also occurs (Parsons and Cuthbertson, 1992; Agriculture Western Australia web site).

The herbicides that are effective against stemless thistle damage pasture legumes grown in association. A program of cultivation, lucerne establishment and limited spraying is recommended in Australia.

Onopordum acaulon is a prohibited species of New Zealand and would affect any exports contaminated with propagules of the species (MAF, 1999).

Level of certainty = uncertain. The risk rating could be higher. Stemless thistle occurs in irrigated vegetable crops and cultivated land in southeastern Australia, but it is not known to what extent they compete for nutrients with other crops and what effect heavy patches may have on subsequent crops (Parsons and Cuthbertson, 1992).

D. **Environmental Impact**

Consider whether or not the weed, if introduced, could:

- Cause impacts on ecosystem processes (alteration of hydrology, sedimentation rates, a fire regime, nutrient regimes, changes in productivity, growth, yield, vigor, etc.).
- Cause impacts on natural community composition (*e.g.*, reduce biodiversity, affect native

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populations, affect endangered or threatened species, impact keystone species, impact native fauna, pollinators, or microorganisms, etc.).
- Cause impacts on community structure (*e.g.*, change density of a layer, cover the canopy, eliminate or create a layer, impact wildlife habitats, etc.). T
- Have impacts on human health such as allergies or changes in air or water quality.
- Have sociological impacts on recreation patterns and aesthetic or property values.
- Stimulate control programs including toxic chemical pesticides or introduction of a nonindigenous biological control agent. T

Assign ratings as follows:

Rating	Numerical Score	Explanation
High	3	Three or more of the above. (Potential to cause major damage to the environment with significant losses to plant ecosystems and subsequent physical environmental degradation. Population reduction of endangered or threatened species would elevate that one impact to a high rating.)
MediumT	2T	Two of the above. (Potential to cause moderate impact on the environment with obvious change in the ecological balance, affecting several attributes of the ecosystem, as well as moderate recreation or aesthetic impacts.)
Low	1	One of the above, unless the factor is potential to reduce populations of endangered or threatened species, which rates High. (Limited potential impact on environment.)
Negligible	0	None of the above. (No potential to degrade the environment or otherwise affect ecosystems.)

Rationale for the rating and the level of certainty:

Stemless thistles spread over large areas, shading out more useful plants (Agriculture Western Australia website).

In the young growth stages, stemless thistles are susceptible to herbicides containing 2,4-D or MCPA, while dicamba is more effective on older plants. Herbicide use would be required, in conjunction with cultural practices, to control an infestation.

While specific information about environmental effects is unavailable, *O. acaulon* is listed on the .....

Weed Science web site operated by the Agriculture Department of Western Australia as a significant environmental weed and invasive species.

Level of uncertainty: uncertain. The risk rating may be higher, but few environmental impacts are reported in the scientific literature.

ECONOMIC and ENVIRONMENTAL IMPORTANCE SUMMARY: Consequences of Introduction: Cumulative Risk Element Score

Add together the numerical estimates for the four risk elements to produce an overall estimate of the Consequences of Introduction Risk Rating for the weed. The overall risk rating is used to assign a Consequences of Introduction Risk Score as follows:

Risk: Consequences of Introduction (Sum Risk Elements #1-4) (2+2+2+2 = 8)		
Cumulative Risk Element Score	Risk Rating	Risk Score
0 - 2	Negligible	0
3 - 6	Low	1
7 - 10 T	Medium T	2
11 - 12	High	3

The Consequences of Introduction Risk Rating, an indicator of the potential of the weed to become established and spread, and its potential to cause economic and environmental impacts, is medium for stemless thistle.

Step 6. Assess Likelihood of Introduction.

Discuss entry potential and establishment potential. What is the likelihood that the species will enter the United States, survive the shipment and find a suitable habitat for establishment?

Assign ratings as follows:

Rating	Numerical Score	Explanation: Introduction is
High T	3 T	Very likely or certain
Medium	2	Likely
Low	1	Low, but clearly possible
Negligible	0	Extremely unlikely

Rationale for rating and the level of certainty:

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As mentioned under risk element one, dispersal potential, *Onopordum* species have been introduced into Australia on many occasions as ornamentals and as agricultural contaminants. The same pathways provide a high likelihood of further introduction into the United States. Onopordum acaulon seeds are offered in a few seed exchange web sites outside of the United States. Potential pathways into the United States are ornamental seed shipments, contaminated agricultural seed shipments, and passenger baggage. None of these pathways is subject to treatment prior to or after shipping, and the propagules would be likely to survive and be introduced repeatedly into the environment, either intentionally by gardeners or unintentionally as seed contaminants of agricultural crops.

Level of certainty = reasonably certain

Step 7. Conclusion: Pest Risk Potential of the Weed.

Produce an estimate of the pest risk potential of the weed by considering the Consequences of Introduction and the Likelihood of Introduction using the following table as a guide. The pest risk potential of the weed will be obtained from the combination of the scores for likelihood of introduction and consequences of introduction, and will be assigned as follows:

Likelihood of Introduction (Rating and Score)	Consequences of Introduction (Rating and Score)	Overall Pest Risk Potential of the weed
Negligible (0)	Negligible (0)	Negligible
Negligible (0)	Low (1)	Negligible
Negligible (0)	Medium (2)	Negligible
Negligible (0)	High (3)	Negligible
Low (1)	Negligible (0)	Negligible
Low (1)	Low (1)	Low
Low (1)	Medium (2)	Low
Low (1)	High (3)	Low
Medium (2)	Negligible (0)	Negligible
Medium (2)	Low (1)	Low
Medium (2)	Medium (2)	Medium
Medium (2) T	High (3) T	Medium- High T
High (3)	Negligible (0)	Negligible
High (3)	Low (1)	Low

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Likelihood of Introduction (Rating and Score)	Consequences of Introduction (Rating and Score)	Overall Pest Risk Potential of the weed
High (3)	Medium (2)	Medium-High
High (3)	High (3)	High

Summary and Conclusion:

Onopordum acaulon has a medium consequences of introduction rating and a high likelihood of introduction rating, for an overall risk rating of medium-high. This species is not known to occur in the United States, and could likely establish throughout the southeast and within the states of Texas, California and Arizona. This species is a weed of roadsides, wastelands, channel banks, irrigated vegetable crops, cultivated land and pastures in Australia (Parsons and Cuthbertson, 1992; Auld and Medd, 1992; Agriculture Western Australia web site) and has potential to be an environmental and pasture weed in the United States. Stemless thistle has the potential to reduce carrying capacity of infested paddocks. Stock forced to eat the plant may suffer impaction and liver damage. Seeds survive in the soil for several years, making eradication difficult (Parsons and Cuthbertson, 1992). Onopordum acaulon meets the definition of quarantine pest.

Step 8. References.

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