RISK ASSESSMENT SUMMARY SHEET

Updated: November 2016

Canadian pondweed (*Elodea canadensis*)

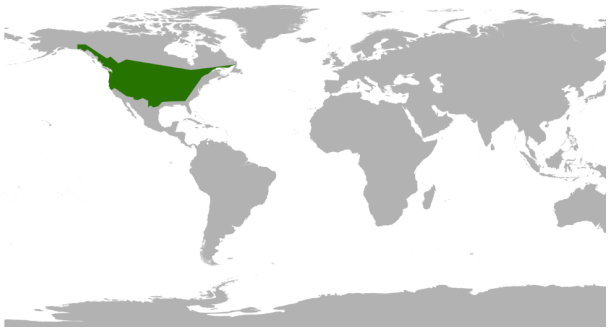
- Freshwater plant from North America with branching stems up to 30cm long.
- Reproduces from stem fragments.
- Common and widespread throughout most of Britain.
- Can form dense stands which displace native species and block waterways interfering with recreation.

History in GB

First recorded in a lake at Duns Castle, Berwickshire in 1842, following accidental or deliberate release after import for ornamental purposes in aquaria and ponds. It probably moved from artificial to natural sites as a result of fragments being transported by stock or by man, such as on fishing equipment or boats. Currently common and widespread in GB, absent only from parts of north-west Scotland, and higher altitudes in other areas. Now frequently displaced by similar native species, particularly *E. nuttallii* and *Lagarosiphon major*.

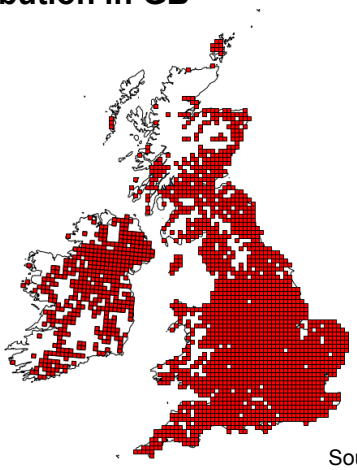
Native distribution

Native to North America



Source: NNSIP 2016

Distribution in GB



Source: NBN 2016

Impacts

Environmental

- Forms dense stands which displace other aquatic plants, block light and produce anoxic conditions in the water.

Economic

- Dense stands can prevent the use of water for recreational activities.
- May also impact on navigation and port infrastructure, and clog and impede drainage waterways.

Social

- Can interfere with recreational activities such as boating, watersports or angling.

Introduction pathways

Horticultural trade (very likely) - traded as an ornamental plant in GB.

Spread pathways

Natural (intermediate) - reproduces vegetatively through small pieces of stem which break off from the main plant. These have high survival rates and may be carried over long distances increasing their invasion capabilities.

On boats / fishing lines (rapid) - stem fragments can easily be carried on equipment.

Summary

	Risk	Confidence
Entry	VERY LIKELY	VERY HIGH
Establishment	VERY LIKELY	VERY HIGH
Spread	RAPID	VERY HIGH
Impacts	MODERATE	VERY HIGH
Conclusion	MEDIUM	VERY HIGH

Information about GB Non-native Species Risk Assessments

The Convention on Biological Diversity (CBD) emphasises the need for a precautionary approach towards non-native species where there is often a lack of firm scientific evidence. It also strongly promotes the use of good quality risk assessment to help underpin this approach. The GB risk analysis mechanism has been developed to help facilitate such an approach in Great Britain. It complies with the CBD and reflects standards used by other schemes such as the Intergovernmental Panel on Climate Change, European Plant Protection Organisation and European Food Safety Authority to ensure good practice.

Risk assessments, along with other information, are used to help support decision making in Great Britain. They do not in themselves determine government policy.

The Non-native Species Secretariat (NNSS) manages the risk analysis process on behalf of the GB Programme Board for Non-native Species. Risk assessments are carried out by independent experts from a range of organisations. As part of the risk analysis process risk assessments are:

- Completed using a consistent risk assessment template to ensure that the full range of issues recognised in international standards are addressed.
- Drafted by an independent expert on the species and peer reviewed by a different expert.
- Approved by an independent risk analysis panel (known as the Non-native Species Risk Analysis Panel or NNRAP) only when they are satisfied the assessment is fit-for-purpose.
- Approved for publication by the GB Programme Board for Non-native Species.
- Placed on the GB Non-native Species Secretariat (NNSS) website for a three month period of public comment.
- Finalised by the risk assessor to the satisfaction of the NNRAP.

To find out more about the risk analysis mechanism go to: www.nonnativespecies.org

Common misconceptions about risk assessments

To address a number of common misconceptions about non-native species risk assessments, the following points should be noted:

- Risk assessments consider only the risks posed by a species. They do not consider the practicalities, impacts or other issues relating to the management of the species. They therefore cannot on their own be used to determine what, if any, management response should be undertaken.
- Risk assessments are about negative impacts and are not meant to consider positive impacts that may also occur. The positive impacts would be considered as part of an overall policy decision.
- Risk assessments are advisory and therefore part of the suite of information on which policy decisions are based.
- Completed risk assessments are not final and absolute. Substantive new scientific evidence may prompt a re-evaluation of the risks and/or a change of policy.

Period for comment

Draft risk assessments are available for a period of three months from the date of posting on the NNSS website*. During this time stakeholders are invited to comment on the scientific evidence which underpins the assessments or provide information on other relevant evidence or research that may be available. Relevant comments are collated by the NNSS and sent to the risk assessor. The assessor reviews the comments and, if necessary, amends the risk assessment. The final risk assessment is then checked and approved by the NNRAP.

*risk assessments are posted online at:
https://secure.fera.defra.gov.uk/nonnativespecies/index.cfm?sectionid=51
comments should be emailed to nnss@apha.gsi.gov.uk

GB NON-NATIVE ORGANISM RISK ASSESSMENT SCHEME

For more information visit: www.nonnativespecies.org

	Name of Organism	***Elodea canadensis* - Canadian Pondweed**
	Objectives:	Assess the risks associated with this species in GB
	Version:	Final: February 2017
	Author:	C McGavigan (QUB)
	Suggested citation:	McGavigan (2017). GB Non-native Organism Risk Assessment for *Elodea canadensis* . www.nonnativespecies.org

N	QUESTION	RESPONSE	COMMENT
1	What is the reason for performing the Risk Assessment?		Request by the GB Programme Board for Non-native Species
2	What is the Risk Assessment area?	GB	
3	Does a relevant earlier Risk Assessment exist?	YES (Go to 4)	
4	If there is an earlier Risk Assessment is it still entirely valid, or only partly valid?		Partly valid (problems with selection criteria in cell 13 c/d)
A	**Stage 2: Organism Risk Assessment SECTION A: Organism Screening**		
5	Identify the Organism. Is the organism clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank?	YES (Give the full name & Go to 7)	*Elodea canadensis* Michx. Hydrocharitaceae. Horticultural and vernacular names: *C* anadian waterweed, Canadian pondweed, Linne-lus Canèidianach (Gaelic), Tím uisce (Irish), Alaw Canada (Welsh). Elodea nuttallii (Planch.) H.St.John (1920) is a single taxonomic entity belonging to Family Hydrocharitaceae. In Europe, Elodea species can be distinguished from all other aquatic and plants except Egeria densa and Hydrilla verticillata by their whorls of undivided leaves, which lack a sheathing base but have a single central vein and small marginal teeth. Egeria densa can be distinguished from Elodea by its generally much larger size, the presence of small teeth along the central vein on the leaves and by the nature of the teeth on the leaf margins. Lagarosiphon major has very strongly recurved leaves and these are in spirals, whereas those of Elodea are in whorl. (Lansdown 2008).
6	If not a single taxonomic entity, can it be redefined?		
7	Is the organism in its present range known to be invasive, i.e. to threaten species, habitats or ecosystems?	YES (Go to 9)	Known to be invasive in all areas where present outside its native range, including parts of Europe, South America, Central America, Asia, Australasia, and Africa. In the UK, since its first authenticated occurrence in the early 19th century, it has shown a characteristic pattern: invasion a new habitat, followed by rapid increase, then steady decline and stabilisation or disappearance from the habitat (Rodwell, 1995) Populations recorded in several lakes (>16) in the Northern Ireland Lake Survey (Gibson *et al.,* 1992) have declined and in some cases disappeared (McGavigan Pers. comm.) Invasion and spread were most rapid during the 19th century. Dramatic increases have been rare since the start of the 20th century and have usually occurred when the plant has become established in made-made water bodies such as drainage channels and gravel pits. Decline may be due to reduction in certain nutrients or pathogenic effects. There have been reports of sudden population crashes. *Elodea canadensis is* frequently displaced by similar invasive species, notably *Elodea nuttallii* (Barrat-Segretain *et al.,* 2004) and *Lagarosiphon major (James* et al., *1999).* It has been recorded from 2872 x 10 km squares.
8	Does the organism have intrinsic attributes that indicate that it could be invasive, i.e. threaten species, habitats or ecosystems?	YES or UNCERTAIN (Go to 9)	*Elodea canadensis* a rhizomatous, perennial, submerged, aquatic plant. It is present in freshwater lakes and ponds, reservoirs and slow-moving streams and canals, often forming dense mats. Dense growth of *Elodea canadensis* can block light penetration into water bodies, reducing or eliminating native water plants and affecting associated populations of aquatic invertebrates. Dense growth can affect recreation activities, especially boating, watersports or angling. It reproduces by small pieces of stem breaking off a plant which rapidly grow to form new plants- indeed every node is capable of producing a new plant. At the onset of cold weather the plant dies back to underground stems crowned by winter buds (turions). Growth recommences as soon as the temperature rises again.
9	Does the organism occur outside effective containment in the Risk Assessment area?	YES (Go to 10)	Widely established and distributed outside any effective containment.
10	Is the organism widely distributed in the Risk Assessment area?	YES & Future conditions/management procedures/policies are being considered (Go to 19)	Overall, *Elodea canadensis* is common and widespread in the UK. It occurs throughout England and Wales, being absent from parts of the Pennines and central Wales. In Scotland it occurs mostly in southern, central and eastern parts of the country and is largely absent from the Highlands and Islands although is present in the Orkneys. It is less likely to spread into areas where currently absent as the ecological conditions are probably unsuitable (see 2.4) , although spread to any unoccupied area cannot be ruled out.
11	Does at least one species (for herbivores, predators and parasites) or suitable habitat vital for the survival, development and multiplication of the organism occur in the Risk Assessment area, in the open, in protected conditions or both?		
12	Does the organism require another species for critical stages in its life cycle such as growth (e.g. root symbionts), reproduction (e.g. pollinators; egg incubators), spread (e.g. seed dispersers) and transmission, (e.g. vectors)?		
13	Is the other critical species identified in question 12 (or a similar species that may provide a similar function) present in the Risk Assessment area or likely to be introduced? If in doubt, then a separate assessment of the probability of introduction of this species may be needed.		

14	Does the known geographical distribution of the organism include ecoclimatic zones comparable with those of the Risk Assessment area or sufficiently similar for the organism to survive and thrive?			
15	Could the organism establish under protected conditions (e.g. glasshouses, aquaculture facilities, terraria, zoological gardens) in the Risk Assessment area?			
16	Has the organism entered and established viable (reproducing) populations in new areas outside its original range, either as a direct or indirect result of man's activities?			
17	Can the organism spread rapidly by natural means or by human assistance?			
18	Could the organism as such, or acting as a vector, cause economic, environmental or social harm in the Risk Assessment area?			
19	This organism could present a risk to the Risk Assessment area and a detailed risk assessment is appropriate.	Detailed Risk Assessment Appropriate GO TO SECTION B		
20	This organism is not likely to be a harmful non-native organism in the Risk Assessment area and the assessment can stop.			
B	**SECTION B: Detailed assessment of an organism's probability of entry, establishment and spread and the magnitude of the economic, environmental and social consequences**			As indicated above the plant is already widely established and regarded as naturalised in much of the UK. This risk assessment should, therefore, aim to assess future spread. However, for completeness I have made comments on the probability of entry and establishment.
	Probability of Entry	**RESPONSE**	**UNCERTAINTY**	**COMMENT**
1.1	List the pathways that the organism could be carried on. How many relevant pathways can the organism be carried on?	very many - 4	LOW - 0	Horticultural trade; aquarium trade; disposal of cultivated material; natural spread from habitats where already present especially when seasonal flooding occurs (Barrat-Segretain et al., 2004). Fragments have high survival rates which allow them to be dispersed over long distances, therefore increasing their invasion capabilities. Unintentional introductions: a) habitat alteration/canals; b) recreational activities as fragments attached to boat and transport together with fishes taken from lakes (Kozhova and Izhboldiana, 1993); c) Introduced in UK as commodities with timber trade (Cook and Urmi-König, 1985). Intentional introductions: d) as ornamental plants in aquariums/ponds/amenities, via the trade in live aquarium plants legal or otherwise (Bowmer et al., 1995) and its disposal near waterways. This must be considered to be the principal pathway.
1.2	Choose one pathway from the list of pathways selected in 1.1 to begin the pathway assessments.	Horticultural trade		
1.3	How likely is the organism to be associated with the pathway at origin?	very likely - 4	LOW - 0	Deliberate trade of *Elodea canadensis* occurs in its the native range (USA and Canada) although trade is banned in some states where it is considered to be invasive. Annual sales of Canadian waterweed along with Nuttalls waterweed and curly waterweed, amount to between £2m and £5m. (Keith Davenport pers. comm. In Davis, 2009)
1.4	Is the concentration of the organism on the pathway at origin likely to be high?	moderately likely - 2	LOW - 0	Deliberate trade, although nowadays not traded as much as some similar species such as *Lagarospihon major* .
1.5	How likely is the organism to survive existing cultivation or commercial practices?	very likely - 4	LOW - 0	The plant easily survives in cultivation.
1.6	How likely is the organism to survive or remain undetected by existing measures?	likely - 3	LOW - 0	Would be easily seen when established during the growing season. However, small fragments would not be easily detected. It can be confused with other similar species and remain undetected during winter (in sediment).
1.7	How likely is the organism to survive during transport /storage?	very likely - 4	LOW - 0	
1.8	How likely is the organism to multiply/increase in prevalence during transport /storage?	unlikely - 1	MEDIUM -1	Some growth may occur during transport. Fragmentation of plants during storage may encourage spread when plants are released.
1.9	What is the volume of movement along the pathway?	moderate - 2	LOW - 0	Easy to grow but seems to be less popular in trade than *Lagarosiphon major* .
1.10	How frequent is movement along the pathway?	occasionally - 2	MEDIUM -1	The lower popularity of this plant in trade may mean that movement is less frequent.
1.11	How widely could the organism be distributed throughout the Risk Assessment area?	very widely - 4	LOW - 0	The current distribution of the plant in the risk assessment area is very wide (see distribution map at http://data.nbn.org.uk/gridMap/gridMap.jsp?allDs=1&srchSpKey=NHMSYS0000458325)
1.12	How likely is the organism to arrive during the months of the year most appropriate for establishment ?	very likely - 4	LOW - 0	Because the plant dies back during the winter, it is most likely to available for trade, and disposal into the natural environment, during the summer months.
1.13	How likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) or other material with which the organism is associated to aid transfer to a suitable habitat?	likely - 3	LOW - 0	Fragments of the plant from disposal of aquarium or pond contents into he natural environment could aid transfer.
1.14	How likely is the organism to be able to transfer from the pathway to a suitable habitat?	very likely - 4	LOW - 0	Historically assumed that the transfer from horticulture/cultivation into natural habitats has aided the current widespread distribution of *Elodea canadensis.*
	Probability of Establishment	**RESPONSE**	**UNCERTAINTY**	**COMMENT**

1.15	How similar are the climatic conditions that would affect establishment in the Risk Assessment area and in the area of current distribution?	similar - 3	LOW - 0	Climatic conditions are similar between the native North American range and the UK. There seem to be no limiting climatic factors.
1.16	How similar are other abiotic factors that would affect establishment in the Risk Assessment area and in the area of present distribution?	similar - 3	LOW - 0	See 2.4
1.17	How many species (for herbivores, predators and parasites) or suitable habitats vital for the survival, development and multiplication of the organism species are present in the Risk Assessment area? Specify the species or habitats and indicate the number.	very many - 4	LOW - 0	*Elodea canadensis* has been recorded in a diverse range of habitats as it is able to tolerate a wide range of conditions and can be found in depths of water up to 4m, where it is able to exploit un populated deep littoral sites. This species appears to be limited by fast flowing waters and sites with low alkalinity (See 1.27)
1.18	How widespread are the species (for herbivores, predators and parasites) or suitable habitats vital for the survival, development and multiplication of the organism in the Risk Assessment area?	widespread - 4	LOW - 0	Widespread - see 2.4.
1.19	If the organism requires another species for critical stages in its life cycle then how likely is the organism to become associated with such species in the risk assessment area?	N/A	LOW - 0	There is no evidence to suggest that the species requires any other method for critical stages in its life cycles.
1.20	How likely is it that establishment will not be prevented by competition from existing species in the Risk Assessment area?	very likely - 4	LOW - 0	Native aquatic plant species are generally outcompeted by *Elodea canadensis.* However, other introduced species, especially *Elodea nuttallii* and *Lagarosiphon major,* may outcompete *E. canadensis.* Where it establishes it can form exceptionally dense monocultures, excluding native species through competition.
1.21	How likely is it that establishment will not be prevented by natural enemies already present in the Risk Assessment area?	likely - 3	LOW - 0	Although there is evidence that some wildfowl (Lodge 1991; Van Donk and Otte, 1996) and snails (Elger *et al*., 2004) graze on Elodea spp. it has been shown that *Elodea spp.* are unpalatable to important aquatic herbivores such as *Lepidoptera* (Erhard et al., 2007). Elodea spp. also use allelopathy to effectively limit photoautotroph and cyanobacteria production, reducing light limitation and enhancing their potential for growth and spread (Vanderstukken *et al.;* Erhard & Gross, 2006).
1.22	If there are differences in man's management of the environment/habitat in the Risk Assessment area from that in the area of present distribution, are they likely to aid establishment? (specify)	very likely - 4	LOW - 0	Management practices, such as mechanical harvesting, may give rise to small plant fragments which would aid establishment. Mechanical control aid to establishment increasing fragmentation of the plant, which have high survival rates which allow them to be dispersed over long distances, therefore increasing their invasion capabilities (Barrat-Segretain, et al., 2002).
1.23	How likely is it that existing control or husbandry measures will fail to prevent establishment of the organism?	likely - 3	LOW - 0	Already widely established and mechanical control techniques further aid establishment.
1.24	How often has the organism been recorded in protected conditions, e.g. glasshouses, elsewhere?	frequent - 3	LOW - 0	Grown in plant nurseries, garden ponds.
1.25	How likely is the reproductive strategy of the organism and duration of its life cycle to aid establishment?	very likely - 4	LOW - 0	The plant reproduces vegetatively in the risk assessment area. All plants are believed to be female. Although there is one record of male plants in the UK from the 1880s, there have been no records before or since. In the native range male plants are less common than female. Growth of new plants from a single node or small fragments is a very effective reproductive strategy.
1.26	How likely is it that the organism's capacity to spread will aid establishment?	likely - 3	LOW - 0	The current widespread distribution is indicative of how well it can become established.
1.27	How adaptable is the organism?	very adaptable - 4	LOW - 0	The plant can grow in a range of conditions in the UK (See 2.4). Evidence shows that this plant has very plastic characteristics and has been shown to spread in a wide range of conditions and nutrient concentrations from oligotrophic to Eutrophic (Cook and Urmi-König 1985; Simpson 1990). It can grow in very shallow to deep water in lakes, reservoirs, ponds, rivers, streams, canals, ditches. It can survive in up to 4 meters of water depth (McGavigan, 2012) in slow moving water. It tolerates pH values from 6.0 to 7.5 (CABI, 2005). This species can even grow slowly under ice cover and can survive inside the ice (Bowmer et al., 1995) and it is also able to persist in canals with heavy boat traffic (Murphy and Eaton, 1983).
1.28	How likely is it that low genetic diversity in the founder population of the organism will not prevent establishment?	very likely - 4	LOW - 0	Low genetic diversity has not prevented widespread establishment in the UK over a 180 year period.
1.29	How often has the organism entered and established in new areas outside its original range as a result of man's activities?	very many - 4	LOW - 0	All introductions into continents outside North America are due to Man's activities. Subsequent spread has been due to a combination of Man's activities and natural means of spread. *Elodea canadensis* originated in North America, was reported in Ireland in 1836 and in Britain in 1842 (Preston and Croft, 1997). For more details of the spread, see Simpson (1984). It subsequently became widespread in north and central European countries (DAISIE, 2009). In addition, it has expanded its range to include parts of South America, Central America, Asia, Australasia, and Africa (USDA-ARS, 2009).
1.30	How likely is it that the organism could survive eradication campaigns in the Risk Assessment area?	very likely - 4	LOW - 0	Given that the plant can grow from a single node, great care would be needed to ensure complete eradication.
1.31	Even if permanent establishment of the organism is unlikely, how likely is it that transient populations will be maintained in the Risk Assessment area through natural migration or entry through man's activities (including intentional release into the outdoor environment)?	N/A	LOW - 0	The plant has been permanently established for many years now.
	Spread	**RESPONSE**	**UNCERTAINTY**	**COMMENT**
2.1	How rapidly is the organism liable to spread in the Risk Assessment area by natural means?	intermediate - 2	MEDIUM -1	In the risk assessment area the plant exclusively reproduces vegetatively through small pieces of stem which break off from the main plant. These may be carried to new habitats by birds or mammals. Fragments have high survival rates which allow them to be dispersed over long distances, therefore increasing their invasion capabilities.

2.2	How rapidly is the organism liable to spread in the Risk Assessment area by human assistance?	rapid - 3	LOW - 0	Boats, fishing lines - the plant reproduces vegetatively from small pieces of stem that rapidly produce roots and grow into new plants. Garden ponds and aquaria are likely to be sources of new plants.
2.3	How difficult would it be to contain the organism within the Risk Assessment area?	very difficult - 4	LOW - 0	The plant is so widely established that it is effectively beyond containment.
2.4	Based on the answers to questions on the potential for establishment and spread define the area endangered by the organism.		LOW - 0	*Elodea canadensis* occurs on fine substrates at c. 0.15-4 m depth, rarely more, in unshaded, eutrophic to meso-oligotrophic water-bodies, where turbulence through water-flow or wave action is minimal. It is most frequently found in lowland ponds, lakes, canals, slow-moving rivers and streams. It is sometimes found in slightly brackish costal waters but generally does not tolerate salinities of more than 3.5 ppt. with an optimum water temperature of 10-25ºC. It prefers calcareous water with a pH range of 6.5-10. *Elodea canadensis* is common and widespread in the UK below 300 m. It occurs throughout England and Wales, being absent from parts of the northern Pennines and central Wales. In Scotland it occurs mostly in lowland southern, central and eastern parts of the country and is largely absent from parts of the Southern Uplands, the northern and western Highlands and Islands although is present on South Uist and in the Orkneys. It is absent from Shetland (see distribution map at http://data.nbn.org.uk/gridMap/gridMap.jsp?allDs=1&srchSpKey=NHMSYS0000458325)
	Impacts	**RESPONSE**	**UNCERTAINTY**	**COMMENT**
2.5	How important is economic loss caused by the organism within its existing geographic range?	moderate - 2	LOW - 0	The main impact is likely to be on recreational activities, especially boating, watersports and angling. In its native range, it is not considered a pest. In its introduced range it has the potential to develop into dense submerged beds, which prevent the use of water for recreational and professional purposes, navigation and port infrastructure. The plant can also clog and impede drainage waterways.
2.6	Considering the ecological conditions in the Risk Assessment area, how serious is the direct negative economic effect of the organism, e.g. on crop yield and/or quality, livestock health and production, likely to be? (describe) in the Risk Assessment area, how serious is the direct negative economic effect of the organism, e.g. on crop yield and/or quality, likely to be?	minor - 1	LOW - 0	Not serious given the long establishment of the plant and the fairly limited likelihood of it being seriously invasive in the future in the risk assessment area. No evidence of economic problems in terms crop production or livestock health. Not enough information available to make an assessment.
2.7	How great a loss in producer profits is the organism likely to cause due to changes in production costs, yields, etc., in the Risk Assessment area?	minor - 1	LOW - 0	Interference with recreation, primarily sailing and other water sports, fishing restrictions.
2.8	How great a reduction in consumer demand is the organism likely to cause in the Risk Assessment area?	minor - 1	LOW - 0	No information.
2.9	How likely is the presence of the organism in the Risk Assessment area to cause losses in export markets?	very unlikely - 0	LOW - 0	There are no losses to export markets
2.10	How important would other economic costs resulting from introduction be? (specify)	minor - 1	LOW - 0	Interference with recreation, primarily boating, water sports and angling.
2.11	How important is environmental harm caused by the organism within its existing geographic range?	moderate - 2	LOW - 0	Regarded as invasive in some states in USA but otherwise does not cause environmental harm in North America. Is considered very damaging in areas where introduced, especially where this has been recent.
2.12	How important is environmental harm likely to be in the Risk Assessment area?	moderate - 2	LOW - 0	*Elodea canadensi* s can have a general negative impact on the functioning of aquatic ecosystems and it will outcompete native aquatic plants. It may take 3-4 growing seasons to assume pest proportions at a site, with such proportions being maintained for up to a decade more. Stem fragments have high survival rates, which allow them to be dispersed over long distances. It often forms dense monospecific stands and displaces other aquatic plants from many localities (Simpson 1984; Barrat-Segretain 2005). E. canadensis have shading effects during phases of rapid growth and mass occurrence. The plants compete with and displace indigenous vegetation, thus reducing biodiversity (Josefsson and Andersson, 2001). Dense populations of plants reduce the water movement, cut off light, produce anoxic conditions and trap sediments in the system. Plant decomposition at the end of the growing season typically induces a secondary eutrophication leading to the accumulation of end products toxic to many plants. Extracts from this species reduce the growth of several aquatic primary producers, among them epiphytic algae and cyanobacteria isolated from different submersed macrophytes (Erhard and Gross, 2006). Although evidence shows that *E. canadensis* abundance has reduced in Irish waters (McGavigan pers comm., Caffrey pers. comm.), high abundances of this species continue to persist in Welsh standing water SSSIs, therefore close monitoring will be required, especially if climatic conditions change through global warming, to limit further spread in existing sites and to prevent its spread into previously un-invaded sites.
2.13	How important is social and other harm caused by the organism within its existing geographic range?	minor - 1	LOW - 0	Most likely to have a minor effect on recreational activities such as boating, watersports or angling.
2.14	How important is the social harm likely to be in the Risk Assessment area?	major - 3	LOW - 0	*E. canadensis* forms large and dense stands that interfere with boating, fishing and adversely affect recreation activities.
2.15	How likely is it that genetic traits can be carried to native species, modifying their genetic nature and making their economic, environmental or social effects more serious?	very unlikely - 0	LOW - 0	*Elodea canadensis* only reproduces vegetatively so there is minimal risk of genetic traits being carried to native species. Other genera in the Hydrocharitaceae native or introduced (indicated by *) into the risk assessment area *Egeria*, Hydrilla, Hydrocharis, Lagarosiphon*, Najas, Stratiotes* and *Vallisneria**. It is very unlikely to cross with any of these and no intergeneric hybridisation between them has been recorded .
2.16	How probable is it that natural enemies, already present in the Risk Assessment area, will have no affect on populations of the organism if introduced?	very likely - 4	LOW - 0	Although there is evidence that some wildfowl (Lodge 1991; Van Donk and Otte, 1996) and snails (Elger *et al* ., 2004) graze on Elodea spp. it has been shown that *Elodea spp.* are unpalatable to important aquatic herbivores such as *Lepidoptera* (Erhard et al., 2007). Elodea spp. also use allelopathy to effectively limit photoautotroph and cyanobacteria production, reducing light limitation and enhancing their potential for growth and spread (Vanderstukken *et al.;* Erhard & Gross, 2006).

2.17	How easily can the organism be controlled?	difficult - 3	LOW - 0	*Elodea canadensis* is easily cut and controlled for short periods (1-2 months in summer) by mechanical methods. However, cutting may promote spread due to the vegetative reproduction of this species. Cutting early in spring may delay the onset of the peak biomass period. It is susceptible to chemical control to dichlobenil applied in spring before the plant is fully grown. However, sites treated with chemical control have experienced a regrowth of the plant between 2 and 3 years after treatment. The use of herbivorous Grass Carp can be used as a biological control method, however, damage to native plant species may occur since Grass Carp is a generalist feeder.
2.18	How likely are control measures to disrupt existing biological or integrated systems for control of other organisms?	unlikely - 1	LOW - 0	Native species may be impacted by control methods.In particular, cutting may cause further spread of *E. canadensis* by vegetative reproduction, resulting in increased ecosystem damage as native species are surplanted. Native species may be grazed by Grass Carp reducing native species abundances and providing niche availability for further invasions to occur.
2.19	How likely is the organism to act as food, a host, a symbiont or a vector for other damaging organisms?	very unlikely - 0	LOW - 0	None known.
2.20	Highlight those parts of the endangered area where economic, environmental and social impacts are most likely to occur.		LOW - 0	Reservoirs where infestations may block pumping equipment and hinder water drawdown. Lowland ponds, lakes, canals, slow-moving rivers and streams and, especially, made-made water bodies such as drainage channels and gravel pits.
	Summarise Entry	very likely - 4	LOW - 0	The plant has been growing in the risk assessment area since the early 19th century. Entry has been by deliberate introduction through the horticultural and aquarium trades, disposal of cultivated material and subsequent natural spread. Horticultural trade in this species has now declined.
	Summarise Establishment	very likely - 4	LOW - 0	The plant is widely established in the risk assessment area.
	Summarise Spread	rapid - 3	LOW - 0	*E. canadensis* provides one of the classic examples of the explosive spread of an alien plant (Preston and Croft, 1997). The plant does not spread with the same vigour as when first invasive in the risk assessment area. However, it still has the potential to invade newly established habitats, including man-made water bodies such as drainage channels and gravel pits and movement into areas currently uncolonised cannot be ruled out.
	Summarise Impacts	moderate - 2	LOW - 0	*Elodea canadensis* is now considered to be a widely established plant in the UK. Where it forms dense colonies thatalter ecosystems, impact water draw down and cause economic damage to angling, leisure and water sports income.
	Conclusion of the risk assessment	MEDIUM -1		Widely established, with the potential to invade new habitats.
	Conclusions on Uncertainty		LOW - 0	

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