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@fera.gsi.gov.uk

GB NON-NATIVE ORGANISM RISK ASSESSMENT SCHEME
For more information visit: www.nonnativespecies.org

	Name of Organism:	***Ludwigia* species specifically *L. grandiflora*, *L. hexapetala* and *L. peploides***	
	Objectives:	Assess the risks associated with this species in GB	
	Version:	FINAL 05/10/10. Original draft 02/03/10.	
N	**QUESTION**	**RESPONSE**	**COMMENT**
1	What is the reason for performing the Risk Assessment?		Request made by GB Programme Board
2	What is the Risk Assessment area?	Great Britain	
3	Does a relevant earlier Risk Assessment exist?	NO OR UNKNOWN (Go to 5)	
4	If there is an earlier Risk Assessment is it still entirely valid, or only partly valid?		
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)	Aquatic Ludwigia species, including L. grandiflora, L. hexapetala and L. peploides, are thought to occur in the wild in Europe. They are all reputedly sold in the GB and are also thought to be present in the wild in the GB. The taxonomy and hence identification of Ludwigia species is not well understood, at least not in the GB. There is an indigenous species of Ludwigia in the GB, L. palustris, which is very rare (Wiggington 1999). It was thought that a recent record of Ludwigia in Surrey was L. palustris but it was redetermined as the horticultural hybrid L. x kentiana (Clement 2000). At this point in time, a single risk assessment of those aquatic species of this genus makes good sense. Further more specific risk assessments may be necessary as more is understood about the different species, for example some species (e.g. L. hexapetala) are more frost tolerant than others (e.g. L. grandiflora). The native species could be confused with the non-native species when not in flower.
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)	*Ludwigia* species can be invasive in human constructed habitats such as irrigation ditches and canals (personal observation and Hall *et al.* 1971; Thendi 1996) and has also occurred in natural habitats in France and the Netherlands.
8	Does the organism have intrinsic attributes that indicate that it could be invasive, i.e. threaten species, habitats or ecosystems?		
9	Does the organism occur outside effective containment in the Risk Assessment area?	YES (Go to 10)	*Ludwigia* species are known from about thirteen locations in the UK, the likely number is greater than this.
10	Is the organism widely distributed in the Risk Assessment area?	NO (Go to 11)	*Ludwigia* species have only been recorded in a few locations in the UK. These have been in recent years. The genus, *L. palustris* apart, is not included in Preton *et al*. (2002) or the accompanying CD.
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?	YES (Go to 12)	*Ludwigia* species can grow in a range of aquatic habitats.
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)?	NO (Go to 14)	Given that species of the genus can reproduce vegetatively, pollination is not essential for maintaining a population and hence there is no reliance on any species or range of species.
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?	YES (Go to 16)	Given that *Ludwigia* species have been able to survive and thrive in the UK, the answer has to be yes. *Ludwigia* species have been spreading up mainland Europe towards the UK but it is not clear if plants would be able to survive in the UK.

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?	YES (Go to 17)	The population at the Wildfowl and Wetlands Trust Barn Elms Reserve is an example of this.
17	Can the organism spread rapidly by natural means or by human assistance?	YES (Go to 18)	This is based on experience in France, Belgium and the Netherlands and in southern Africa where the plant is spread as vegetative fragments (Grillas *et al.* 1992; Thendi 1996).
18	Could the organism as such, or acting as a vector, cause economic, environmental or social harm in the Risk Assessment area?	YES OR UNCERTAIN (Go to 19)	
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**			
	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?	moderate number - 2	MEDIUM -1	Brought into the UK via the plant trade (Grillas *et al.* 1992) and potentially as seed on the bodies of birds or in their digestive tract.
1.2	Choose one pathway from the list of pathways selected in 1.1 to begin the pathway assessments.	Introduction/spread via the plant trade		
1.3	How likely is the organism to be associated with the pathway at origin?	very likely - 4	LOW - 0	*Ludwigia* species are exported from nurseries in countries such as the Netherlands, into UK garden centres. They are however not that widely available.
1.4	Is the concentration of the organism on the pathway at origin likely to be high?	unlikely - 1	LOW - 0	*Ludwigia* has been included on a list of plants for which a ban of sale may be considered. Also see 1.3.
1.5	How likely is the organism to survive existing cultivation or commercial practices?	very likely - 4	LOW - 0	These practices would ensure its survival in good condition.
1.6	How likely is the organism to survive or remain undetected by existing measures?	very unlikely - 0	LOW - 0	Again, as it is the traded commodity, it is obvious.
1.7	How likely is the organism to survive during transport /storage?	very likely - 4	LOW - 0	As 1.5.
1.8	How likely is the organism to multiply/increase in prevalence during transport /storage?	moderately likely - 2	LOW - 0	There is likely to be some growth but not substantial as this would deter purchasers, i.e. plants need to be contained in pots.
1.9	What is the volume of movement along the pathway?	moderate - 2	MEDIUM -1	No figures available on volume of import.
1.10	How frequent is movement along the pathway?	occasionally - 2	LOW - 0	Movement is limited to season (spring to late summer) when sales can be made.
1.11	How widely could the organism be distributed throughout the Risk Assessment area?	very widely - 4	LOW - 0	Garden centres across the UK sell *Ludwigia* species and natural spread could distribute it throughout the risk assessment area.
1.12	How likely is the organism to arrive during the months of the year most appropriate for establishment ?	very likely - 4	LOW - 0	Very likely given both vegetative and seed spread.
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?	very likely - 4	LOW - 0	Most plants purchases are likely to be planted in ponds etc.
1.14	How likely is the organism to be able to transfer from the pathway to a suitable habitat?	moderately likely - 2	MEDIUM -1	There is little information about how plants are spread from ornamental ponds etc. into the wild. The plant could be dominant especially during warm bright periods and people could dump excess growth into ponds in the wild.

	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	MEDIUM -1	The main area of natural occurrence, e.g. Argentina, has a similar climate to the UK in some parts, but is mostly frost-free. However, *L. grandiflora* has successfully colonised as far north as Washington State and New York state in the USA, which have harsher winters than the UK.
1.16	How similar are other abiotic factors that would affect establishment in the Risk Assessment area and in the area of present distribution?	very similar - 4	LOW - 0	Habitats in the present area of distribution are very similar to those found in the UK, such as irrigation channels, ponds, meres and small lakes.
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	*Ludwigia* species could establish themselves in a range of habitats as they have, for example, in France (Dutartre 1997; Eigle and Dutartre 1996), Belgium and the Netherlands.
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	Suitable habitats occur throughout the UK: ponds, drainage channels, canals, lakes and reservoirs (Dutartre *et al*. 1989; Grillas *et al.* 1992).
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		No such requirement known though pollination might be restricted to certain insects. This is not especially relevant as these plants can spread vegetatively (Berner 1956; 1971).
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	MEDIUM -1	The propensity of *Ludwigia* species for growing out from the margins of a waterbody and occupying the water surface with floating mats gives the plant a significant competitive advantage (Yen and Myerscough 1989).
1.21	How likely is it that establishment will not be prevented by natural enemies already present in the Risk Assessment area?	very likely - 4	MEDIUM -1	Some herbivores have been recorded in France (Cordo and Deloach 1982a; 1982b) but these have not had a marked effect on the plants.
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)	likely - 3	LOW - 0	Management, especially cutting, is likely to cause the plants to spread as they can reproduce from vegetative fragments.
1.23	How likely is it that existing control or husbandry measures will fail to prevent establishment of the organism?	very likely - 4	LOW - 0	The main reason is that managers are unlikely to recognise the plant, hence no control is likely to take place. Even if the plant were recognised, managers would not know how to deal with it.
1.24	How often has the organism been recorded in protected conditions, e.g. glasshouses, elsewhere?	very rare - 0	LOW - 0	It would only be present in glasshouses where it was being deliberately cultivated.
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	Vegetative reproduction is the main mode of spread (Muller 1997). Although seed formation has been noted in France (Dutartre *et al.* 1989), it is not clear if the seed is viable due possibly to the climate (Muller 1997).
1.26	How likely is it that the organism's capacity to spread will aid establishment?	very likely - 4	LOW - 0	See 1.25.
1.27	How adaptable is the organism?	very adaptable - 4	LOW - 0	*Ludwigia* species can colonise a range of habitats and due to its ability to raft on the water surface, achieves dominance (no other plant in the UK occupies this niche). The plant can also use its "bladders" to sequester oxygen under low oxygen conditions (Jovet and Bourasseau 1952).
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	This factor has generally not been a problem for aquatic plants (Sculthorpe 1967).
1.29	How often has the organism entered and established in new areas outside its original range as a result of man's activities?	many - 3	LOW - 0	Apart from France (Jovet and Vilmorin 1979), Belgium and the Netherlands, the species are also known from sub-Saharan Africa, e.g. Hall *et al.* (1971).
1.30	How likely is it that the organism could survive eradication campaigns in the Risk Assessment area?	very unlikely - 0	LOW - 0	As *Ludwigia* species are known from only a handful of sites, such a campaign would have a high chance of success.
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	

	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 connected water bodies and in watercourses with slow to moderate flow, *Ludwigia* will spread easily and rapidly by plant fragments. Spread between unconnected waterbodies is poorly understood.
2.2	How rapidly is the organism liable to spread in the Risk Assessment area by human assistance?	rapid - 3	MEDIUM -1	The spread of *Ludwigia* depends on people disposing of excess plant material into ponds etc. Its prodigious potential for growth (doubling biomass in 15-20 days in the French situation) suggests that it will outgrow ornamental ponds and hence find its way into the countryside (Dutartre 1986). Control by ignorant managers, e.g. by cutting, would speed up spread.
2.3	How difficult would it be to contain the organism within the Risk Assessment area?	very easily - 0	LOW - 0	The limited number of locations makes containment a feasible target. Currently it is known from six locations but Defra reports that actual numbers of sites could be up to 60 (Timesonline, 3 January 2007). For further details contact Jonathan Newman (CEH, Wallingford).
2.4	Based on the answers to questions on the potential for establishment and spread define the area endangered by the organism.		HIGH -2	The UK as a whole - plants are provided for sale across the UK.

	Impacts	RESPONSE	UNCERTAINTY	COMMENT
2.5	How important is economic loss caused by the organism within its existing geographic range?	moderate - 2	MEDIUM -1	*Ludwigia* species are problems in irrigation channels, dams/reservoirs and canals and rivers in South America and southern Africa (personal observations). The plant builds up floating mats which can be colonised by other plants, e.g. sedges and grasses but later shrubs and trees. Floating islands can be created.
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?	minimal - 0	MEDIUM -1	*Ludwigia* plants are unlikely to have a detectable direct negative impact economically.
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?	minimal - 0	MEDIUM -1	These plants only have indirect effects.
2.8	How great a reduction in consumer demand is the organism likely to cause in the Risk Assessment area?	minor - 1	MEDIUM -1	Reductions of this type could occur where water based recreation is disrupted (Dutartre *et al.* 1989). This would apply to angling in particular.
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	These plants would not have such an effect.
2.10	How important would other economic costs resulting from introduction be? (specify)	moderate - 2	MEDIUM -1	Costs incurred would be through the need for management especially in relation to flood control and water lost to irrigation (e.g. Internal Drainage Boards). If the plant formed mats leading to island creation this could pose serious flood risk issues. If the plant became very widespread it would cease to be acceptable visually and visitor rates to nature conservation sites etc. would fall.
2.11	How important is environmental harm caused by the organism within its existing geographic range?	major - 3	MEDIUM -1	The growth form shades out other plants and *Ludwigia* stands are typically monospecific. Once a floating mat is established other species start to colonise it, further shading out aquatic species but compensating to some degree for loss of submerged and floating species. In addition to shading, mats of *Ludwigia* bring about deoxygenation of the water with potential damage to fish stocks and to other fauna.
2.12	How important is environmental harm likely to be in the Risk Assessment area?	major - 3	LOW - 0	Evidence from France (Dutartre *et al.* 1989), Belgium and the Netherlands indicates that harm to biodiversity is serious. Whole lake systems in France have been taken over by Ludwigia, with a resulting loss of water for waterfowl.
2.13	How important is social and other harm caused by the organism within its existing geographic range?	minor - 1	MEDIUM -1	Mainly loss of biodiversity in initial stages of mat formation.
2.14	How important is the social harm likely to be in the Risk Assessment area?	minor - 1	MEDIUM -1	Primarily through disruption to angling and other water-based sports, e.g. rowing and sailing.
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	There are no truly closely related native species; the only native *Ludwigia s*pecies is very rare (see 5).
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	MEDIUM -1	Experience with respect to other invasive aquatic plant species suggests that there will be no check in terms of herbivores or pathogens. Muller (1997) reports that a diversity of insects feed on *L. peploides* and that there could be potential for a biocontrol agent, mentioning specifically a flea beetle (Cordo and Deloach 1982a) and weevils (Cordo and Deloach 1982b). Despite such herbivores, the plant has survived. Cattle will also feed on the plant (Muller 1997). *Ludwigia* is not palatable to Grass Carp.
2.17	How easily can the organism be controlled?	with some difficulty - 2	MEDIUM -1	Research is underway to determine how best to control *Ludwigia* (Defra) but both the herbicide glyphosate and cutting can be effective. The range of herbicides for use in or near water is rapidly declining and will make control of this species more difficult. It is essential to remove all plant material as *Ludwigia* species can regrow from stem fragments. Biological control could be viable.
2.18	How likely are control measures to disrupt existing biological or integrated systems for control of other organisms?	unlikely - 1	MEDIUM -1	Chemical control on a repeated basis is damaging to other plants, most of which would be susceptible to glyphosate, but it is unlikely that biological or integrated control systems will be present where *Ludwigia* is a problem.
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	MEDIUM -1	None has been reported.
2.20	Highlight those parts of the endangered area where economic, environmental and social impacts are most likely to occur			Waterbodies across the UK and those that are sensitive particularly with respect to biodiversity value, angling and other water sports.

Summarise Entry	very likely - 4	LOW - 0	Water plant trade; disposal of excess plant growth; natural means.
Summarise Establishment	very likely - 4	LOW - 0	Vegetative spread, dominant life form and adaptability to different types of water bodies.
Summarise Spread	intermediate - 2	MEDIUM -1	Still and slow flowing water bodies across the UK.
Summarise Impacts	major - 3	LOW - 0	Impact on biodiversity followed by flood risk, angling and other water users.
Conclusion of the risk assessment	HIGH -2	LOW - 0	The high volume of plant trade has guaranteed that the plant has been imported widely into the UK. Its ability to grow from fragments of stem has enabled it to spread from ponds and ornamental pools etc. into the wild. Its dominant life form enables it to establish a stronghold in a water body. Resistance to restrictions on sale of the plant by the plant trade have exacerbated the problem.
Conclusions on Uncertainty		LOW - 0	*Ludwigia* species are reasonably well studied and the information on which the assessment is based is sound. Further investigation is needed to understand in more detail how the plant is dispersed in the wild and in particular the role of seeds. Research is badly needed into effective means of control that have minimal collateral damage.

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