



# **Water Primrose (*Ludwigia* species) Exclusion Strategy and Invasive Species Action Plan**

## 1. Introduction

The risk assessment undertaken as part of the Invasive Species Ireland project prioritised *Ludwigia grandiflora* / *L. uruguayensis* for preparation of an Exclusion Strategy and Invasive Species Action Plan to inform actions needed to prevent its introduction and measures required to prevent impact should the species be confirmed in Ireland. This species acquired a score of 23 out of a possible 25 from stage 1 of the risk assessment owing, in part, to its potential impact on protected habitats and species and non-compliance with EU legislative obligations under the Water Framework and Habitats Directives.

Since carrying out the risk assessment, it has been confirmed that there are two species of *Ludwigia* present in Britain: *L. peploides* and *L. hexapetala* (Booy, O. *et al.*, 2009). Following the precautionary principle, the remit of this Exclusion Strategy and Invasive Species Action Plan has been extended to cover the entire genus *Ludwigia*. This reflects the difficulty in distinguishing species (EPPO, 2004); the fact that the genus *Ludwigia* is under review (EPPO, 2004); that no members of this genus are native to Ireland; and the potential for other members of the genus to become invasive in Ireland.

## 2. Aim of plan

The aim of the Exclusion Strategy is to guide actions required to prevent the introduction of species from the genus *Ludwigia* to Ireland.

The aim of the contingency aspects of this Invasive Species Action Plan is to identify actions required to effectively respond to an incursion of *Ludwigia* in Ireland. This section is divided into pre-invasion and post-invasion actions.

These aims can be achieved through the review and implementation of legislation; raising awareness of the economic and environmental impacts of this potentially invasive genus; developing policy, networks, and implementing actions needed to deal with incursions.

## 3. Key priorities

### 3.1 Exclusion strategy

- Restrict the sale of the genus *Ludwigia* through garden centres, supermarkets and aquarists and ensure *Ludwigia* species are not imported to the island of Ireland.
- Raise public awareness of the economic and environmental impacts *Ludwigia* species could have in Ireland in combination with education efforts targeted at key stakeholder groups linked to the import of these species.
- Encourage the removal and proper disposal of domestic plantings in ponds and aquaria and promote the use of native species.
- Ensure networks and information are in place to help identify if and when this species arrives in Ireland. This can be done by encouraging surveillance for this genus among gardeners, naturalists the general public, and water course users such as agriculturalists, anglers and canoeists.

### 3.2 Invasive Species Action Plan

- Guide the eradication of the plant at all sites where it becomes established.
- Engage with stakeholders to provide advice and help, where appropriate, to eradicate populations in private gardens.

## 4. Invasion history

Some members of this genus have become highly invasive and caused significant economic and environmental damage in many parts of the world (EPPO, 2004; Global Invasive Species Database, 2009;

New South Wales Agriculture, 2009). *L. peploides* is now the subject of control measures in Britain. It is only known from a few sites in the UK and it has been eradicated from some of these. *L. hexapetala* is the only other non-native species of *Ludwigia* known to occur in the UK, although water-primrose (*L. grandiflora*) has often been incorrectly recorded. Distinguishing between non-native species of *Ludwigia* is very difficult. If this is required expert consultation may be necessary (Booy *et al.* 2009). Data on full geographical distribution is lacking and complicated by the fact that the genus *Ludwigia* is under revision (EPPO, 2004).

Using patterns of invasion from Western Europe to undertake a systematic horizon scanning exercise for Britain and Ireland, we can expect that invasive non-native species present in Britain, such as *L. peploides* and *L. hexapetala*, will arrive in Ireland (Ermgassen and Aldridge, 2009). At the time of preparing this Exclusion Strategy and Invasive Species Action Plan an unconfirmed report of an unidentified *Ludwigia* species in Ireland was sent to the Invasive Species Ireland project. This is being verified at the time of writing.

## 5. Nomenclature of *L. peploides*

**Scientific name:** *L. peploides*

**Common name:** creeping water-primrose, Water Primrose

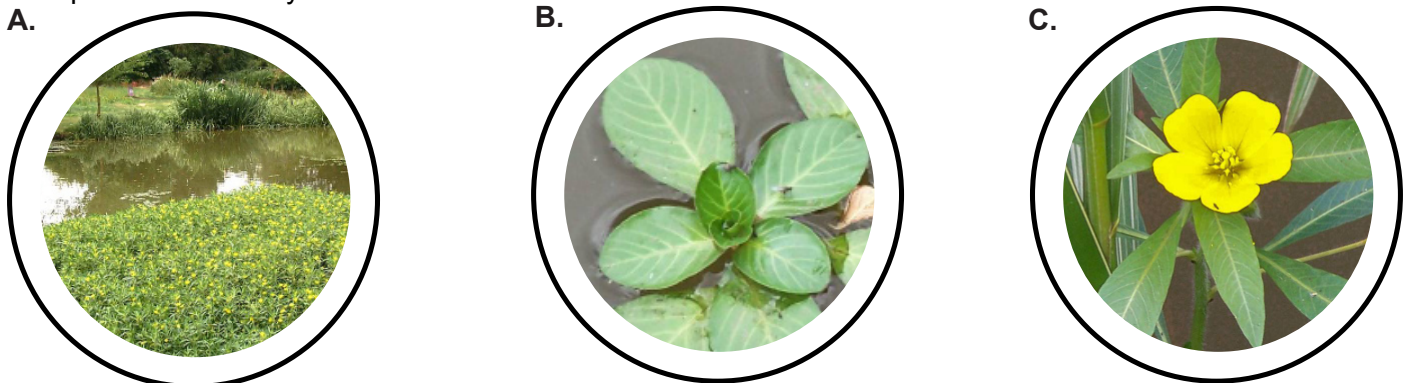
**Also known as:** Often incorrectly identified as *L. grandiflora* and labelled in garden centres as *Jussiaea*

**Similar species:** The genus *Ludwigia* contains 33 Species and 41 accepted taxa overall (USDA, 2009).

## 6. Identification features

Most *Ludwigia* species are immersed plants; however, *Ludwigia repens* is mostly submersed and does not look much like the other *Ludwigia* species. There are many species, some large and shrubby, and some small and floating. They commonly grow in shallow marshy areas (Figure 1A), borrow pits and ditches. They flower in all seasons except winter.

*Ludwigia* can grow to 1 to 2 m tall; however some are only inches tall. Stems are branched and sometimes have long hairs. The leaves are ovate (Figure 1B) to lance-shaped (Figure 1C), and up to nine centimetres long. Leaves are covered on both sides by minute soft hairs. Most have conspicuous yellow flowers (Figure 1C). The flowers have four or five petals (University of Florida, 2008). To distinguish between species, expert consultation will be required. Images shown here are that of *L. peploides* in Britain as this may be the species most likely to arrive in Ireland.



**Figure 1.** 1A. *L. peploides* invasion at in a pond in Britain; 1B. Leaves of *L. peploides*; 1C. Flowers of *L. peploides*. Photos courtesy of GB Non-native Species Secretariat.

## 7. Impacts

*Ludwigia* can form very dense (almost impenetrable) mats in freshwater ecosystems. Large accumulations of this species can lead to a depletion of oxygen levels in the water while also competing with native species for space and resources. This species has been linked to significant losses in biodiversity at impacted sites in France.

The rapid and extensive development of plant populations can block waterways (and thus disturb many human activities such as navigation, hunting, fishing, irrigation and drainage), reduce biodiversity and degrade water quality. Studies done in France have shown that *Ludwigia* species were able to produce rapidly a high biomass (up to 2 kg of dry matter per m<sup>2</sup>). Biomass could double in 15 to 20 days in slow-flowing waters, and in 70 days in rivers. As an example, populations of *Ludwigia* species in Marais d'Orx (France) occupied a few m<sup>2</sup> in 1993 and reached 130 ha in 1998 (EPPO, 2004).

*L. peploides* and *L. grandiflora* have also been shown to have an alleopathic impact. Combined with the various competitive attributes, allelopathy may contribute to the great success of these two invasive *Ludwigia* in Europe (Dandelot, 2008). In threatened wetland communities, allelopathy might have an important impact by diminishing the seedling survival of the most vulnerable species.

## 8. Distribution and spread potential

Fragmentation of stems is the main mode of dispersal of *Ludwigia* species. The role of seeds remains to be studied further (viable seeds were able to germinate in laboratory conditions but no data has yet been obtained in outdoor conditions). It is suspected that humans and birds are responsible for plant movement between waterways. These plants have also shown a good resistance to frost in Europe (EPPO, 2004).

Predictions based on our current knowledge of the habitats most susceptible to invasion will allow us to identify priority areas for control and prevention. Proximity to populations of *Ludwigia* should be used to prioritise local preventative measures but on a national scale, remote and isolated populations are likely to occur at geographically distant sites due to the vectors and pathways associated with this species.

The distribution potential for *Ludwigia* in Ireland is high as available habitat is widespread. The primary sites of infestation will be garden ponds, small enclosed waterbodies and the canal systems. From these sites it may spread to larger lakes where we would see similar environmental and economic impact as experienced in France.

### Action 1. Establish accurate baseline distribution

In order to progress action on the ground, it is essential to have easily available distribution information. Recording programmes for invasive species should be encouraged on an annual basis and records should be submitted to the National Invasive Species Database and made readily available through the two biodiversity record centres on the island of Ireland. The biodiversity record centres should be resourced to gather information on invasive species and disseminate this information on request and/or online methods to key stakeholders for example, Local Biodiversity Officers and site managers.

## 9. Exclusion strategy

### Action 2. Enforcement and raise awareness of legislative powers

Legislation is already in place to prevent the release of invasive species in both Northern Ireland and the Republic of Ireland:

Northern Ireland - under Article 15 (2) of The Wildlife (Northern Ireland) Order 1985 (under review) if any person plants or otherwise causes to grow in the wild any plant which is included in Part II of Schedule 9, he shall be guilty of an offence.

Republic of Ireland - under Section 52(7) of The Wildlife (Amendment) Act 2000 any person who plants or otherwise cause to grow in a wild state in any place in the State any species of flora, or the flowers, roots, seeds or spores of flora except under and in accordance with a licence granted in that behalf by the Minister shall be guilty of an offence.

### Action 3. Amend existing legislation

Legislation should be strengthened to ensure a total ban on import and possession of all *Ludwigia* species. To this end:

- The genus *Ludwigia* should be added to Schedule 9 Part II of the Wildlife (Northern Ireland) Order 1985.
- The Minister of the Environment in the Republic of Ireland has power to prohibit the possession or introduction of any species that may be detrimental to native species. The genus *Ludwigia* should be brought to the attention of the Minister and the required prohibition enacted.

### Action 4. Highlight, support and promote Invasive Species Codes of Practice

A key priority to prevent the spread and release of invasive species is to promote the uptake of the Invasive Species Codes of Practice and support these with literature and information leaflets for both industry and the general public.

### Action 5. Public sector bodies adopt Invasive Species Codes of Practice

All public sector organisations should lead by example and adopting Invasive Species Codes of Practice in their relevant work areas. This is a key priority to the success of each of the codes. Government agencies should also incorporate the sentiment of the codes into tenders and procurement procedures and ensure that suppliers are abiding by the codes, where possible.

## **10. Pre-invasion measures**

While progress has been made in invasive species management and prevention in Ireland, there are many areas of work that still must be addressed:

### **Action 6. Develop early detection networks**

The development and implementation of early detection networks should incorporate training of regional fisheries officers and those working on waterbodies on the identification of this and other invasive non-native species. Training should include raising awareness of the potential impacts, the importance of biological records and associated standards, the Alien Watch function of the Invasive Species Ireland website and the role of the two biological record centres on the island of Ireland.

### **Action 7. Develop and implement rapid response plans for high risk species and regions**

An additional component of early detection and ability to deliver on rapid response is the adequate resourcing of the Alien Watch section of the Invasive Species Ireland website. This should be done in partnership with the two biodiversity record centres on the island of Ireland. The goal here is to ensure that a report to the website triggers action on the ground and that there are cost effective mechanisms in place to verify or discount reports.

Early detection will require an adequate level of information flow to the general public and key stakeholders. The Invasive Species Ireland website should be the focal point for dissemination of current information.

### **Action 8. Develop awareness and develop appropriate legislation to enable custom officials to monitor ports of entry for invasive non-native species**

Currently, there is no legislative remit in place in Ireland to allow custom officials to monitor for all invasive species. There is a need for new legislation similar to plant health regulations that enables custom officials to act as border control for invasive species.

## 11. Contingency measures

### Action 9. Ensure a programme of eradication and control is implemented if a population of *Ludwigia* is found in Ireland

If *Ludwigia* is discovered in Ireland, then management options will need to be considered with the aim of containment, control and ultimately eradication of the population. Results from the eradication programme currently underway in Britain should guide any necessary action in Ireland and future development of this plan.

#### 11.1 Best practice management guidance

A combination of the physical, chemical and environmental control options outlined below are recommended. In general, programmes should manually remove growth prior to flowering. Spraying regrowth with glyphosate should then follow. The intention here is to reduce the risk of over spray of herbicide onto native flora and into water bodies. Results can be improved by slashing stands prior to flowering, then spraying the regrowth 2-4 weeks later (New South Wales Agriculture, 2009). Repeat applications will probably be required for larger plants, and a follow up program will be required to deal with seedlings.

Correct disposal of seeding material is essential. Unless suitably contained on site, all seed capsules should be carefully handled and bagged in single use rip-proof bags to contain seeds and then carefully disposed of. Discarded plant material should also never be left in contact with the soil as it may take root (NSWA, 2009).

**Note:** Care should be taken not to inadvertently spread fragments or seeds attached to clothing or equipment. Strict cleaning protocols should be adapted and adhered to. Correct disposal of plant material is also essential.

#### 11.2 Mechanical control

Mechanical control of aquatic weeds primarily consists of removing the weeds physically from the waterbody or inhibiting growth and development. This could be done manually by hand, using hand tools or machines. It may also consist of altering the environment or creating conditions/situations which may inhibit or do not permit growth and development of weed. Options available to managers include:

- Manual Cleaning: more suited to smaller infestations such as ponds or streams.
- Cutting or harvesting: use of cutting tools by hand or machine operated. Boats specifically designed for the task can be utilised.
- Chaining: This technique has been used in canals and river systems. This method has been found effective where there is dominance of emergent and submersed weeds.
- Netting: Scattered floating weeds can be skimmed out of small water bodies using nets.

Seedlings can be pulled by hand, but mature plants are more difficult with many long roots embedded in the substratum. Where the majority of the root is not removed, the plant will resprout. In some areas *Ludwigia* acts as a bank/ stream bed stabiliser and manual removal would increase disturbance. The NSW (1999) recommends slashing and burning dense stands. Where fruit is formed, cut and bag these before removing the rest of the plant. Decomposition of crushed or damaged plant material may result in increased nutrient availability and a reduction in dissolved oxygen.

The control of aquatic weeds is difficult, especially in dynamic or large systems. The use of booms or nets to act as barriers, preventing drift material escaping will be needed in both large and small scale projects



when practicing mechanical control. In large waterbodies, inflatable rubber booms can be used to restrain the drift of free floating aquatic weeds. The barriers are made to allow water to pass through them and to sustain the wave and wind action. In smaller waterbodies such as small rivers and streams, netting or mesh should be placed down stream to capture any debris.

## 11.2 Chemical control\*

Most aquatic weeds can be controlled effectively by use of herbicides . The time and method of herbicide application varies with the type of weed flora and the habitat in which the weeds are to be controlled. Control of aquatic weeds by herbicides is generally easier, quick and usually cheaper, when compared to mechanical methods but it may have wider impacts on the environment. *Ludwigia* may tolerate low concentrations of residual herbicides.

At a site in the New Forest, control of 97.81% was achieved using the glyphosate and non-oil soya sticking agent. This adjuvant (TopFilm) may have the advantage of increasing herbicide delivery to the target plant while reducing the concentrations of herbicide required. Manufacturers recommendations and statutory obligations must be followed (Defra, 2006).

**Note:** Prior to undertaking any spraying operation in or near water it is essential that the user is fully trained to the required pesticide spraying level (e.g. PA1, PA6 aw). The user must fully comply with the Pesticide Product Label. In the UK the use of Pesticides is regulated by the Pesticide Safety Directorate (PSD). The Pesticide Control Service (PCS) of the Department of Agriculture and Food is responsible in Ireland. Historically several pesticides have been available for aquatic use in the UK and Ireland. It is expected that certain chemicals will be subject to restrictions in the near future. Please refer to PSD website (<https://secure.pesticides.gov.uk/pestreg/ProdSearch.asp>), the PCS website (<http://www.pcs.agriculture.gov.ie/pest.asp?searchType=functCrop>) or contact the relevant organisation directly for the most up-to-date list of herbicides approved for aquatic use.

## 11.3 Environmental control

Light is a prerequisite for photosynthesis and restricting it may aid in the control of aquatic weeds. In the case of *Ludwigia*, shading may have potential for small infestations; however, large-scale shading operations may negatively impact other plants, fish, and wildlife (Defra, 2006). Options available to managers include planting of trees along banks, use of geotextile fabric or other appropriate barrier and the manipulation of water clarity. At present, these remain untested. Research is required both on small scale and large scale projects to determine their efficacy.

## 11.4 Biological control

No known research has been conducted on introduced biological control agents and therefore biological control is not recommended as an option for use at this time. Also, policy and legislation relating to biological control in Ireland remains unclear at this time. Clarification and policy development is required. If biological control for this species is considered in the future, species specificity and the ability of the chosen biological control agent to persist under Irish conditions must first be understood.

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\* When considering chemical control options always refer to the Invasive Species Ireland policy on this management procedure. A brief statement on this policy can be found in Section 12 of this document.



## 12. Invasive Species Ireland: Policy statement on chemical control

1. The Invasive Species Ireland Steering Group do not support unjustified general, non-specific chemical control of aquatic invasive species due to potential impacts on non-target species; residual impact and persistence in the environment; the lack of associated rigorous monitoring to appraise effectiveness of control methods; and the potential noncompliance with the Water Framework Directive.
2. Targeted and appraised chemical control does have a role to play in management of aquatic invasive species, but should be seen as a last resort; after all other alternative control options have been thoroughly considered and assessed.
3. Before undertaking a chemical control programme, a transparent cost/benefit analysis identifying the risks associated with intervention options and risks of non intervention must be carried out.
4. A transparent cost/benefit analysis of management options should include the following:
  - Knowledge of the invasive species occurrence/distribution at and around the location.
  - Thorough knowledge of the invasion ecology and life history of the species.
  - An assessment of the potential impacts based on invasive history elsewhere and similarity of Irish habitats. This should include the identification of:
    - The sensitivity of native species, habitats and ecosystems present in respect to international, European and domestic legislative obligations and concerns.
    - Impacts on economic and amenity values
    - Potential impact of both the invasive alien species and the proposed control methodology.
    - Other human, animal and plant health issues.
  - The need for appropriate assessments.
  - Efficacy of control and eradication methods available based on assessment of experience elsewhere and on site, if applicable.
  - Assessment of known impacts of potential control methods on non-target species and residual impacts in the environment.
  - Due consideration of the legal status of the options considered.
  - A planned schedule of works with disposal procedures for waste predetermined.
  - The identification of competent authority with the capacity and budget to complete the programme.
5. If the analysis concludes that other control options are not sufficient the Invasive Species Ireland Steering Group recognise that in these circumstances, chemical control has a role in the management of the aquatic invasive species.

## 13. Resourcing the plans

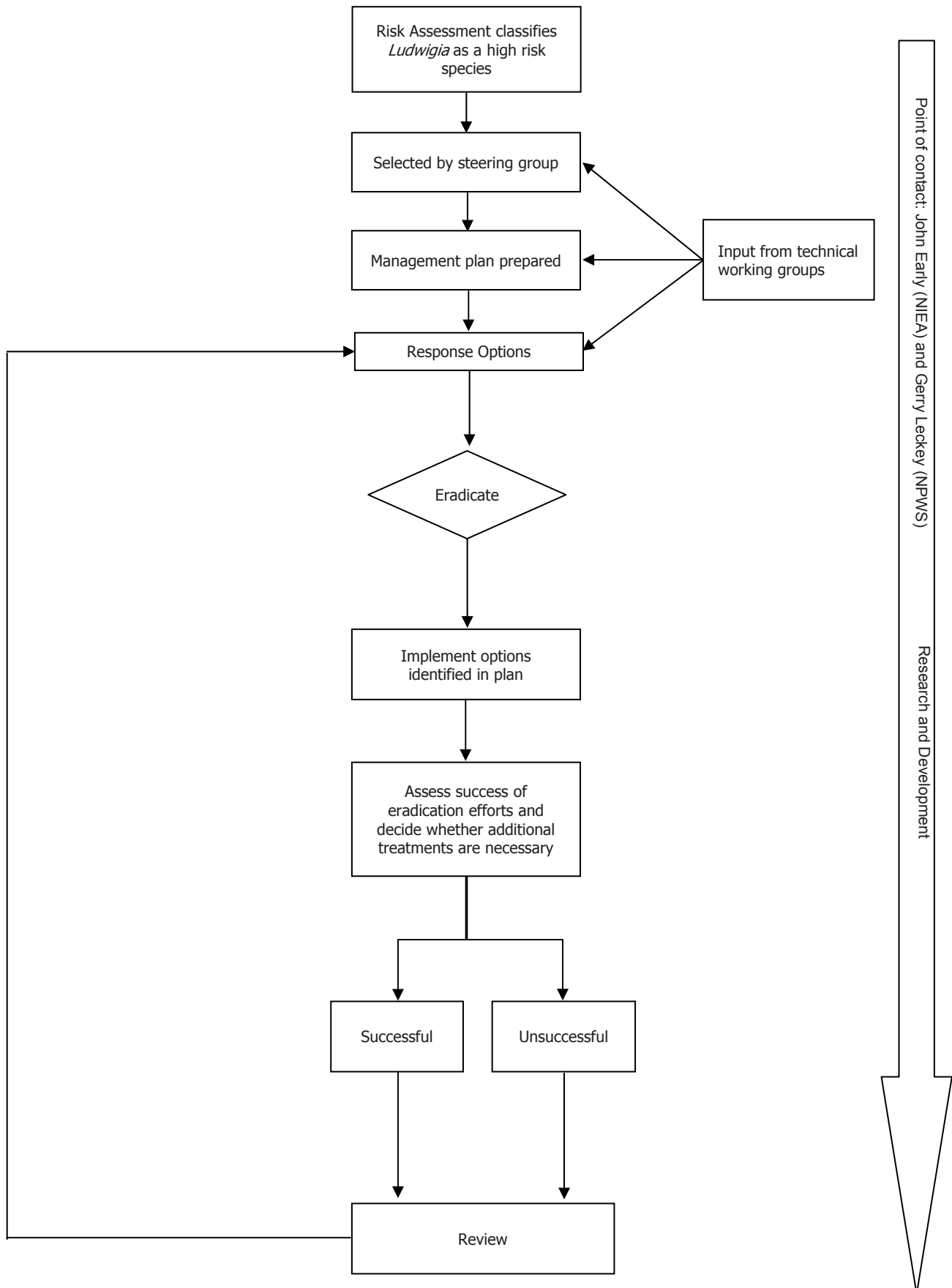
### Action 10. Ensure adequate resources are in place to facilitate implementation of this plan

Small scale control programmes for this species i.e. garden ponds are estimated to cost less than £500. Larger ponds or river systems will required additional funding on a continuous basis until eradication is achieved. This is estimated to cost up to £5,000 annually. Should a lake, canal, or river system become colonised, costs associated will increase and are estimated to fall between the £50,000 - 100,000 in the first year. If funds are dedicated early in the invasion of a system this will reduce the overall cost of the programme and provide the greatest value for money in terms of commitment of resources and preventing economic impact in Ireland.

#### 14. Recommended actions and timetables

No.	Action	Responsibility	Timescale
1	Establish accurate baseline distribution	Government Agencies in partnership with the National Biodiversity Data Centre, Cedar and other stakeholders engaged in the collection of biodiversity data	Annual programme required. Programmes should aim to build on that of the 2009 Invasive Species Survey co-ordinated by the National Biodiversity Data Centre
2	Enforcement and raise awareness of legislative powers	State agencies in partnership with relevant stakeholders	Initiate in 2009
3	Amend existing legislation	State agencies	2009 - 2010
4	Highlight, support and promote Invasive Species Codes of Practice	State agencies, Invasive Species Ireland, relevant stakeholders	Initiate in 2009
5	Public sector bodies adopt Invasive Species Codes of Practice	All public bodies	2009
6	Develop early detection networks	NPWS, NIEA, local authorities and other relevant stakeholders	2009/2010
7	Develop and implement rapid response plans for high risk species and regions	NPWS, NIEA, local authorities and relevant stakeholders	Immediately after successful completion of Action 6
8	Develop awareness and develop appropriate legislation to enable custom officials to monitor ports of entry for invasive non-native species	NPWS, NIEA, local authorities and relevant government agencies	2009 - 12
9	Ensure a programme of eradication and control is implemented if a population of <i>Ludwigia</i> is found in Ireland	NPWS, NIEA, local authorities and relevant stakeholders	Maximum of 5 year programme of work required.
10	Ensure adequate resources are in place to facilitate implementation of this plan	NPWS, NIEA, local authorities and relevant stakeholders	Immediately

## 15. Decision process



## 16. Template management plan

Use this template to help formulate a management plan outlining how you are going to proceed and what you will need.

Site Manager(s)/Owner(s): \_\_\_\_\_

Site Name(s): \_\_\_\_\_

Central grid reference: \_\_\_\_\_

License to proceed with plan acquired? Yes ☐ No ☐

### Site details

Address:	
Telephone:	
Email:	
Agencies/persons involved:	
Date:	
Species of concern:	

### Invasion history

Date of introduction:	
Original location of introduction:	
Date of first report to competent authority:	
Method of introduction:	
Additional information on introduction event:	

### Site information

Total site area:	
Total area colonised:	
Total area of relevant habitats:	

Designation	On site	Near site	None present
<b>Details:</b>  Establish if there is a requirement to apply for a license/notify before proceeding with plan.			

Rare and threatened species	On site	Near site	None present
Red Data Book or BAP species:			
Other rare or threatened species:			

### Current identified impacts

Impacts	Minimal	Moderate	Severe

### Human sensitivities/vested interests at site

Issue	Human receptor

### Identify requirements and best practice for collaboration with stakeholders

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### Actions and resources

Management options	Responsibility	Date to undertake

Resources needed	Responsibility	Date to undertake

### Monitoring and evaluation

Name of person/s	Date to undertake	Report to	Additional treatments date (if required)



## **17. Summary of actions needed for effective management**

1. Confirm identification of species. Refer to recognised experts to confirm identification, if required.
2. Develop and produce a site specific management plan. Use the template provided in this document to guide you. A key part of this will involve surveying and producing a distribution map indicating the species distribution on the site.
3. Consider all designated sites on or nearby the management area. You may need to apply for a license under nature conservation legislation to proceed and/or undertake an Appropriate Assessment under the terms of Article 6 of the Habitats Directive. Remember that actions taken outside a designated site may have an impact on a nearby designated site and are thus subject to the same considerations.
4. Consider surrounding properties and households. Talk to adjacent land owners and make them aware of the issues and what you plan to do. It may not be possible but always attempt to get their support. Control programmes will have a higher chance of success with support from the local community. Raise awareness of the issues and ensure alerts are placed in appropriate media e.g. the Invasive Species Ireland website.
5. Consider if you can successfully and safely carry out the work or if professional practitioners, with relevant training and certificates should undertake the work. Also consider if the programme can be co-ordinated with voluntary clubs and local societies and ensure their support and understanding of the issues.
6. Ensure safe disposal of plant material, including the cleaning of any machinery or equipment that may be contaminated.
7. Remember relevant health and safety legislation and procedures.
8. Identify if sufficient resources are/will be available to complete the work within the planned timescale. If work will take more than 1 year to complete, ensure you have sufficient funds to complete the work.
9. Monitor for missed plants/reintroduction during site visits. If applicable, ensure new members of staff are aware of the action plan and report sightings.

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The Invasive Species Ireland Project is undertaken, in partnership, by  
EnviroCentre and Quercus.



[www.envirocentre.co.uk](http://www.envirocentre.co.uk)



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Ireland Environment Agency.



[www.ni-environment.gov.uk](http://www.ni-environment.gov.uk)



[www.npws.ie](http://www.npws.ie)

For more information on the Invasive Species Ireland Project please see the  
website at [www.invasivespeciesireland.com](http://www.invasivespeciesireland.com)