Fringed Water Lily (*Nymphoides peltata*) Invasive Species Action Plan

1. Introduction

The risk assessment undertaken as part of the Invasive Species Ireland project prioritised *Nymphoides peltata* for preparation of an Invasive Species Action Plan. *N. peltata* has negative impacts on the environment, biodiversity, native flora and fauna, tourism and transport. This species acquired a score of 19 out of a possible 25 from stage 1 of the risk assessment process owing, in part, to its potential impact on protected habitats and species leading to non-compliance with EU legislative obligations under the Water Framework and Habitats Directives.

2. Aim of plan

The aim of this Invasive Species Action Plan is to prevent further spread of *N. peltata* in Ireland and put in place mechanisms to prevent new introductions to the island. The management plan sets out actions required for successful implementation and guidance on methods for eradication/control of *N. peltata* populations in Ireland. This can be achieved through the implementation of control options, raising awareness of this species, developing policy and identifying actions needed to deal with further spread.

3. Key priorities

3.1. Prevention of further spread

- Restrict the sale of *N. peltata* through garden centres, supermarkets, aquarists and other retail outlets.
- Raise public awareness of the economic and environmental impacts *N. peltata* could have in Ireland in combination with education efforts targeted at key stakeholder groups linked to the import and spread of this and other aquatic plant species.
- Encourage the removal and proper disposal of domestic plantings in ponds and aquaria and promote the use of native species.
- To inform management by recommending methods to gather accurate baseline distribution of this species. This can be achieved by encouraging recording of the plant by the general public, gardeners, naturalists and water course users such as agriculturalists, anglers and canoeists.

3.2. Eradication

- Guide the eradication of the plant at its known wild populations.
- Engage with stakeholders to provide advice and help, where appropriate, to eradicate populations in private gardens.

4. Invasion history

N. peltata is native to central and east England but has been transferred around Britain and Ireland as an ornamental plant. It is now known to be invasive in New Zealand, Canada, the US states of Washington, Maine, New Hampshire, Connecticut, Vermont and South Carolina where authorities are attempting to use regulations to control this invasive species (GISD, 2009).

5. Nomenclature

Common name: Fringed waterlily

Also known as: Floating heart, fringed water lily, yellow floatingheart, Entire marshwort

Synonyms: *Limnanthemum peltatum, N. nymphaeoides*

6. Identification

N. peltata is an aquatic, bottom-rooted perennial with long branched stolons extending up to one metre or more that lie just beneath the waters surface. The node on the stolons typically produces a plant and many thread-like roots. Leaves are heart-like to almost circular in shape and are 3-10 cm long on long stalks that arise from creeping underwater rhizomes. The leaves are frequently purplish underneath, with slightly wavy, shallowly scalloped margins. The flowers are bright yellow, 5-petaled and 3-4 cm in diameter. The flowers are held above the water surface on long stalks, with one to several flowers per stalk. The flower edges are distinctively fringed giving the common name of Fringed waterlily. The fruit is a capsule up to 2.5cm long containing numerous seeds. The seeds are flat, oval and about 3.5mm long with hairy edges (GISD, 2009).

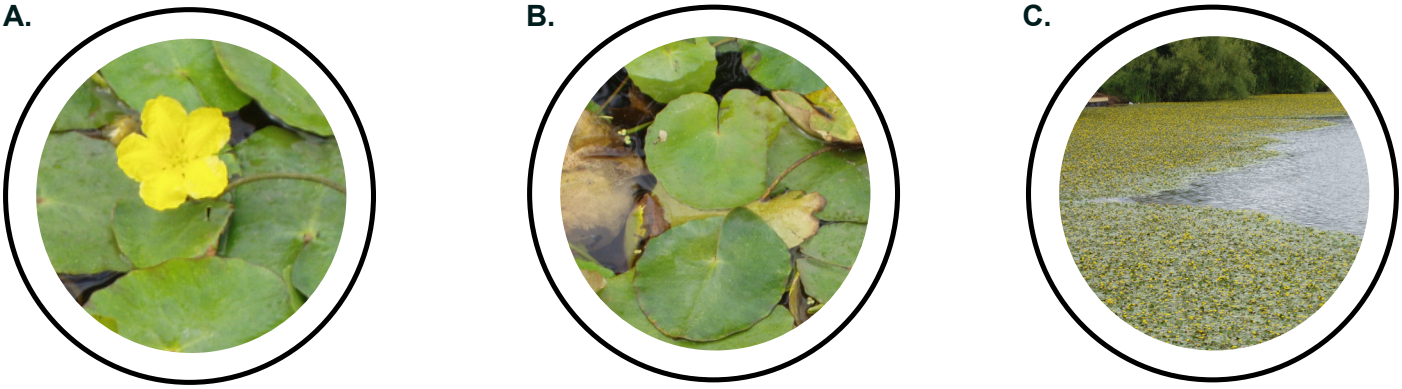


Figure 1. 1A. Flowers of *N. peltata.* **1B.** Leaves of *N. peltata.* **1C.** *N. peltata* invasion at in a pond in Belfast City. Photos courtesy of John Early.

7. Impacts

N. peltata is a very aggressive plant that is capable of rapid growth and spread which can displace native species, reduce biodiversity, limit recreation, diminish aesthetic value, and decrease water quality and flow. Presently, it is locally established in lakes and ponds in Ireland where it thrives in shallow (<1.5m deep) and nutrient rich waterbodies. Impacts include (Department of Conservation and Recreation, 2004):

- Dense floating mats of *N. peltata* can form on the water's surface, restricting light to the complete exclusion of other native plants.
- Decreasing the air exchange between the water's surface and the atmosphere.
- Thick floating mats have prevented fishing, boating, swimming and other activities in a ponds and lakes.
- The loss of recreational and aesthetic value can cause a decline in surrounding lake property value.
- Algae, a major component of the base of the food chain, can be shaded out by dense mats of *N. peltata*. The resulting decline in algae can disrupt the entire food web in a lake.
- *N. peltata* may form dense single species stands that often do not provide ideal habitat or food for native wildlife and may limit access to the water for some species. These native wildlife populations may be forced to relocate or perish, ultimately resulting in a loss of biodiversity and a disruption in the balance of the ecosystem.
- Sediment levels increase with increasing *N. peltata* abundance.

8. Known distribution and spread potential

N. peltata is known to be dispersed through natural and human mediated vectors such as gardening, the horticulture trade, recreational and industrial boats, clothing and equipment, animals and water currents. Single fragments of this plant are capable of colonising an entire water body within a few years. The known distribution of *N. peltata* in Ireland is shown in Figure 2.

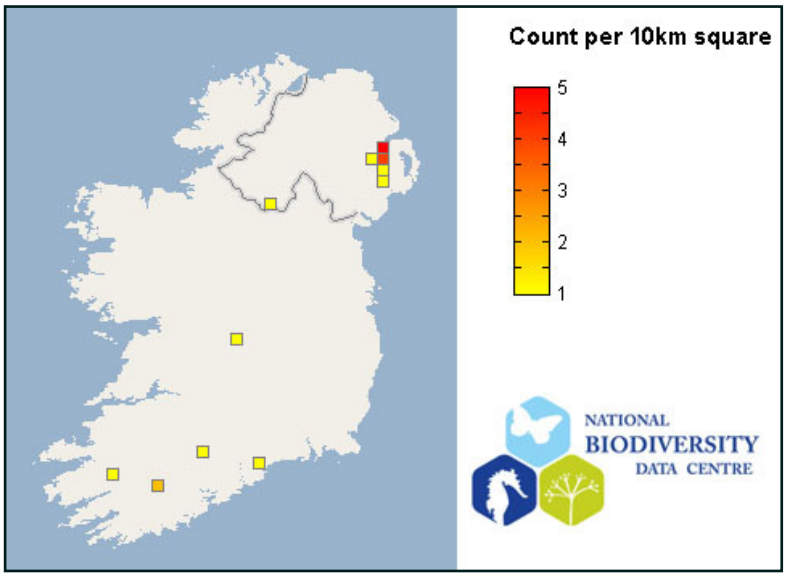


Figure 2: June 2009 known distribution of *N. peltata.* For up-to-date maps, please refer to the National Biodiversity Data Centre www.biodiversityireland.ie.

N. peltata is known to colonise slow moving rivers, lakes, reservoirs, ponds and swamps 0.5 to 4 metres deep. It can also grow on damp mud. Available habitat is widespread in Ireland. It's range will be extended by natural and anthropogenic means which results in an island wide distribution potential.

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 known populations of *N. peltata* 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.

If eradication is the ultimate goal all locations must be known. Plants left untreated/removed will facilitate reintroduction. If a site is chosen for *N. peltata* eradication or management other invasive aquatic plants should be included in the plan.

Action 1. Establish accurate baseline distribution

In order to progress action on the ground, it is essential to have information on its distribution easily available. 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. Prevention of further spread

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 (under review) 1985 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 *N. peltata*. To this end:

- *N. peltata* 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. *N. peltata* 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 priority action 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. Eradication and management

Action 6. Prioritise sites for eradication across the island of Ireland and initiate programme of measures

N. peltata has a relatively restricted distribution across the island of Ireland (Figure 2). We are still at an early stage of colonisation and action is needed sooner rather than later to prevent widespread economic impacts, loss of biodiversity and a need for large scale and expensive programmes in the future. State agencies and local authorities such as councils should prioritise sites for eradication based on a transparent framework to guide a co-ordinated eradication programme. It would be cost effective to undertake this for all the high risk invasive aquatic plant species identified in the Invasive Species Ireland risk assessment

10.1 Best practice management guidance

Little information is available on the control of this species (GISD, 2009) and what information is available suggests that managers are faced with a difficult but not impossible task. A combination of the physical, chemical and environmental control options outlined below is recommended. In general, programmes should manually remove growth and spray missed material and regrowth, if possible. The intention here should be to reduce the risk of non-target spray of herbicide onto native flora and into water bodies. Repeat applications will probably be required, and a follow up programme will be required to deal with regrowth. Managers should also consider sharing their experiences of this species through websites such as the Invasive Species Ireland website.

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

10.2 Physical control

The leaf petioles are easily cut by hand scythe (in shallow water) or by weed cutting buckets or boats in deeper water. However, the plant will form new leaves and one or two cuts may be necessary each spring and summer to maintain the water adequately for recreation or boat traffic. It is necessary to remove cut material otherwise the floating masses will continue to cause problems and may deoxygenate the water when they rot. Cutting will not eradicate the plant but may be the best option in water bodies where cutting of other weeds is regularly practised (CEH, 2004).

Mechanical eradication can only be achieved by dredging or raking out the rhizomes buried in the bottom silt. This is seldom 100% effective and is too expensive to be considered solely as a method of weed control but will produce useful results when dredging is required for other purposes. Hand raking, using a rope and grapnel, can be effective where the bottom silt is sufficiently soft and in very localised areas for creating fishing swims (CEH, 2004).

The practice of physical control can lead to further spread of this species. Given the importance of vegetative reproduction fragments released during cutting may result in spreading of this species. Experience from Sweden suggests that mechanical control may constitutes an important factor spread (Larson 2007). 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.

10.3 Chemical control*

Previous studies have shown Dichlobenil (Midstream GSR, Casoron G, Luxan dichlobenil) has been found to be effective against this plant. This herbicide, however, will no longer be approved for use in or near the aquatic environment after 18th March 2010. Any user wishing to use Dichlobenil would be required to apply for Specific Off License Approval (SOLA) prior to any planned usage from the Pesticide Safety Directorate (PSD).

This is a granular formulation which is applied in the spring when growth is just starting but well before the leaves reach the surface. The granules sink into the bottom sediment and the herbicide is absorbed by the roots of the plant. Because the granules hold the herbicide and release it locally into the sediment, it is

* 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 11. For a more detailed outline of the policy please refer to the Invasive Species Ireland website.

necessary to ensure that they are spread evenly within the treated area and appropriate motorised or hand operated granule applicators are recommended for this treatment (CEH, 2004). This product may not be suitable for use in certain circumstances due to potential impact on non-target species e.g. fish species. The Safety Data Sheet makes specific reference potential for harm to aquatic organisms and that it may cause long-term adverse effects in the aquatic environment (Scotts, 2001).

It is possible to treat small localised areas within a waterbody and the manufacturers recommend that not more than 20% of the waterbody is treated at any one time in densely infested waters. Where complete eradication is required, a second application in the following season may be necessary.

The herbicide glyphosate has also been used to control *N. peltata*. Experience from sites in Ireland have shown that glyphosate sprayed onto leaf surface using boat mounted calibrated boom sprayer can achieve a high degree of success (John Early & J Caffrey, pers comm.). It is recommended that managers use the adjuvant TopFilm to increase effectiveness of the glyphosate treatment.

Note: Prior to undertaking any spraying operation 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.

10.4 Environmental control

N. peltata does not normally grow in water more than 1.5 m deep or in fast flowing waters. In some instances, it may be possible to alter water depth or flow characteristics in channels to make them unsuitable for this plant. Small areas can be eliminated by shading the plant with a floating opaque material. (CEH, 2004).

11. 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.

12. Resourcing the plan

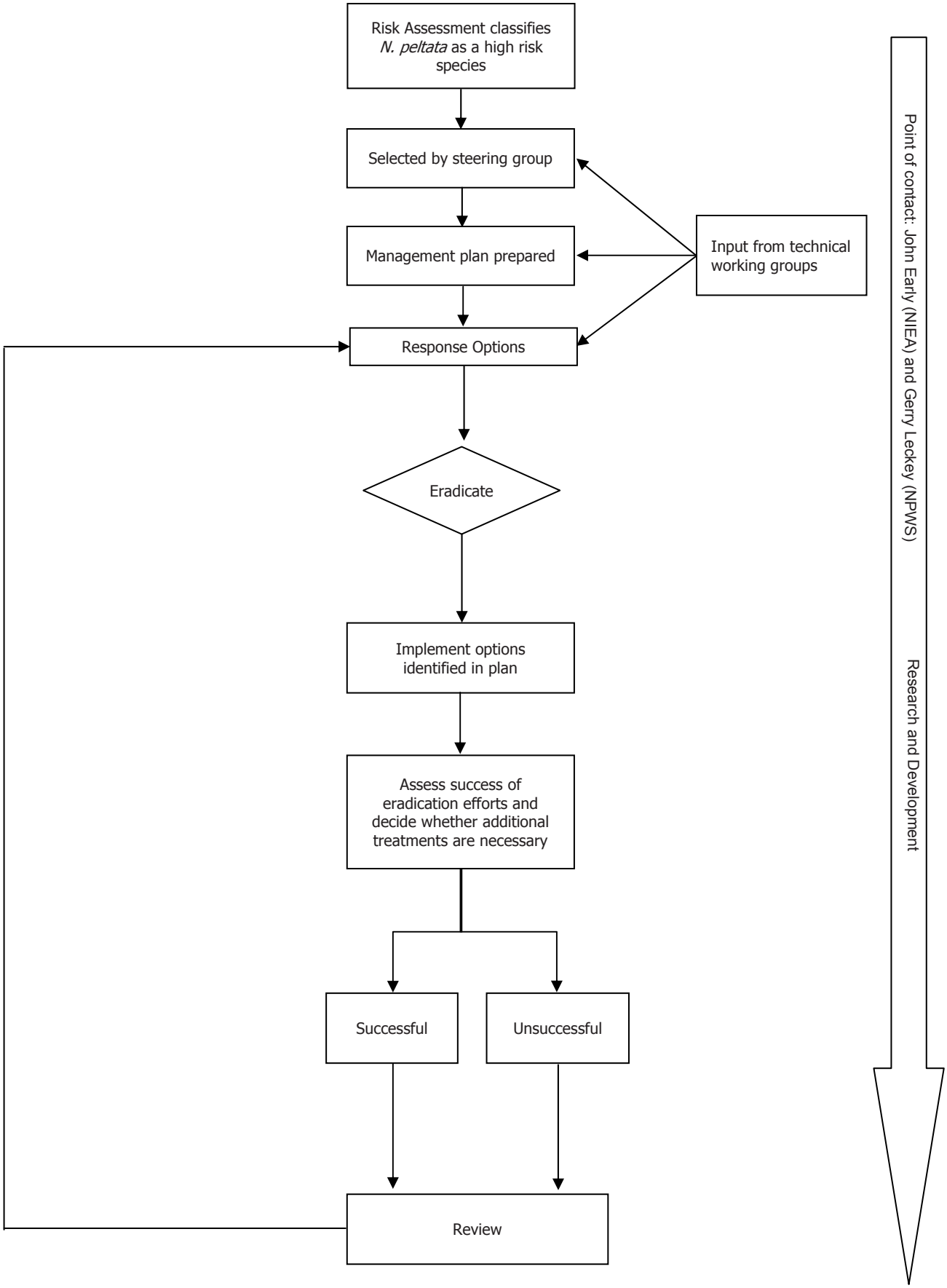
Action 7. Ensure adequate resources are in place to facilitate implementation of this plan

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.

13. 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	Prioritise sites for eradication across the island of Ireland and initiate programme of measures	NPWS, NIEA , local authorities and other relevant stakeholders	2009/2010
7	Ensure adequate resources are in place to facilitate implementation of this plan	NPWS, NIEA and relevant stakeholders	Immediately after successful completion of Action 6

14. Decision process



15. 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**
Details: 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

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)

16. 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.

17. References

Centre for Ecology and Hydrology, 2004. Information Sheet 6: Fringed Waterlily. [online] Available from http://www.nerc-wallingford.ac.uk/research/capm/pdf%20files/6%20Fringed%20Water%20Lily.pdf. [accessed 12 June 2009].

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

www.envirocentre.co.uk

www.quercus.ac.uk

and is funded by the National Parks and Wildlife Service and the Northern Ireland Environment Agency.

www.ni-environment.gov.uk

www.npws.ie

For more information on the Invasive Species Ireland Project please see the website at www.invasivespeciesireland.com

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