ALASKA NON-NATIVE PLANT INVASIVENESS RANKING FORM

Botanical name: *Elodea canadensis* Michx.
Common name: Canadian waterweed
Assessors:

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Date: 2/23/2011
Date of previous ranking, if any: Click here to enter a date.

OUTCOME SCORE:

CLIMATIC COMPARISON

This species is present or may potentially establish in the following eco-geographic regions:

Pacific Maritime	Yes
Interior-Boreal	Yes
Arctic-Alpine	Yes

INVASIVENESS RANKING	**Total** (total answered points possible[1])	**Total**
Ecological impact	40 (40)	27
Biological characteristics and dispersal ability	25 (20)	19
Ecological amplitude and distribution	25 (25)	23
Feasibility of control	10 (10)	6
Outcome score	100 (95)[b]	75[a]
Relative maximum score[2]		**79**

[1] For questions answered "unknown" do not include point value for the question in parentheses for "total answered points possible."
[2] Calculated as a/b × 100

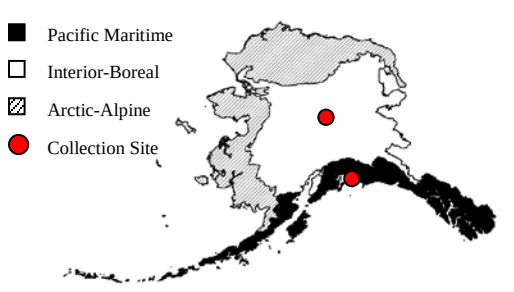
A. CLIMATIC COMPARISON

1.1. Has this species ever been collected or documented in Alaska?

☒ Yes - continue to 1.2
☐ No - continue to 2.1

1.2. From which eco-geographic region has it been collected or documented (see inset map)? Proceed to Section B. INVASIVNESS RANKING

☒ Pacific Maritime
☒ Interior-Boreal
☐ Arctic-Alpine



Documentation: *Elodea canadensis* has been documented from Eyak Lake near Cordova in the Pacific Maritime ecogeographic region of Alaska and Fairbanks in the Interior-Boreal ecogeographic region (UAM 2011).

Note on taxonomy: Canadian waterweed has been known to forms fertile hybrids with Nuttall's waterweed (*Elodea nuttallii*) in natural environments (Cook and Urmi-Konig 1985). Laboratory crosses also yield fertile hybrids with viable seed (Ernst-Schwarzenbach 1945). Hybrids between these two species exhibit morphologically intermediate vegetative characteristics and are only distinguishable by their floral structures. Both species share geographic range and are native to most of temperate North America.

2.1. Is there a 40 percent or higher similarity (based on CLIMEX climate matching, see references) between climates where this species currently occurs and:

a. Juneau (Pacific Maritime region)?
☐ Yes – record locations and percent similarity; proceed to Section B.
☐ No

b. Fairbanks (Interior-Boreal region)?
☐ Yes – record locations and percent similarity; proceed to Section B.
☐ No

c. Nome (Arctic-Alpine region)?
☒ Yes – record locations and percent similarity; proceed to Section B.
☐ No

If "No" is answered for all regions; reject species from consideration

Documentation: *Elodea canadensis* has been documented from a site approximately 2.5 km from Lillehammer, Norway, and from Uppsala, Sweden, which have 49% and 47% climatic similarities with Nome, respectively (CLIMEX 1999, Herbarium of Oskarshamn 2010, Norwegian Species Observation Service 2011). This species can grow slowly under ice cover and can overwinter in 1°C to 4°C water (Spicer and Catling 1988, Bowmer et al. 1995).

B. INVASIVENESS RANKING

1. Ecological Impact

1.1. Impact on Natural Ecosystem Processes

a.	No perceivable impact on ecosystem processes	0
b.	Has the potential to influence ecosystem processes to a minor degree (e.g., has a perceivable but mild influence on soil nutrient availability)	3
c.	Has the potential to cause significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, degrades habitat important to waterfowl)	7
d.	Has the potential to cause major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology, hydrology, or affects fire frequency thereby altering community composition; species fixes substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species)	10
e.	Unknown	U

Score **7**

Documentation: *Elodea canadensis* accumulates nutrients while reducing nutrient availability in the substrate. Dense populations can restrict water flow (Spicer and Catling 1988, Gollasch 2006). Infestations increase the turbidity and pH of water and cause significant variations in phosphorous concentrations. This species reduces oxygen concentrations within 5 cm of the substrate but increases oxygen concentrations above 5 cm (Spicer and Catling 1988).

1.2. Impact on Natural Community Structure

a.	No perceived impact; establishes in an existing layer without influencing its structure	0
b.	Has the potential to influence structure in one layer (e.g., changes the density of one layer)	3
c.	Has the potential to cause significant impact in at least one layer (e.g., creation of a new layer or elimination of an existing layer)	7
d.	Likely to cause major alteration of structure (e.g., covers canopy, eliminating most or all lower layers)	10
e.	Unknown	U

Score **8**

Documentation: *Elodea canadensis* reduces the amount of light available to surrounding vegetation, thereby reducing the density of or eliminating underlying layers (Rørslett 1986, Spicer and Catling 1988). In Chena Slough near Fairbanks, Alaska, this species has formed dense monocultures, creating a new layer of tall aquatic vegetation (Larsen et al. 2010).

1.3. Impact on Natural Community Composition

a.	No perceived impact; causes no apparent change in native populations	0
b.	Has the potential to influence community composition (e.g., reduces the population size of one or more native species in the community)	3
c.	Has the potential to significantly alter community composition (e.g., significantly reduces the population size of one or more native species in the community)	7
d.	Likely to cause major alteration in community composition (e.g., results in the extirpation of one or more native species, thereby reducing local biodiversity and/or shifting the community composition towards exotic species)	10
e.	Unknown	U

Score **7**

Documentation: *Elodea canadensis* can form dense mats, especially on iron-rich substrates (Spicer and Catling 1988), displacing native plant species, decreasing planktonic productivity, and reducing local biodiversity (Rørslett 1986, Podraza 2010). However, populations are likely to decline as iron is removed from the substrate (Spicer and Catling 1988).

1.4. Impact on associated trophic levels (cumulative impact of this species on the animals, fungi, microbes, and other organisms in the community it invades)

a.	Negligible perceived impact	0
b.	Has the potential to cause minor alteration (e.g., causes a minor reduction in nesting or foraging sites)	3
c.	Has the potential to cause moderate alteration (e.g., causes a moderate reduction in habitat connectivity, interferes with native pollinators, or introduces injurious components such as spines, toxins)	7
d.	Likely to cause severe alteration of associated trophic populations (e.g., extirpation or endangerment of an existing native species or population, or significant reduction in nesting or foraging sites)	10
e.	Unknown	U
	Score	**5**

Documentation: *Elodea canadensis* provides a food source for many freshwater organisms, including aquatic insects and fish (Spicer and Catling 1988, Gollasch 2006). However, this species is expected to degrade fish habitat in Alaska (Fairbanks Soil and Water Conservation District 2011).

Total Possible	40
Total	**27**

2. Biological Characteristics and Dispersal Ability

2.1. Mode of reproduction

a.	Not aggressive (produces few seeds per plant [0-10/m^2] and not able to reproduce vegetatively).	0
b.	Somewhat aggressive (reproduces by seed only [11-1,000/m^2])	1
c.	Moderately aggressive (reproduces vegetatively and/or by a moderate amount of seed [<1,000/m^2])	2
d.	Highly aggressive (extensive vegetative spread and/or many seeded [>1,000/m^2])	3
e.	Unknown	U
	Score	**3**

Documentation: Vegetative reproduction is the primary mode of establishment and spread for *Elodea canadensis*. This species reproduces vegetatively from stem fragments and condensed shoot buds that break away from the parent plants and root at the nodes. Plants produce vegetative buds at the beginning of winter or in unfavorable growing conditions. Single sex populations can invade waterways and spread aggressively. Although *Elodea canadensis* can reproduce sexually by seeds, few viable seeds are produced. Sexual reproduction is thus relatively unimportant (Spicer and Catling 1988, Bowmer et al. 1995).

2.2. Innate potential for long-distance dispersal (wind-, water- or animal-dispersal)

a.	Does not occur (no long-distance dispersal mechanisms)	0
b.	Infrequent or inefficient long-distance dispersal (occurs occasionally despite lack of adaptations)	2
c.	Numerous opportunities for long-distance dispersal (species has adaptations such as pappus, hooked fruit coats, etc.)	3
d.	Unknown	U

Score **3**

Documentation: Seeds are transported by wind and water (Spicer and Catling 1988). Stem fragments and vegetative buds easily break away from the parent plants and float to new locations, where they root at the nodes. Stem fragments have higher survival rates in fall than in spring (Barrat-Segretain et al. 2002). Flooding significantly increased the density of propagules in a wetland soil bank along the Rhone River in France (Cellot et al. 1998). Stem fragments are dispersed by waterfowl (Spicer and Catling 1988). Vegetative buds can survive desiccation and low temperatures, and they can be dispersed by wildlife to new bodies of water (Bowmer et al. 1995).

2.3. Potential to be spread by human activities (both directly and indirectly – possible mechanisms include: commercial sale of species, use as forage or for revegetation, dispersal along highways, transport on boats, common contaminant of landscape materials, etc.).

a.	Does not occur	0
b.	Low (human dispersal is infrequent or inefficient)	1
c.	Moderate (human dispersal occurs regularly)	2
d.	High (there are numerous opportunities for dispersal to new areas)	3
e.	Unknown	U

Score **3**

Documentation: *Elodea canadensis* is grown as an aquarium plant and has spread to new regions by trade. Many infestations, including those at Chena Slough, have likely originated from dumped aquarium material (Bowmer et al. 1995, Josefsson and Andersson 2001, Larsen et al. 2010). Stems can become tangled on and dispersed by boat props or trailers, vehicles that cross fords (Spicer and Catling 1988, Bowmer et al. 1995), and float plane rudders (Wurtz and Lisuzzo 2011).

2.4. Allelopathic

a.	No	0
b.	Yes	2
c.	Unknown	U

Score **U**

Documentation: *Elodea canadensis* supports low densities of epiphytic organisms (organisms that grow on plant surfaces non-parasitically), possibly because this species exudes allelopathic chemicals. Extracts from *Elodea canadensis* have been shown to reduce the growth of epiphytic algae and cyanobacteria. However, it is unknown if plants exude the allelopathic chemicals at ecologically significant concentrations. Potential allelopathic effects of *Elodea canadensis* on other aquatic macrophytes have not been observed (Erhard and Gross 2006).

2.5. Competitive ability

a.	Poor competitor for limiting factors	0

b.	Moderately competitive for limiting factors	1
c.	Highly competitive for limiting factors and/or able to fix nitrogen	3
d.	Unknown	U

Score **2**

Documentation: *Elodea canadensis* grows rapidly and can outshade surrounding vegetation. When growing under favorable conditions, it produces dense stands that displace native species (Rørslett et al. 1986, Spicer and Catling 1988, Podraza 2010).

2.6. Forms dense thickets, has a climbing or smothering growth habit, or is otherwise taller than the surrounding vegetation.

a.	Does not grow densely or above surrounding vegetation	0
b.	Forms dense thickets	1
c.	Has a climbing or smothering growth habit, or is otherwise taller than the surrounding vegetation	2
d.	Unknown	U

Score **2**

Documentation: *Elodea canadensis* can form dense stands, especially on substrates with large amounts of available iron in cold, static or slow-moving water. Floating plants can root and establish over native plants, reducing the amount of light for underlying vegetation (Spicer and Catling 1988).

2.7. Germination requirements

a.	Requires sparsely vegetated soil and disturbance to germinate	0
b.	Can germinate in vegetated areas, but in a narrow range of or in special conditions	2
c.	Can germinate in existing vegetation in a wide range of conditions	3
d.	Unknown	U

Score **U**

Documentation: The germination requirements of *Elodea canadensis* are unknown.

2.8. Other species in the genus invasive in Alaska or elsewhere

a.	No	0
b.	Yes	3
c.	Unknown	U

Score **3**

Documentation: *Elodea nuttallii* is known to occur as an invasive, non-native species in Europe (Barrat-Segretain et al. 2002).

2.9. Aquatic, wetland, or riparian species

a.	Not invasive in wetland communities	0
b.	Invasive in riparian communities	1
c.	Invasive in wetland communities	3
d.	Unknown	U

Score **3**

Documentation: *Elodea canadensis* is an aquatic species and grows in lakes, ponds, rivers, and streams (Haynes 2000, Klinkenberg 2010).

Total Possible	20
Total	**19**

3. Ecological Amplitude and Distribution

3.1. Is the species highly domesticated or a weed of agriculture?

a.	Is not associated with agriculture	0
b.	Is occasionally an agricultural pest	2
c.	Has been grown deliberately, bred, or is known as a significant agricultural pest	4
d.	Unknown	U

Score **4**

Documentation: *Elodea canadensis* is grown deliberately as an aquarium plant (Bowmer et al. 1995).

3.2. Known level of ecological impact in natural areas

a.	Not known to impact other natural areas	0
b.	Known to impact other natural areas, but in habitats and climate zones dissimilar to those in Alaska	1
c.	Known to cause low impact in natural areas in habitats and climate zones similar to those in Alaska	3
d.	Known to cause moderate impact in natural areas in habitat and climate zones similar to those in Alaska	4
e.	Known to cause high impact in natural areas in habitat and climate zones similar to those in Alaska	6
f.	Unknown	U

Score **4**

Documentation: *Elodea canadensis* is often problematic in its native range in Canada, where populations reduce the navigability of waterways (Spicer and Catling 1988). This species also causes major modifications in aquatic habitats in Sweden (Josefsson and Andersson 2001). It has spread around the entire perimeter of Lake Baikal in Russia, where it is highly competitive (Kozhova and Izhboldina 1992). In Lake Steinsfjord in Norway, it covered 79% of the lake bottom between 0 and 6 m depth (Rørslett et al. 1986), and it has created a new layer of dense aquatic vegetation in several rivers in New Zealand (Wells 2008).

3.3. Role of anthropogenic and natural disturbance in establishment

a.	Requires anthropogenic disturbance to establish	0
b.	May occasionally establish in undisturbed areas, readily establishes in naturally disturbed areas	3
c.	Can establish independently of natural or anthropogenic disturbances	5
e.	Unknown	U

Score **5**

Documentation: Floating plants can extend their roots through established vegetation into the substrate and outcompete surrounding vegetation for light (Spicer and Catling 1988).

3.4. Current global distribution

a.	Occurs in one or two continents or regions (e.g., Mediterranean region)	0
b.	Extends over three or more continents	3
c.	Extends over three or more continents, including successful introductions in arctic or subarctic regions	5
e.	Unknown	U

Score **5**

Documentation: *Elodea canadensis* is native to much of North America, including British Columbia (Haynes 2000). In British Columbia, it is frequent south of 51°N but rarely occurs farther north (Klinkenberg 2010). It has been introduced to Europe, Asia, Africa, Australia, and New Zealand (Spicer and Catling 1988, Bowmer et al. 1995, Thorp and Wilson 1998, Haynes 2000, Landcare Research 2011). This species is known to grow in subarctic Scandinavia (Gollasch 2006) and has been documented as far north as 65°N in Finland (University Museums of Alberta 2011).

3.5. Extent of the species' U.S. range and/or occurrence of formal state or provincial listing

a.	Occurs in 0-5 percent of the states	0
b.	Occurs in 6-20 percent of the states	2
c.	Occurs in 21-50 percent of the states and/or listed as a problem weed (e.g., "Noxious," or "Invasive") in one state or Canadian province	4
d.	Occurs in more than 50 percent of the states and/or listed as a problem weed in two or more states or Canadian provinces	5
e.	Unknown	U

Score **5**

Documentation: *Elodea canadensis* grows in 46 states of the U.S. and much of southern Canada (Haynes 2000, USDA 2011). It is not considered a noxious weed in any states of the U.S. or provinces of Canada.

Total Possible 25
Total **23**

4. Feasibility of Control

4.1. Seed banks

a.	Seeds remain viable in the soil for less than three years	0
b.	Seeds remain viable in the soil for three to five years	2
c.	Seeds remain viable in the soil for five years or longer	3
e.	Unknown	U

Score **0**

Documentation: The amount of time seeds remain viable is unknown. However, *Elodea canadensis* rarely reproduces by seeds (Spicer and Catling 1988).

4.2. Vegetative regeneration

a.	No resprouting following removal of aboveground growth	0
b.	Resprouting from ground-level meristems	1
c.	Resprouting from extensive underground system	2

d.	Any plant part is a viable propagule	3
e.	Unknown	U

Score **3**

Documentation: Meristem tissues are present in stem nodes and vegetative buds (Barrat-Segretain et al. 1998). Vegetative buds remain dormant on the bottom sediment over winter (Spicer and Catling 1988). Stem fragments containing at least four nodes were able to regenerate after storage in greenhouse water pans for more than ten weeks. Internodal stem fragments and root fragments do not root or resprout (Barrat-Segretain et al. 1998).

4.3. Level of effort required

a.	Management is not required (e.g., species does not persist in the absence of repeated anthropogenic disturbance)	0
b.	Management is relatively easy and inexpensive; requires a minor investment of human and financial resources	2
c.	Management requires a major short-term or moderate long-term investment of human and financial resources	3
d.	Management requires a major, long-term investment of human and financial resources	4
e.	Unknown	U

Score **3**

Documentation: Mechanical control methods are often counterproductive because they cause stems to fragment, allowing the plants to spread to new areas (Bowmer et al. 1995). If populations are controlled mechanically, plants and plant parts must be removed from the water (Spicer and Catling 1988). Suctioning plants out with a pump may provide effective control while removing most plant materials (Wells 2008). Plants can be shaded with opaque, floating sheets (Podraza 2010). Most herbicides do not provide effective control of *Elodea canadensis*. However, fluridone can control populations in static water and acrolein can temporarily control populations in moving water. Paraquat and diquat can also be used to control *Elodea canadensis*, especially when applied in late spring or summer. However, the use of herbicides may not be suitable for natural areas, as they will also destroy native aquatic vegetation (Bowmer et al. 1995). Additionally, the large amounts of decaying vegetation will reduce available oxygen, possibly resulting in the eradication of other aquatic organisms. The introduction of the sterile triploid grass carp (*Ctenopharyngodon idella*) has proven effective in controlling populations of *Elodea canadensis* (Spicer and Catling 1988). Planting overhanging willows or other native trees and shrubs on the banks of waterways can outshade *Elodea canadensis* (Wells 2008).

Total Possible	10
Total	**6**

Total for four sections possible	95
Total for four sections	**75**

References:

Barrat-Segretain, M., A. Elger, P. Sagnes, and S. Puijalon. 2002. Comparison of three life-history traits of invasive *Elodea canadensis* Michx. and *Elodea nuttallii* (Planch.) H. St. John. Aquatic Botany. 74(4). 299-313 p.

Barrat-Segretain, M., G. Bornette, and A. Hering-Vilas-Bôas. 1998. Comparative abilities of vegetative regeneration among aquatic plants growing in disturbed habitats. Aquatic Botany. 60(3). 201-211 p.

Bowmer, K., S. Jacobs, and G. Sainty. 1995. Identification, Biology, and Management of *Elodea canadensis*, Hydrocharitaceae. Journal of Aquatic Plant Management. 33. 13-19 p.

Cellot, B., F. Mouillot, and C. Henry. 1998. Flood drift and propagule bank of aquatic macrophytes in a riverine wetland. Journal of Vegetation Science. 9(5). 631-640 p.

CLIMEX. 1999. CLIMEX for Windows, Predicting the effects of climate on plants and animals. Version 1.1a. CISRO Publishing. Collingwood, Australia.

Erhard, D., and E. Gross. 2006. Allelopathic activity of *Elodea canadensis* and *Elodea nuttallii* against epiphytes and phytoplankton. Aquatic Botany. 85(3). 203-211 p.

Fairbanks Soil and Water Conservation District. 2011. *Elodea canadensis* infestation in Chena Slough. [25 February 2011] http://www.fairbankssoilwater.org/resources_Chena_Slough_Invasive.html

Gollasch, S. 2006. *Elodea canadensis*. DAISIE European Invasive Alien Species Gateway. [23 February 2011] http://www.europe-aliens.org/pdf/Elodea_canadensis.pdf

Haynes, R. 2000. *Elodea canadensis* Michaux. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 12+ vols. New York and Oxford. Vol. 22, p. 33.

Herbarium of Oskarshamn. 2010. Accessed through GBIF (Global Biodiversity Information Facility) data portal (http://data.gbif.org/datasets/resource/1024, 2011-02-09). Oskarshamn, Sweden.

Josefsson, M., and B. Andersson. 2001. The Environmental Consequences of Alien Species in the Swedish Lakes Mälaren, Hjälmaren, Vänern, and Vättern. AMBIO: A Journal of the Human Environment. 30(8). 514-521 p.

Klinkenberg, B. (Editor) 2010. *Elodea canadensis* Michx. In: E-Flora BC: Electronic Atlas of the Plants of British Columbia**.** Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia. Vancouver, BC. [23 February 2011] Available: http://www.geog.ubc.ca/biodiversity/eflora/index.shtml

Kozhova, O., and L. Izhboldina. 1992. Spread of *Elodea canadensis* in Lake Baikal. Hydrobiologia. 239(1). 43-52 p.

Landcare Research. 2011. *Elodea canadensis* Michx. (1803). New Zealand Plants. Landcare Research. Lincoln, New Zealand. [23 February 2011] http://nzflora.landcareresearch.co.nz/

Larsen, A., N. Lisuzzo, and T. Wurtz. 2010. *Elodea canadensis*: an unexpected visitor to Alaska. Forest Service, U.S. Department of Agriculture, and National Park Service, U.S. Department of the Interior. [23 February 2011] http://www.fairbankssoilwater.org/pdfs/Elodea_overview.pdf

Norwegian Species Observation Service. 2011. Accessed through GBIF (Global Biodiversity Information Facility) data portal (http://data.gbif.org/datasets/resource/11831, 2011-02-23). Norwegian Biodiversity Information Centre (NBIC). Trondheim, Norway.

Podraza, P. 2010. *Elodea canadensis* (aquatic plant). Global Invasive Species Database. Invasive Species Specialist Group, Species Survival Commission, International Union for Conservation of Nature. [23 February 2011] http://www.issg.org/database/welcome/

Rørslett, B., D. Berge, and S. Johansen. 1986. Lake enrichment by submersed macrophytes: a Norwegian whole-lake experience with *Elodea canadensis*. Aquatic Botany. 26. 325-349 p.

Spicer, K., and P. Catling. 1988. The Biology of Canadian Weeds. 88. *Elodea canadensis* Michx. Canadian Journal of Plant Science. 68(4). 1035-1051 p.

Thorp, J., and M. Wilson. 1998. Weeds Australia. [23 February 2011] http://www.weeds.org.au/

UAM. 2011. University of Alaska Museum, University of Alaska Fairbanks. Available: http://arctos.database.museum/home.cfm

USDA. 2011. The PLANTS Database. National Plant Data Center, Natural Resources Conservation Service, United States Department of Agriculture. Baton Rouge, LA. http://plants.usda.gov

University of Alberta Museums. 2011. Accessed through GBIF (Global Biodiversity Information Facility) data portal (http://data.gbif.org/datasets/resource/11612, 2011-02-23). Vascular Plant Herbarium, University of Alberta. Edmonton, Alberta.

Wells, R. 2008. An assessment of the threat of the aquatic weed elodea at Piriaka, Whanganui River. National Institute of Water and Atmospheric Research Ltd. Hamilton, New Zealand. 14 p.

Wurtz, T., and N. Lisuzzo. 2011. The cost of no action: What would not doing anything about the infestation of an invasive aquatic plant in the Fairbanks area cost Alaska? Alaska Region, Forest Service, U.S. Department of Agriculture. [23 February 2011] http://www.fairbankssoilwater.org