GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Elodea canadensis***

Elodea canadensis 简体中文 正體中文 **System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Liliopsida	Hydrocharitales	Hydrocharitaceae

Common name Kanadan vesirutto (Finnish), Kanadese waterpes (Afrikaans), Vasspest (Norwegian), broad waterweed (English, United States), peste d'eau (French), Vandpest (English), Kanada vesikatk (Estonian), Kanada vesihain (Estonian), ditch moss (English), elodeja (Latvian), vandpest (Danish), oxygen weed (English, United States), anacharis (English), Canada waterweed (English, United States), Kanadine elodeja (Lithuanian), common waterweed (English, United States), Kanadische wasserpest (German), water-thyme (English, United States), Canadian water pest (English, United States), vesirutto (Finnish), Moczarka kanadyjska (Polish), Vattenpest (Swedish), vanlig vattenpest (Swedish), Peste d'aqua comune (Italian), brede waterpest (Dutch), Almindelig vandpest (Danish), Canadian waterweed (English, United States), American elodea (English, United States), gemeine wasserpest (German), elodee du Canada (French), American waterweed (English, Germany), Canadian pondweed (English, United States)

Synonym
Anarcharis canadensis , Planch
Anarcharis alsinastrum , Bab.
Anarcharis planchonii , Caspary) Rydb.
Anarcharis pomeranica , (Rchb.) Peterm.
Elodea brandegeeae , St. John
Elodea ioensis , Wylie
Elodea latifolia , Caspary
Elodea linearis , (Rydb.) St. John
Elodea oblongifolia , Michx. Ex Caspary
Elodea planchonii , Caspary
Helodea canadensis , Reichb.
Philotria canadensis , (Michx.) Britt.
Philotria linearis , Rydberg
Philotria planchonii , (Caspary) Rydb.
Serpicula verticillata , Rostk. & Schmidt
Udora canadensis , (Michaux) Nuttall 1818
Serpicula canadensis , (Michaux) 1829
Philotria iowensis , (Wylie) Wylie 1911
Anarcharis canadensis , (Michaux) Planchon, var *planchonii* (Caspary) Victorin 1931
Anarcharis linearis , (Rydberg) Victorin 1931

Similar species *Egeria densa, Lagarosiphon major, Elodea nuttallii*

Summary *Elodea canadensis* a submergent, aquatic plant, native to North America, has spread rapidly and easily throughout the world. Particularly in Europe, this species is very invasive and is considered a weed due to its ability to grow and multiply fairly rapidly in many diverse habitats and conditions. It is capable of causing problems of economic importance, habitat alteration, competition and threat to biodiversity. In addition, this species is not easily manageable. For these reasons, this species has been the focus of many experiments and research in the hopes of establishing a greater knowledge of growth habits, the true threat it causes, and possible prevention methods.

view this species on IUCN Red List

Species Description
Elodea canadensis is a submerged, rather densely bushy, aquatic perennial (CABI, 2005). This aquatic herb has stems that branch out between 20 and 30 cm in length, which tends to form dense monospecific stands that can cover hundreds of acres (DAISIE, 2009). The joints of the stems are brittle (DAF). The leaves are oblong-linear and are in groups of three (DAISIE, 2009). The numerous overlapping, dark green, transulcent, and minutely toothed leaves are about 1 cm long, and 2-3 mm wide (CABI, 2005). In addition, the leaves have a non-waxy texture and are rigid (Herault *et al*., 2008). This species contains flowers, either white or pale purple, that appear at the surface of the water (DAISIE, 2009). The flowers have also been described in color as being rose-white. The flowers are carried to the surface on a long slender stalk, which is 2-15 cm long, with a sheathing, two-lobed spathe (CABI, 2005). In addition, there are fruits, which are capsule having a length of less than 1 cm (DAISIE, 2009) and 3 mm in width. The roots are white, unbranched and thread-like (CABI, 2005). The plant has multiple apical growth points (Herault, Bornet & Tremolieres, 2008). In winter the stems build turions, specialised overwintering buds (Cook & Urmig-Koenig, 1985). \r\n\r\n
E. canadensis can be classified as a species of intermediate palatability. However, this species is poorly consumed by invertebrates (Barrat-Segretain *et al*. 2002). It is able to transport and fix carbon by using 4-carbon acids to supplement the 3-carbon acid pathway. It is also able to use bicarbonate as a carbon source in alkaline conditions either directly or by converting bicarbonate into carbon dioxide by acidification of the cell walls (Bowmer *et al*., 1995). This plant has been reported from sites in lakes of a very wide range of depths, and it is generally considered relatively highly tolerant to low light conditions. In addition, this species is able to form new side shoots, even when leaves are missing or the stem has turned brown as a result of herbivory, therefore concluding that the fragments of this species have high regenerative capacities (Mielecki & Peiczynska, 2005).\r\n\r\n
Elodea species have a wide range of phosphorus content in their biomass (Garbey *et al*., 2004) and they are able to store this nutrient in their roots (Eugelink, 1998) to be used for growing when phosphorus levels in water are low. *E. canadensis* is also able to take up phosphors from the sediment by its roots, so reducing the phosphorus concentration in the water column in most cases is not able to reduce its growth.

Lifecycle Stages
Elodea canadensis rapidly propagates through stem fragments dispersed by water currents, waterfowl and human activities, and flooding was the essential parameter of this expansion (Barrat-Segretain & Elger, 2004). Fragments grow in a wide range of light conditions and only a very marked reduction in light levels was able to restrict the growth of this plant. This species responded to cutting by producing more lateral shoots, which is very important in very poor light conditions under which the main shoots begin to die off quickly. It can, therefore, be expected that the death of a parent fragment will be followed by the continued growth of a young one detaching from it. Thus, this implies that fragments of this species are able to regrow into new individuals even when transported to the deeper part of the littoral characterized by low light levels (Mielecki & Pieczynska, 2005).

Uses
Elodea canadensis is economically important as an ornamental species. It is sold in garden shops as “oxygen weed” for private ponds to improve water quality and pond scenery.\r\nIt is also an important part of lake ecosystems in its native habitat of North America. It provides habitat for aquatic invertebrates, fish and amphibians and is a food source for waterfowl, beavers and muskrats (Washington State Department of Ecology, Undated).

Habitat Description

Elodea Canadensis has a wide range of conditions in which it can grow. It can grow in very shallow to deep water and in slightly mineralized and acid water in siliceous sediments to heavily mineralized water in calcareous sediments. However, it prefers mesotrophic waters (CABI, 2005). This species can even grow slowly under ice cover and can survive inside the ice (Bowmer *et al*., 1995). Dense stocks can also partly survive, when the water level sinks and the plants on the banks are exposed to dryness for several weeks. (Experiments with *E. nuttallii* but \r\n*E. canadensis* will show the same tolerance to dryness, P. Podraza, unpublished data).In its native habitat, *E. canadensis* resides in surface standing waters, surface running waters: shallow lakes, ponds, pools, ditches and streams with slow moving water. In its invaded habitat, it can survive in the same environments; however it can survive in up to 3 meters of water depth in slow moving water, and in exceptional cases up to 16 meters in depth. It tolerates pH values from 6.0 to 7.5 and temperatures from 1 to 25 degrees in celcius (Gollasch, 2006). The foliage can stand much battering by turbulence, but, being poorly anchored or not at all, this species will not persist in waters with a continuously fast flow and favours still or sluggish conditions (Rodwell, 1998).

Reproduction

Elodea canadensis is dioecious. Pollination occurs near the water surface and pollin is distributed by wind and water currents. Vegetative reproduction by fragments is very common (Gollasch, 2006). Seeds are seldom produced due to a shortage of male plants. Reproduction and dispersal are primarily vegetative by fragmentation of the stems that float away, root, and start new plants (CABI, 2005). In addition, vegetation reproduction by fragmentation is the main way in which a population is rebuilt. Fragmentation does not restrict the growth of this plant, and it can even stimulate it in favorable light conditions (Mielecki & Pieczynska, 2005). This type of reproduction by this plant occurs by shoot fragmentation. The stems are extremely brittle and the broken portions quickly produce adventitious roots (Rodwell, 1998).

Nutrition

Nutrient availability in the sediment and water column is known to affect the composition of the community of submerged plants. In addition, it has been suggested that turbidity and nutrient loads are the two factors controlling the occurrence of submerged macrophytes (Thiebaut, 2005) in lakes. In running waters in most catchment areas the nutrient concentration in sediments and water column cannot be reduced to a limitation level due to surface runoff from non-point sources.

General Impacts

It might only take three to four seasons for *Elodea canadensis* to assume the proportion of a major pest at a site, with such luxuriance being maintained for up to a decade more (Rodwell, 1998). In the latter half of the 19th century and the first half of the 20th century, this species was extremely problematic to Europe, having spread rapidly throughout and causing major environmental problems (CABI, 2005). This waterweed can have a general negative impact on the functioning of the aquatic ecosystem and it will outcompete native aquatic plants. In addition, it can impede water flow and adversely affect recreation activities (CABI, 2005). This plant responds to shading by decreasing its foliar investment and elongating its internode's length to overtop direct competitors, a developmental response that brings their larger leaves into a more favourable light environment (Herault, Bornet & Tremolieres, 2008). Fragments of this species have high survival rates which allow them to be dispersed over long distances, therefore increasing their invasion capabilities (Barrat-Segretain, Elger, Sagnes *et al* 2002). Extracts from this species reduce the growth of several aquatic primary producers, among them epiphytic algae and cyanobacteria isolated from different submersed macrophytes (Erhard & Gross, 2006).

Management Info
Physical: Mechanical removal of the biomass will temporarily reduce the populations and their proliferation. However, as the plant spreads through fragmentation, it is essential to prevent the spread of plant fragments by creating filters downstream before any mechanical treatment is carried out. All plants removed must be carefully disposed of to prevent dissemination of fragments (CABI, 2005). This plant can be easily cut and controlled for short periods by mechanical control methods. The cut weed should be removed from the water to avoid deoxygenation. However the growing rate of *E. canadensis* is very fast and the effects of mowing only last for a few weeks (P. Podraza, pers. comm.). Continued mowing of the invasive water plant species *Myriophyllum spicatum* has led to its disappearance from the system in some cases. However this has not been successful with a similar species *E. nuttalli* and it is thought that it would also be unsuccessful with *E. canadensis* (P. Podraza, pers. comm.).
Other appropriate methods of mechanical control include removal by hand, raking, chains, weed bucket, weed boat or dredging (CEH, 2004). *E. canadensis* is adapted to stagnant or slow flowing waters. Increasing flow velocity in running waters can reduce the plant density.
Biological: Introduction of herbivorous fish such as grass carp *(Ctenopharyngodon idella)* has been proposed as a possible agent in the control of this waterweed. Active feeding of grass carps occurs at 7-8°C and active feeding requires 20°C (NatureServe, 2008). During active feeding grass carps are able to consume 75-200% of their body mass per day (Clugston & Shireman 1987, in Jordan, 2003) and are voracious, unselective feeders; they are able to destroy the entire palatable aquatic vegetation in a water body (Jordan, 2003).Carp may also cause increased densities of phytoplankton, due to fish metabolism causing the mobilisation of nutrients (Perrow *et al*., 1999) This can be a very serious problem when the density of toxic cyanphycea (blue-green algae) increases. Stocking up carp population densities may increase the biomass of unpalatable species at the expense of the more palatable ones (Bowmer *et al*., 1995). Rudd (*Scardinius erythrophthalmus*), a native fish species in Europe, which is omnivorous but prefers *Elodea* to feed on, is very suitable for weed control. It has minor ecological disadvantages, but their feeding capacity is low (Podraza, 2009). Common carp and other bottom feeding fish, which create turbid water, can also be effective in preventing regrowth of the plant after mechanical removal or control by a herbicide (CEH, 2004). In addition a fungus (*Fusarium* sp.) (Gollasch, 2006) and some nematodes (Gerber & Smart, 1987) were identified in laboratory tests as damaging to *E. canadensis*.
Chemical: Diquat and copper sulphate or chelates of copper can be used in stagnant water. The addition of copper is reputed to improve control compared with diquat alone, and is also advantageous because algae are inhibited. However copper is toxic to most crustacean species, affects fish reproduction and may impact the food web structure, e.g. by reducing the zooplankton densities. Terbutryne is used for control of various submerged weeds. Acrolein gives temporary control in flowing water. It is injected into the water and allowed to flow over the weed beds (Bowmer *et al*., 1995).
Environmental: Shade will control most submerged aquatic plants. This can be achieved by planting trees on the south side of waterbodies or by using a floating sheet of opaque material (CEH, 2004).

Pathway
E. canadensis was probably introduced by aquarists or by transport vehicles and transport together with fishes taken from lakes (Kozhova & Izhboldiana, 1993).Introduction of *E. canadensis* into a country has almost certainly been *via* the trade in live aquarium plants, legal or otherwise (Bowmer, Jacobs & Sainty, 1995).*E. canadensis* can be dispersed via ships as fragments attached to anchor chains or fenders.*E. canadensis* is sold in garden centre shops as oxygen weed for private ponds to improve water quality and pond scenery.

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ALIEN RANGE

[1] ATLANTIC - NORTHEAST
[1] AUSTRALIA
[1] AUSTRIA
[1] CENTRAL AMERICA
[1] CZECH REPUBLIC
[1] DENMARK
[1] ESTONIA
[1] EUROPE
[1] FINLAND
[1] FRANCE
[1] GERMANY
[1] IRELAND
[1] ITALY
[1] LATVIA
[1] LITHUANIA
[1] MEXICO
[1] NEW ZEALAND
[1] NORTHERN AFRICA
[1] NORWAY
[1] POLAND
[1] PORTUGAL
[2] RUSSIAN FEDERATION
[1] SOUTH AFRICA
[1] SOUTH AMERICA
[1] SPAIN
[1] SWEDEN
[1] SWITZERLAND
[2] UNITED KINGDOM
[1] UNITED STATES

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