

<b>Title:</b> Impact Assessment of the Order to ban the sale of certain non-native species in England and Wales under section 14ZA of the Wildlife and Countryside Act 1981  <b>IA No:</b> Defra 1348  <b>Lead department or agency:</b> Defra  <b>Other departments or agencies:</b>	<b>Impact Assessment (IA)</b>			
	<b>Date:</b> 01/01/2011			
	<b>Stage:</b> Final			
	<b>Source of intervention:</b> Domestic			
	<b>Type of measure:</b> Secondary legislation			
<b>Contact for enquiries:</b> Simon Mackown simon.mackown@defra.gsi.gov.uk 0117 3723612				
<b>Summary: Intervention and Options</b>				<b>RPC:</b> GREEN

Cost of Preferred (or more likely) Option			
Total Net Present Value	Business Net Present Value	Net cost to business per year (EANCB on 2009 prices)	In scope of One-In, Measure qualifies as One-Out?
£63.39m	£0m	£0m	Yes   IN

**What is the problem under consideration? Why is government intervention necessary?**

Five invasive aquatic plants, which cause environmental and economic harm, are proposed for sales bans. These have previously been the subject of voluntary sales bans, which have had only limited success. Globally, invasive non-native species are considered one of the most significant threats to biodiversity. Their impacts can be far reaching and costly - disrupting ecosystems, threatening economic interests such as agriculture, forestry, fisheries and development, as well as impacting on our general quality of life. In many cases voluntary measures can have a positive impact but where these are ineffective, or there is a limit to their success, there is a need for appropriate regulation to reduce the risk of introduction to the wild.

**What are the policy objectives and the intended effects?**

The main policy aim is to ban the sale of the proposed species, restricting their availability and minimising the risk of deliberate or accidental release to the wild. This will have the benefit of preventing further negative impacts on biodiversity and increases to already significant management costs, particularly spread to new areas. Furthermore, failure to limit further releases to the wild risks undermining current management and eradication projects. Finally, a ban would create a level playing field where businesses who are implementing voluntary trade bans are not disadvantaged compared to those who are acting irresponsibly and continuing to sell these species.

**What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)**

0) Do nothing new. We would instead continue to work with trade representatives to seek to improve voluntary bans (which to date have failed to fully achieve their objectives).

1) Prohibit the five proposed species from sale, to eliminate irresponsible trade in these species (initially 28 species were consulted upon, these final 5 were deemed the most appropriate for regulation and were selected in liaison with representatives from industry and conservation organisations).

Regardless of the decision on these species our principal means of approaching invasive non-native species issues is to work in partnership with trade bodies and other non-governmental organisations to share best practice, disseminate guidance and educate the public.

<b>Will the policy be reviewed?</b> It will be reviewed. <b>If applicable, set review date:</b> 10/2016					
Does implementation go beyond minimum EU requirements?				Yes	
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.		<b>Micro</b> Yes	<b>&lt; 20</b> Yes	<b>Small</b> Yes	<b>Medium</b> Yes
What is the CO <sub>2</sub> equivalent change in greenhouse gas emissions? (Million tonnes CO <sub>2</sub> equivalent)				<b>Traded:</b> n/a	<b>Non-traded:</b> n/a

***I have read the Impact Assessment and I am satisfied that (a) it represents a fair and reasonable view of the expected costs, benefits and impact of the policy, and (b) that the benefits justify the costs.***

Signed by the responsible Minister: \_\_\_\_\_ de Mauley \_\_\_\_\_ Date: \_\_\_\_\_ 03/03/2014 \_\_\_\_\_

# Summary: Analysis & Evidence

# Policy Option 1

## Description:

### FULL ECONOMIC ASSESSMENT

Price Base Year 2011	PV Base Year 2012	Time Period Years 5	Net Benefit (Present Value (PV)) (£m)		
			Low: 63.26	High: 63.53	Best Estimate: 63.39

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	0	0	0
High	0	0	0
Best Estimate	0	0	0

#### Description and scale of key monetised costs by 'main affected groups'

It will no longer be possible to trade these species to aquaculture. However, we will provide an adequate transitional period to allow businesses to sell their remaining stock and source alternatives. There is a wide range of available aquatic plants and suitable and easily obtainable alternatives are available. Therefore we predict costs to industry will be negligible. Organisations representing industry do not oppose these measures.

#### Other key non-monetised costs by 'main affected groups'

These plants are generally marketed and bought for their functionality as opposed to as specific species and there are alternatives available which fulfil these functional requirements. Therefore, while there will be a small reduction in choice of plants available, there will be no appreciable impact on aquarists and pond keepers and it is unlikely to be noticed in the vast majority of cases.

BENEFITS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low		14.33	63.26
High		14.41	63.53
Best Estimate		14.37	63.39

#### Description and scale of key monetised benefits by 'main affected groups'

Reduction anticipated in (a) the direct cost of management to waterways managers and conservation bodies; & (b) indirect costs associated with increased flood risk and negative impacts on recreational activities such as boating and angling. Cost categories a & b are not additive or mutually exclusive and the lower and upper band scenarios are derived by making assumptions about how management and indirect impacts are combined (details provided below).

#### Other key non-monetised benefits by 'main affected groups'

These species form dense mats which in turn impact on aquatic ecosystems by eliminating submerged plants and algae, reducing the amount of dissolved oxygen which leads to a decline in other aquatic species such as invertebrates and fish. The presence of these species may prevent a waterbody achieving the highest ratings for 'good ecological status' under the Water Framework Directive.

Key assumptions/sensitivities/risks	Discount rate (%)	3.5
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The IA assumes a linear population growth of the proposed species over the 5 year period 2011 -2016.

Role of anthropogenic action in spread is estimated at 10% of future spread of species.

Information on calculations of average annual cost and details of NPV are given in the evidence section.

### BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			In scope of OIOO?	Measure qualifies as
Costs: 0.08	Benefits:	Net: -0.08	Yes	IN

# Evidence Base (for summary sheets)

## Purpose of Regulation

To ban the sale of certain invasive non-native species under section 14ZA of the Wildlife and Countryside Act, 1981. These species are considered to be highly invasive and there is a real risk of escape and spread into the wild as a result of their use. The purpose of this measure is to close one of the main entry pathways: availability through trade. Ultimately this will reduce the likelihood of these species establishing in the wild and causing harm to native biodiversity and wider society.

## Rationale

The majority of non-native species in GB are benign or have positive impacts. However, a small minority of invasive non-native species have the potential to negatively impact on native biodiversity through, for example, competition, predation or the spread of disease. Additionally, invasive non-native species also have the potential to have significant environmental and economic impacts. A recent report, *The Economic Cost of Invasive Non-native Species to Great Britain (CABI, 2009)*, concluded that Invasive non-native species cost the British economy at least £1.7 billion per annum. This is likely to be significantly less than the full economic cost since many indirect costs resulting from INNS, such as the damage to ecosystem services and loss of biodiversity, cannot be readily quantified.

Banning sale of species will not prevent the spread of species where they are already established, but it can contribute to the prevention of the establishment of the species in new areas to where they could not spread by natural means. Species are introduced into the wild in a number of ways, which can be accidental or deliberate such as through misguided efforts to dispose of species sensitively (e.g. transferring them to public waterways when they over grow the site they were purchased for). Therefore whilst banning sales alone will not prevent the natural spread of existing populations of the proposed species, it will close the main pathway for new specimens to enter un-invaded habitats in the wild, thus avoiding the associated environmental, financial and social impacts. The proposed ban on sale of the specific high risk species in this impact assessment needs to be seen in the context of the wider regulatory and non-regulatory invasive non-native species policy described below.

## Background

The principal regulatory provisions that deal with non-native species are contained in Sections 14 – 14ZB of the Wildlife and Countryside Act, 1981 (“WCA”). Section 14 prohibits the introduction into the wild of any animal of a kind which is not ordinarily resident in, and is not a regular visitor to, GB in a wild state, or any species of animal or plant listed in Schedule 9. Additional provisions under section 14ZA of the WCA were introduced in 2006 and provide a power to ban the sale of any live animals or plants to which section 14 of the WCA applies. This power has yet to be used.

Between November 2007 and January 2008 the previous administration and the Welsh Assembly Government held a joint public consultation on a) proposals to amend Schedule 9 of the WCA and b) proposals to ban certain species from sale. Scotland held a separate consultation. Changes to Schedule 9 of the Act in England and Wales came into force in April 2010 when 71 amendments were made via the Wildlife and Countryside Act 1981 (Variation of Schedule 9) (England and Wales) Order 2010.

In the Government response to the consultation it was made clear that decisions on the 28 species proposed (by the statutory conservation agencies) for a ban on sale would be deferred until non-native species risk assessments had been carried out by independent experts to ensure the adequacy of the evidence base. The majority of these risk assessments are now completed. The species proposed by Countryside Council for Wales and Natural England for sales prohibitions were:

## Plants

Himalayan Balsam, *Impatiens glandulifera*

Water Fern, *Azolla filiculoides*

Hottentot Fig, *Carpobrotus edulis*

Japanese Knotweed, *Fallopia japonica*

Few Flowered Leek, *Allium paradoxum* (excluding variety *normale*)

Parrot's Feather, *Myriophyllum aquaticum*

Floating Pennywort, *Hydrocotyle ranunculoides*

Shallon, *Gaultheria shallon*

Australian swamp stone-crop (New Zealand Pygmyweed), *Crassula helmsii*

Rhododendron, *Rhododendron ponticum*

Water Hyacinth, *Eichhornia crassipes*

Water primrose, *Ludwigia peploides*, *Ludwigia uruguayensis*, *Ludwigia grandiflora*

Canadian Waterweed, *Elodea Canadensis*

Nuttall's Waterweed, *Elodea nuttallii*

Curly waterweed, *Lagarosiphon major*

## Animals

Ruddy Duck, *Oxyura jamaicensis*

Topmouth Gudgeon, *Pseudorasbora parva*

American Bullfrog, *Rana catesbeiana*

Edible Frog, *Rana esculenta*

Marsh Frog, *Rana ridibunda*

Italian Crested Newt, *Triturus carnifex*

Red-eared Terrapin, *Trachemys scripta elegans*

African Clawed Toad, *Xenopus laevis*

Marbled Crayfish, *Procambarus sp*

Noble Crayfish, *Astacus astacus*

Red Swamp Crayfish, *Procambarus clarkia*

Spiny-cheek Crayfish, *Orconectes limosus*

Turkish Crayfish, *Astacus leptodactylus*

The proposals were assessed against the following criteria to decide which are to be taken forward:

- **Does the species pose a threat to biodiversity, other environmental interests or social or economic interests?** Complete scientific certainty is not possible and therefore the precautionary principle should be applied. Risk analysis enables decisions to be based on the best available evidence and helps to manage uncertainty. Therefore, in almost all cases, a non-native a risk assessment will need to be completed to take the proposal forward.
- **Does sale contribute to the establishment of the species in the wild?** Consideration of whether the sale of the species contribute to the increased likelihood of the species being introduced to the wild, including where introduction could result in further establishment of the species in new areas? The latter is particularly important - many of the proposed species are already established in GB and our aim should be to prevent or slow further spread, particularly to protected habitats.
- **Are impacts on business proportionate to the risks?** An assessment will be made of the impact on business of prohibiting the trade of the proposed species, based on economic information from stakeholders. Consideration will also be given to the ongoing costs Government, landowners and conservation bodies will incur if sale continues to result in the species establishing in the wild.
- **Is legislation appropriate?** The primary consideration is whether the same outcomes (i.e. reducing the risk of introductions to the wild) can be achieved by non-legislative means such as voluntary codes and public education. There is some, but not complete compliance within the trade sector with voluntary trade bans on a few species. Several parties however feel that investing in management while key species are still on sale to unwitting customers is less than ideal. In these circumstances, legislative controls may be required.

Of the 28 proposals 5 aquatic plant species were considered to have satisfied the above criteria. The species recommended for sales prohibitions are floating pennywort, Australian swamp stone-crop, water primrose, water fern and parrots feather. The rationale for not pursuing the proposals with respect to the 23 other species is given at Annex 1.

The non-native species risk assessments for these species indicated that they can all have significant negative impacts. They all form dense mats, which in turn impact on aquatic ecosystems by eliminating submerged plants and algae, reducing the amount of dissolved oxygen leading to declines in other aquatic species such as invertebrates and fish. These dense mats also reduce access to waterways for boating and angling and can exacerbate flood risk, which can have significant economic impacts. For example, in the report *The Economic Cost of Invasive Non-native Species to Great Britain (CABI, 2009)*, it was estimated that the indirect economic costs of floating pennywort in GB (for example costs to angling and boating) are currently in the region of £23.5 million per annum. While these species can be spread by a number of means, the non-native risk assessments identify anthropogenic spread as the most important. For the detailed risk assessments for each of the species see Annex 2 - 6.

### **Non-legislative approach**

Industry and conservation interests have been engaged on the proposals for ban on sale from an early stage and they have, to varying degrees, provided evidence to supplement the risk assessments. Such a collaborative approach is central to the implementation of the overarching *Invasive Non-Native Species Framework Strategy for Great Britain (2008)*. This provides a strategic framework within which the actions of government departments, their related bodies and key interested parties can be better co-ordinated. The approach seeks to use both voluntary and educational approaches with balanced regulation and has already resulted in some innovative partnership approaches to addressing the issues in a non-regulatory way. For example, the 'Be plant Wise' campaign was successfully launched in February 2010 to (i) educate the public about the appropriate disposal of invasive aquatic plants so as to prevent establishment in the wild and reduce the environmental risk and (ii) to raise awareness of this issue amongst the key retailers of aquatic plants so that they can advise their customers about how to dispose of invasive aquatic plants correctly. The Parliamentary Under-Secretary for Natural Environment and Fisheries agreed to launch a second phase of this campaign in autumn 2010.

All the proposed species are currently subject to voluntary sales bans within the aquatic horticulture trade, however, there is evidence (industry representative and conservation NGOs), that despite the positive action by some, a minority of retailers continue to sell these species. Sales prohibitions for these species would support those who have already taken a positive step toward reducing the threats posed. Furthermore the industry have indicated that they do not oppose these proposals (annex 10).

### **Options**

- 0) Do nothing new. We would instead continue to work with trade representatives to seek to improve voluntary bans which have proven to be ineffective.
- 1) Prohibit the five (shortlisted from the 28 which were consulted upon) proposed species from sale, to eliminate trade in these species.

Regardless of the decision on these species our principal means of approaching invasive non-native species issue is to work in partnership with trade bodies and other non-governmental organisations to share best practice, disseminate guidance and educate the public.

## **Economic Analysis**

### **Costs of legislation to industry**

The cost of the regulation will include the potential loss of trade and the cost of transition to alternative species. However, for the reasons set out below we expect these to be small. Figures given (based on estimates from industry representatives) are likely to be upper bound estimate for the economic cost of

the regulation, as they represent the highly unlikely scenario that businesses are not able to source/adapt to selling new species. For each of the species a loss to the trade will not lead to such a widespread or permanent loss of revenue. There is a wide range of available aquatic plants therefore it is likely that suitable alternatives could be found. This is supported by the fact that some retailers already adhere to a voluntary ban and already sell alternatives to the proposed species. The Royal Horticultural Society, for example, does not stock this species in its plant centers, prohibits exhibitors from selling or showing this species at shows and does not list this species on its plant finder database. Furthermore, the Ornamental and Aquatic Trades Association (OATA) recommends that its members do not sell floating pennywort, Australian swamp stone-crop or water primrose. They also advise their members to find alternatives to parrots feather.

It is our belief that transition to new species should be relatively straightforward as none of the proposed species are traded in large amounts and there are alternatives already available to trade. To support this transition Defra commissioned plantlife and the RHS to produce a guide for on alternatives to invasive non-native species commonly sold for ponds and gardens. The report is published here:

[http://www.plantlife.org.uk/campaigns/invasive\\_plants/alternatives/](http://www.plantlife.org.uk/campaigns/invasive_plants/alternatives/) Furthermore, given the voluntary bans described above and the engagement of the industry with the consultation process which led to these proposals, and the fact that this will be announced a season in advance of the ban coming into force, trade have had ample opportunity to stock alternatives/sell remaining stock of the proposed species.

The criteria for selecting species for the regulation included a measure to assess the proportionate impact on business. OATA have advised that none of the species proposed are of significant importance to trade and do not constitute a significant proportion of their income, this is reflected in the low value of the annual trade in these species. *Lagarosiphon major* was a species originally consulted upon that was not included in the final proposal. This species was discounted as it was felt that, unlike the five proposed species, the sales ban would have a disproportionate impact on business. *L.major* is by far the most commonly sold pond weed with up to £5million sales annually (source: OATA) ; approximately 10 times the value of the 5 proposed species combined.

Moreover, any aquatic plants are generally purchased for their functionality rather than customers looking for specific species. This is supported by the fact in stores plants are often labelled with 'oxygenators' or 'floating water plants' rather than by species name. As such it is reasonable to assume that customers will simply purchase those alternative plants that are offered for sale as 'oxygenators' or 'floating water plants' and subsequently there will be no appreciable loss to trade.

In terms of consumers there is a theoretical social impact by reducing the number of individual species available to them. However, we consider the impact to be negligible and in most cases we do not believe consumers will notice a difference. This is because the trade in these species is very small, there is a broad range of alternatives available and in most cases they are marketed as 'oxygenators' etc rather than as specific species.

Therefore, costs to industry would be transitional as any losses would only occur as a result of the loss of revenue from any remaining stock of species when the sales ban comes into force - a loss that would be quickly be mitigated by the sale of alternative species and avoided if destocking is adequately planned. We will provide trade at least 1 years notice between announcing the decision to make the regulation and the regulation coming into force. As these species are a seasonal product this will give adequate time for the trade to sell any remaining stock and to give business time to source alternatives.

The overall sum of this will be a negligible impact on business.

## **Enforcement Costs**

Natural England is empowered by the Part 8 Agreement made under Section 78 of the Natural Environment and Rural Communities Act 2006 to make licensing decisions regarding activities prohibited by the Wildlife and Countryside Act, 1981. It is not anticipated that any licences would be issued for the

sale of these species. However, Natural England would have to consider any applications made and there will be costs, albeit negligible, associated with any applications.

It is not expected that this legislation will lead to significant numbers of prosecutions. Representatives from the aquaculture trade have indicated that they do not oppose the proposals and the majority of individuals will abide by the law. Regulation will provide a credible threat and as such will primarily act as a tool to empower trade bodies and countryside agencies to convince the minority who do not currently behave in a responsible manner to do so.

### **Impact on small/micro businesses**

While the retailers of aquatic plants are generally small or micro businesses it is not expected that they will be disproportionately hit. There are only a small number of plants which are proposed for sales bans which are not traded in significant numbers. Moreover, suitable alternatives are available. They would minimise any costs by de-stocking in response to the announcement of the ban.

Exempting micro businesses from this new regulation would severely reduce its effectiveness. An exemption would mean that the majority of retailers selling these species would still be able to do so and there would be very little reduction in the risk of spread to the wild. It would be indefensible to introduce such a regulation were it to solely to apply to medium and large size businesses as without targeting all of those who sell these species the objectives of the legislation would not be achieved. We therefore intend to apply for a waiver with respect to the moratorium on new regulation which impacts on micro-businesses.

### **Benefits of legislation**

#### **Non-monetised benefits**

It is widely accepted that invasive non-native species are one of the most important drivers of global biodiversity loss. In October 2010, contracting parties to the Convention on Biodiversity (CBD) signed an agreement to take urgent and effective action to halt the global declines in biodiversity. Of the 20 targets agreed at the convention, a specific target was agreed with respect to invasive non-native species:

*By 2020, invasive alien species and pathways are identified and prioritised, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment (emphasis added).*

The five proposed species can have significant negative impacts on native aquatic biodiversity. They all form dense mats, which in turn impact on aquatic ecosystems by eliminating submerged plants and algae, reducing the amount of dissolved oxygen leading to declines in other aquatic species such as native invertebrates and fish.

Taking measures to prevent their introduction and establishment will have clear benefits for native biodiversity. This is of particular importance in sight of high conservation value such as Sights of Special Scientific Interests and Special Areas of Conservation.

All the proposed species are listed under Schedule 9 of the Wildlife and Countryside Act, 1981 and are therefore prohibited from 'planting' or 'causing to grow' in the wild. However, all the species will produce fragments and propagules that are viable, so even a small number of illegal releases can result in significant wild populations. Management of these species to mitigate their harm and to minimise natural spread in the catchments in which they already occur results in significant costs to nature conservation organisations and groups who voluntarily manage our water bodies.

Our principal concern is to prevent spread to new catchments and habitats and consequent impacts and management costs. Spread to new unconnected water bodies cannot occur through natural spread and will principally be due to human action. Given these species can generate from tiny plant fragments new populations could occur with minimal introductions through illegal or inappropriate disposal.

Reduction in the availability of floating water primrose is of particularly importance. Currently this species can only be found at a small number of isolated locations and is subject to a Government eradication campaign to avoid the significant annual costs of this species seen elsewhere in Europe. Continued releases into the wild, even at very low levels, risks undermining this eradication effort.

## **Economic benefits**

The economic benefits of a ban on sales of the five aquatic species correspond to the avoided liability (in terms of both management costs) and residual, indirect impacts associated with anthropogenic spread. Given that these species first entered the country through the horticultural trade the full extent of the current economic impacts of these species are ultimately attributable to sale. Of course the avoided liability associated to a ban is only a fraction of the total economic costs currently associated to these species: sales from the present day will only limit the spread of species into new areas of the country, it will not redress the impact of the populations already established. However, these species have not invaded all available habitats across the country. Those habitats currently unconnected to invaded catchments are not at risk of spread from those habitats due to the presence of natural barriers. The principal mechanism by which these unconnected habitats can be invaded is through anthropogenic action. Therefore, it is essential, to avoid degradation of these habitats, that measures are taken to minimize the risk of the proposed species being transferred.

Significant efforts are made by waterways managers and local voluntary groups to manage existing populations of these species. Continued release of these species into these areas would undermine these efforts and reduce the likelihood that attempts at eradication (locally or nationally) will be successful.

### *Liability associated with management costs*

Once established in the wild, the effective managing of invasive non-native aquatic plants can be expensive and difficult due to the very nature of the species in question. Management is dependent on a wide variety of factors such as the method of control, the use of contractors, government agency staff or volunteers, species characteristics, time of year, habitat type and ease of access. The extent and efficacy of management can also vary dependent on the aims of those managing the species i.e. management to reduce impacts versus eradication (the latter can prove significantly more costly). Expert opinion (Centre for Ecology and Hydrology) on the cost of managing each of the proposed species, apart from *Ludwigia* spp, was £10,000 per hectare (£1,000,000 per km<sup>2</sup>), based on the cost of managing an average invasive aquatic species. This is a conservative estimate. Due to the current eradication of the limited population of *Ludwigia* spp. in England by the Environment Agency we can calculate the control costs more precisely at £5,241 per hectare (£524,100 km<sup>2</sup>) as the control methods are known. Managing this species is often cheaper than others as currently it has only occurred in smaller isolated water bodies, making management much more straightforward.

The analysis estimates the cost of managing the total **expansion** of the proposed species. Although current practice (and budget constraints) suggest that it may not be possible for the entirety of the expansion to be managed, this analysis does not discriminate between populations which are and are not likely to be managed. Therefore this analysis presents the **potential** management liability avoided relative to the *status quo*. Therefore we estimate the potential total additional management burden over the next five years and the proportion of this due to anthropogenic spread.

### *Liability associated with residual management costs*

The report, *The Economic costs of Invasive Non-native species on Great Britain* (CABI, 2009) estimates that the indirect economic impacts of *H. ranunculoides* are in the region of £24million per annum. Any shallow, slow-moving waterway that is infested with floating pennywort will rapidly become non-navigable and useless for fishing and other leisure activities. Based on visitor numbers and the willingness to pay figures the report estimates the presence of floating pennywort costs an estimated

£17,428,120 per year to leisure and tourism. *H. ranunculoides* will also cause a problem to boat users in areas of significant growth with losses to boating related tourism on rivers and canals estimated at £6,108,099. Furthermore, the report identifies that this species will have an impact on flooding where there will be associated economic costs. However, no data is available on this is available and therefore the indirect cost of this species are likely to be an underestimate.

Given the similar impacts of the five proposed species, this figure has been used as a starting point to estimate the indirect economic benefits of the regulation as a starting point for estimating.

#### *Estimating scenarios for avoided costs*

The relationship between the direct management costs of the species and the indirect costs of the species are not straightforward. If the direct costs are fully realized then the entire population would be managed and therefore the indirect costs would be significantly reduced. These, however, may not be eliminated entirely as management is not equivalent to eradication. With the exception of *Ludwigia* spp. it is unlikely that these species could be eradicated and as such the management costs could represent an annual expenditure. If eradication was attempted for all of the proposed species this would result in significantly higher management costs than set out here.

In short, the direct and indirect costs are not additive nor are they mutually exclusive. The overall cost to the economy of the existence of these species in the wild will be a mix of the management cost and indirect impacts that occur as a result of changes in ecosystems driven by the presence of the species, for example, increased flooding and reduce recreational activity and spending. If the species were not subject to any management then the indirect costs would be at the upper end of the estimates below. Conversely if the full amount of money was spent on management the indirect costs would be much lower but would not be eliminated entirely as the indirect impacts will occur up to the point that the species is removed and then the ecosystem is likely to take to time recover. Additionally, as these species can regenerate from tiny fragments, the costs are likely to be repeated on an annual basis even with high levels of management as control is unlikely to remove all traces of the plant from a water body. Therefore, indirect costs have been assumed to be reduced to 10% of their full value in this scenario. However, this is likely to be an underestimate as not all populations of these species will be actively managed in the wild.

As well as the benefits in reducing spread to new area, sales prohibitions will also help to support current expenditure on the control of these species in areas currently by reducing the likelihood that the species will be able repopulate the area cleared. Water managers spend significant sums of money managing these species and continued illegal disposal of these species in the wild undermines these efforts. Therefore, sales prohibitions will help to avoid populations being replenished where they already exist and are being managed, as well as reducing the chance that they will spread more widely.

In 2011 the Centre for Ecology and Hydrology (CEH) provided estimates of population spread over a between 2010 - 2015. However, if approved, the legislation will come into force in 2012 and this should be used as the baseline. Therefore, for the sake of these calculations, the estimates provided by have been extrapolated to give estimates for the period 2012 – 17.

Table 2. Estimated population expansion of proposed species provided by Centre Ecology and Hydrology based on historical data. Population expansion includes both natural spread and spread by anthropogenic action.

Species	Rate of expansion (number of invaded 100km <sup>2</sup> )	Estimated number of invaded 100km <sup>2</sup> 2010	Estimated number of invaded 100km <sup>2</sup> 2012	Predicted number of invaded 100km <sup>2</sup> 2017 (if no action is taken)	change 2012 - 2017
<b>Water Fern</b>	5.2 per annum	497	507.4	533.4	(26) 5.1%
<b>Parrots Feather</b>	7.15 per annum	343	357.3	393	(35.7) 10%
<b>Floating Pennywort</b>	3.5 per annum	146 (2008)	160	177.5	(17.5) 10.9%
<b>Australian swamp stone-crop</b>	12.9 per annum	634	659.2	723.7	(64.5) 10.9%
<b>Water Primrose</b>	20 per annum	60	100	200	(100) 100%

The number of sites given in Table 2. represents the presence of the species with a 100km<sup>2</sup> area but gives no indication of the extent of the species. Data is sourced from the National Biodiversity Network and the data is generated by volunteers and ecologists. It would be prohibitively expensive to obtain further data at a finer resolution.

The UK National Ecosystem Assessment provides a range of data for the area covered by various types of water bodies at different scales (i.e. England, GB, UK) but it does not contain an estimate of the total area of freshwater in England and Wales. Nor does it provide adequate data from which this can be calculated. However, the Environment Agency were able to calculate the area of England which is covered by freshwater:

- The mapped Area of FW features (such as lakes and ponds) in OS MasterMap in England and Wales is: 1,734,131,870m<sup>2</sup>
- There are 175,059km of rivers represented in MasterMap by single lines, which means they are less than 1m wide in urban areas or less than 2m wide in rural areas. If it is assumed these are 1m wide this equates to another 1,75,059,000 m<sup>2</sup>
- There are also another 26,108km of 'offline drainage features, if these are assumed to be 1m wide this would equate to 26,108,000 m<sup>2</sup>
- The total area of freshwater in England = 1,935,298,870 m<sup>2</sup> or 1,935.299 km<sup>2</sup>.
- The total area of England is approximately 130,400 km<sup>2</sup>, therefore the percentage of England covered in freshwater is = 1.49%.

Therefore, it is assumed that 1.49% of any given hectare is covered by freshwater and provides suitable habitat for the proposed species. Furthermore, given the invasiveness of the species, that within a given hectare all available habitats would be invaded. Taking this into account estimates of the area of spread of the proposed species is given in Table 3.

Table 3. Estimates of the area covered by the proposed species in England (100km<sup>2</sup> converted to km<sup>2</sup>)

Species	Change in number of invaded sites 2012 – 2017 (km <sup>2</sup> )	Change in Area covered by species (km <sup>2</sup> )
Water Fern	2,600	39
Parrots Feather	3,570	53.55
Floating Pennywort	1,750	26.25
Australian swamp stone-crop	6,450	96.75
Water Primrose	100	1.5

Given the estimated impact of Floating Pennywort of £24million per annum, the number of hectares which this species is present (at time of economic assessment) and the estimated extent of the species (converted to km<sup>2</sup>) the estimate indirect costs per km<sup>2</sup> are: (24,000,000/(14,600 \* 0.15) = £1,095,890.4 km<sup>2</sup> or £1.1 million km<sup>2</sup>.

Table 4. estimates the change in costs of the invasive non-native species covered by this IA that we expect over the period 2010 to 2016. Management costs are calculated based on the estimated population expansion (Table 2) and the estimated management costs discussed above.

Species	Cost of control £/km <sup>2</sup>	Change km <sup>2</sup> covered 2012 - 2017	Change in direct management liability of presence in the wild 2012 – 2017	Change in indirect costs of presence in the wild 2012 – 2017 (£1.1million km <sup>2</sup> per hectare for all 5 species)	Estimate of cost of species in the wild - change from 2012 - 2017	
					Lower bound; significant spend on management incurred but indirect costs reduced (10% of total)	Upper bound; indirect impacts incurred in full. No actual spend on management, but significant liability built up
Water Fern	1,000,000	39	39,000,000	43,290,000	42,900,000	43,290,000
Parrots Feather	1,000,000	53.55	53,550,000	59,440,500	58,905,000	59,440,500
Floating Pennywort	1,000,000	26.25	26,250,000	29,137,500	28,875,000	29,137,500
Australian swamp stone-crop	1,000,000	96.75	96,750,000	107,392,500	106,425,000	107,392,500
Water Primrose	524,100	1.5	786,150	951,150	1,650,000	£951,150
Totals		39	216,336,150	240,211,650	238,755,000	240,211,650

The build-up of costs by the end of the period is significant, however this includes the aggregate of both the natural spread of populations already in the wild as well as well as the establishment of new disconnected populations based on historic data. The latter element of this – the spread by human means is likely to be a reasonable proxy for the impact of sale on the spread of the species, therefore,

the benefits of regulation would relate to how much we would expect this spread to reduce over the next five years. It is extremely difficult to provide a direct estimate of the proportion of spread that is due to human means as the historic data does not differentiate by source of spread. Natural spread of the species will be restricted by the connectivity and suitability of habitats. This means establishment of new populations in unconnected habitats which have yet to be invaded by the species is unlikely without human influence. Furthermore, the origin of all populations currently in the wild will have been due to anthropogenic action, therefore it is clear humans must play a significant role in the establishment of the species in the wild.

The non-native species risk assessments for each of the species identified human action as the principle means of establishment and spread in the wild but no figures were given on the relative importance of this mechanism of spread. Unfortunately, it would be prohibitively expensive to develop a monitoring programme that could monitor the spread of current populations and pick up the establishment of new populations throughout England freshwater aquatic ecosystem. Furthermore, disposal of these species in the wild, while illegal, is difficult to detect (no prosecutions have been brought) and therefore the likelihood of obtaining accurate and useful data on this activity is exceedingly low. Therefore, taking into account the continued spread of current populations and the likely establishment and subsequent expansion of new populations an estimate is given where anthropogenic spread constitutes 10% of the total spread of the species. We think this is likely to be a conservative estimate, as where populations are already established, due to the invasive nature of the plants, the scope for expansion of the current stock is limited. Conversely for unaffected water bodies, where species are inadvertently or illegally introduced, populations can expand rapidly. Therefore, whilst the flow of plants into new water bodies might be relatively small its impact on the change in the overall stock is likely to be much higher.

Table 5. Costs associated with spread attributable to anthropogenic spread.

Species	10% attributable to anthropogenic spread	
	Lower estimate (£)	Upper estimate (£)
Water fern	4,290,000	4,329,000
Parrots Feather	5,890,500	5,944,050
Floating pennywort	2,887,500	2,913,750
Australian swamp stone-crop	10,642,500	10,739,250
Water primrose	165,000	95,115
Total	23,875,500	24,021,165

Therefore, by 2016 the financial burden incurred by the 5 proposed species as a result of anthropogenic spread will have increased to £23,875,500 - £24,021,165.

**The benefit of the legislation then is to avoid costs of around £24m by 2017.**

To calculate average annual benefits it is necessary to take into account the population expansion of previous years, therefore annual benefits are additive. Assuming a linear growth pattern estimates of the annual increase in costs due to population expansion over the five year period are as follows:

The low estimate gives an annual increase in costs of  $£23,875,500/5 = £4,775,100$  and the high estimate, gives an annual increase in costs of  $£24,021,165/5 = £4,804,233$

Table 6. Average increase in benefits (costs avoided) over 5 year period 2012 – 2017. 2012 is the base year but the costs of spread won't necessarily be felt in their fullness until beginning of 2013.

Year	Low estimate (£)	High Estimate (£)
2012	0	0
2013	4,775,100	4,804,233
2014	9,550,200	9,608,466
2015	14,325,300	14,412,699
2016	191,00,400	19,216,932
2017	23,875,500	24,021,165

Therefore, the high estimate of the average annual benefits is £14,412,699 and the low estimate is £14,325,300

### Net Present values

Table 7. Net Present Values

Year		Low	High
	Discount factor	Benefit (£m)	Benefit (£m)
2012	1	0	0
2013	0.966184	4.8	4.8
2014	0.933511	9.6	9.6
2015	0.901943	14.3	14.4
2016	0.871442	19.1	19.2
2017	0.841973	23.9	24
<b>Net Present value</b>		<b>63.26</b>	<b>63.53</b>

While there are small transitional costs for the industry there is a clear benefit for landowners and waterways managers in avoiding additional costs of the proposed species should they be allowed to continue to be sold and subsequently released into the wild establishing further populations.

It is intended that the amending Order would come in to force on the common commencement date October 2012. Prior to an Order coming into force, if necessary, we will notify the World Trade Organisation's Sanitary and Phyto-sanitary Committee of our intentions through the usual procedures.

### References

*Invasive Non-Native Species Framework Strategy for Great Britain (2008):*  
<https://secure.fera.defra.gov.uk/nonnativespecies/downloadDocument.cfm?id=99>

*The Economic Cost of Invasive Non-native Species to Great Britain (CABI, 2009):*  
<https://secure.fera.defra.gov.uk/nonnativespecies/downloadDocument.cfm?id=487>

## Annex 1 – Rationale for not banning the sale of certain propose non-native species

Species	Rationale
Ruddy Duck	<b>Role of Sale.</b> Minimal numbers of animals sold each year therefore it is questionable whether ban on sale will have much of an impact. However, situation will be monitored and prohibitions may be considered in the future.
Topmouth Gudgeon	<b>Legislation inappropriate.</b> Already adequately controlled under Import of Live Fish Act (ILFA).
American Bullfrog	<b>Role of Sale.</b> Minimal numbers of animals sold each year therefore it is questionable whether ban on sale will have much of an impact. However, situation will be monitored and prohibitions may be considered in the future.
Edible Frog	<b>Evidence –</b> Non-native species risk assessment still in progress.
Marsh Frog	<b>Role of Sale.</b> While this species poses a medium risk the primary means of spread, as identified in the risk assessment, is as a hitchhiker when fish stocks are moved. Ban on sale would not address this.
Italian Crested Newt	<b>Evidence.</b> Risk (low) identified by non-native species risk assessment does not warrant sales prohibitions.
Red-eared Terrapin	<b>Evidence.</b> Risk (low) identified by non-native species risk assessment does not warrant sales prohibitions.
African Clawed Toad	<b>Evidence.</b> Risk (low) identified by non-native species risk assessment does not warrant sales prohibitions.
Marbled Crayfish	<b>Legislation inappropriate.</b> The same outcome could be achieved by withdrawing the general licence under ILFA for the sale of crayfish for food. Additional legislation unnecessary.
Noble Crayfish	<b>Legislation inappropriate.</b> The same outcome could be achieved by withdrawing the general licence under ILFA for the sale of crayfish for food. Additional legislation unnecessary.
Red Swamp Crayfish	<b>Legislation inappropriate.</b> The same outcome could be achieved by withdrawing the general licence under ILFA for the sale of crayfish for food. Additional legislation unnecessary.
Spiny-cheek Crayfish	<b>Legislation inappropriate.</b> The same outcome could be achieved by withdrawing the general licence under ILFA for the sale of crayfish for food. Additional legislation unnecessary.
Turkish Crayfish	<b>Legislation inappropriate.</b> The same outcome could be achieved by withdrawing the general licence under ILFA for the sale of crayfish for food. Additional legislation unnecessary.
Himalayan Balsam	<b>Evidence –</b> Non-native species risk assessment still in progress.
Hottentot Fig	<b>Evidence –</b> Non-native species risk assessment still in progress.
Japanese Knotweed	<b>Role of Sale.</b> JK is a well known invasive plant species and as such is not sold. Therefore, sales prohibitions are of questionable benefit. In the unlikely event this species is found for sale non-regulatory methods, such as education will achieve the same benefits as regulation.
Few Flowered Leek	<b>Evidence –</b> Non-native species risk assessment still in

	progress.
Shallon	<b>Evidence</b> – Non-native species risk assessment still in progress.
Rhododendron	<b>Evidence</b> – Non-native species risk assessment still in progress.
Water Hyacinth	<b>Evidence.</b> Risk (low) identified by non-native species risk assessment does not warrant sales prohibitions.
Canadian Waterweed	<b>Evidence</b> – Non-native species risk assessment still in progress.
Nuttall's Waterweed	<b>Evidence</b> – Non-native species risk assessment still in progress.
Curly waterweed	<b>Impact on industry</b> – Industry will lose £2-5 million per annum in sales if this species was prohibited from sale. There are currently no suitable alternatives for sale. Aside from the negative impact on the trade this would severely impact the effective, collaborative working relationship that Government currently enjoys with industry in tackling INNS.

**Annex 2,3,4,5 & 6 – Non-native Risk Assessments**

**See attached documents**

# An estimate of population increase of aquatic invasive species in the period 2010 - 2015

In response to an email request made by Defra

**Dr Jonathan Newman CEH Wallingford 9/20/2010**

m301535

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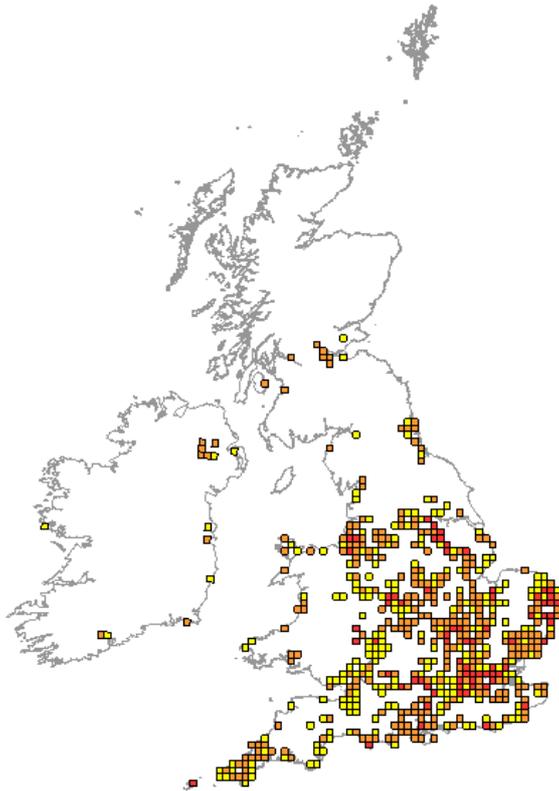
Dr Jonathan Newman  
Head, Aquatic Plant Management Group  
CEH Wallingford  
Crowmarsh Gifford  
Wallingford  
Oxon  
OX10 8BB

Tel: 01491 692556  
Email: [jone@ceh.ac.uk](mailto:jone@ceh.ac.uk)

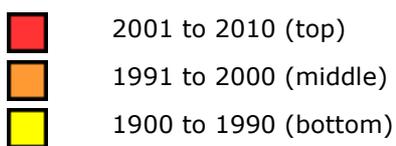
Firstly, how large would you expect a population of the proposed aquatic plants to become based on natural population growth (excluding) from initial dumping to 5 years down the line.

Data are taken from NERC NBN Gateway at <http://www.nbn.org.uk/>

### ***Azolla filiculoides***



#### **10km square legend**



**Note:** the most recent (top most) dates will overlay the earlier dates (lower ones) where squares have records in more than one date class.

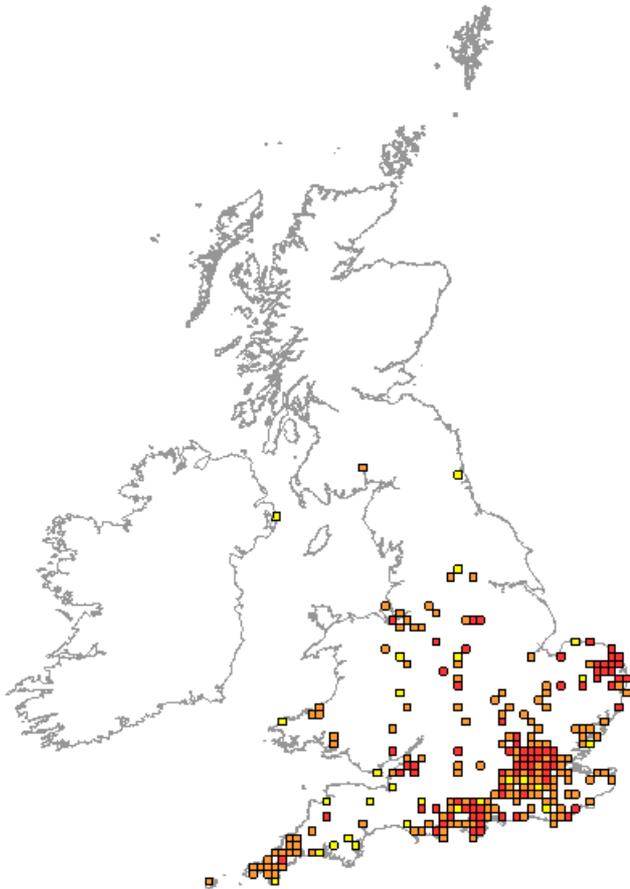
**2001 – 2010 140 sites**  
**1991 - 2000 397 sites**  
**1900 – 1990 393 sites**  
**Total 1800 - 2010 - 497 sites**

Increase after 1990 is  $497 - 393 = 104$  in 20 years, or 5.2 / annum, so in 2015 the number of sites will be 523 or a 5.2% increase.

### ***Ludwigia grandiflora***

There are 14 known sites in the UK. It is likely that this species is under-recorded by a factor of at least 5, meaning there are about 60 sites in the UK at present. The number of sites is estimated to double in the next 5 years as this species is at an early stage of invasion. The total number of sites in 2015 is estimated to be approximately 120, or about a 100% increase

## *Myriophyllum aquaticum*



### 10km square legend

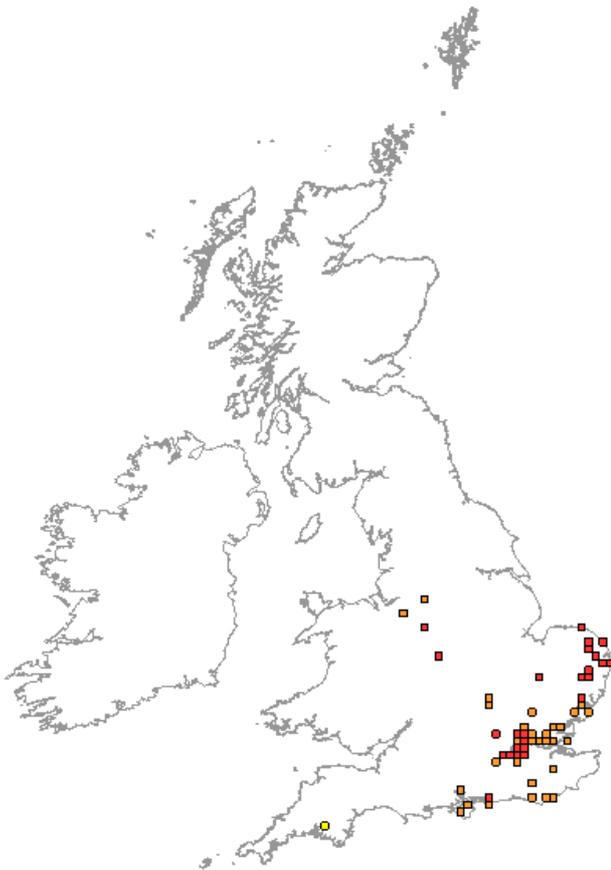
	2001 to 2010 (top)
	1991 to 2000 (middle)
	1900 to 1990 (bottom)

**Note:** the most recent (top most) dates will overlay the earlier dates (lower ones) where squares have records in more than one date class.

**2001 – 2010 157 sites**  
**1991 - 2000 271 sites**  
**1900 – 1990 200 sites**  
**Total 1800 - 2010 - 343 sites**

Increase after 1990 is  $343 - 200 = 143$  in 20 years, or  $7.15 / \text{annum}$ , so in 2015 the number of sites will be 379 sites or a 10% increase

## *Hydrocotyle ranunculoides*



### 10km square legend

	2001 to 2010 (top)
	1991 to 2000 (middle)
	1900 to 1990 (bottom)

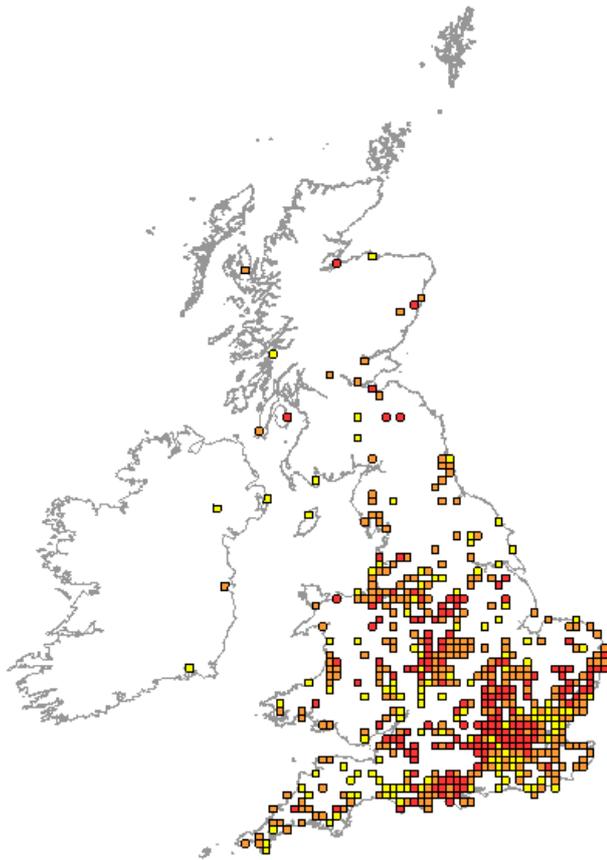
**Note:** the most recent (top most) dates will overlay the earlier dates (lower ones) where squares have records in more than one date class.

**2001 – 2010 48 sites**  
**1991 - 2000 68 sites**  
**1900 – 1990 28 sites**  
**Total 1800 - 2010 - 98 sites**

Increase after 1990 is  $98 - 28 = 70$  in 20 years, or 3.5 / annum, so in 2015 the number of sites will be 116 recorded sites or an 18% increase

*NB These data are incomplete, we have records of total site numbers as 146 in 2008. So an 18% increase would make the number of sites on this baseline about 175*

## *Crassula helmsii*



**10km square legend**

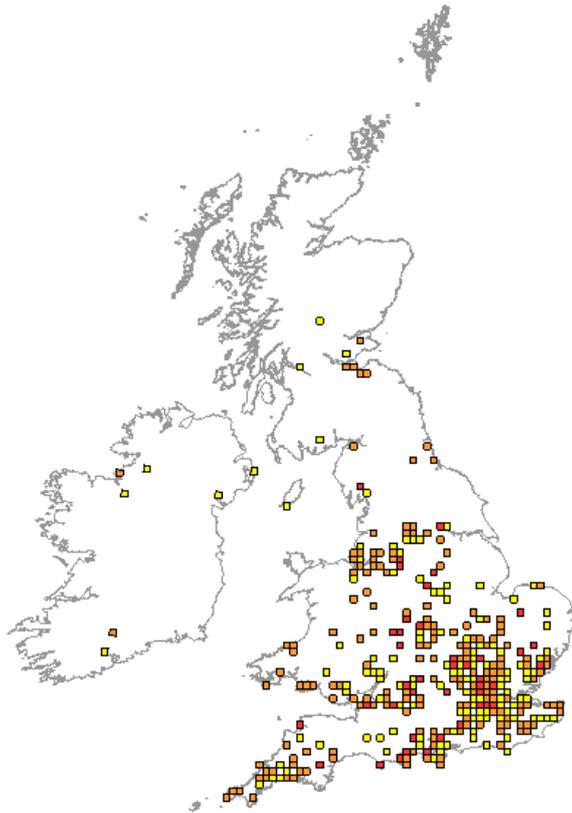
- 2001 to 2010 (top)
- 1991 to 2000 (middle)
- 1900 to 1990 (bottom)

**Note:** the most recent (top most) dates will overlay the earlier dates (lower ones) where squares have records in more than one date class.

**2001 – 2010 280 sites**  
**1991 - 2000 484 sites**  
**1900 – 1990 376 sites**  
**Total 1800 - 2010 - 634 sites**

Increase after 1990 is  $634 - 376 = 258$  in 20 years, or 12.9/ annum, so in 2015 the number of sites will be 699 recorded sites or a 10% increase

## *Lagarosiphon major*



### 10km square legend

	2001 to 2010 (top)
	1991 to 2000 (middle)
	1900 to 1990 (bottom)

**Note:** the most recent (top most) dates will overlay the earlier dates (lower ones) where squares have records in more than one date class.

**2001 – 2010 115 sites**  
**1991 - 2000 388 sites**  
**1900 – 1990 268 sites**  
**Total 1800 - 2010 - 408 sites**

Increase after 1990 is  $408 - 268 = 140$  in 20 years, or 7/ annum, so in 2015 the number of sites will be 443 recorded sites or an 8.6% increase

Secondly, what is the probability that if one of these species is dumped in the wild it will establish a population taking into account suitability of habitat and survivability?

All the species will produce fragments or propagules that are 100% viable, so even if there is a 1% chance of dumping then all these will establish if they end up in a permanent water body. There are two types of dumping, transfer from garden ponds direct to natural water bodies by caring pond owners, and dumping on the banks or transfer to waste collection facilities by contractors, IDBs etc. The likelihood of establishment from the first activity is 100%.

The likelihood of establishment from the second activity is probably about right at 1% of harvested/transported biomass, depending on where most spillage takes place. In my opinion, most spillage will occur at the loading and unloading end of the process, so the likelihood of establishment at the point of loading (or mechanical removal from the watercourse) is high, as this is assumed to be close to the point of origin of the material. Establishment, or persistence at the point of origin will be close to 100%, but the volume will depend on spilt biomass volumes, or fragment quantities. This of course assumes that mechanical control is 99% effective. I would have thought that 90 – 95% efficient would be a more accurate figure, given the inability to mechanically remove fragments entrapped in marginal vegetation, under bushes, and hidden in bankside undergrowth.

**Annex 8 Consultation Document**

**Annex 9 Government response to consultation**

**Please see attached documents.**

## Annex 10



# ORNAMENTAL AQUATIC TRADE ASSOCIATION LTD

*"The voice of the ornamental fish industry"*

Wessex House, 40 Station Road, Westbury, Wiltshire, BA13 3JN, UK

Telephone:+44(0)8700 434013 Fax:+44(0)1373 301236

info@ornamentalfish.org www.ornamentalfish.org www.aquaticsworldwide.org

Huw Thomas  
Head, Protected and Non-native Species Team  
Biodiversity Programme  
Department for Environment, Food and Rural Affairs  
Zone 1/15, Temple Quay House  
2 The Square, Temple Quay  
Bristol BS1 6EB

19<sup>th</sup> October 2011

Dear Huw,

## AQUATIC PLANT PROPOSALS FOR SALES BANS

As no progress on this matter has been reported I thought it timely to remind you of OATA's position.

OATA, as you know has long recommended members do not trade in certain species and more recently have very actively supported the Be Plant Wise Campaign. We will not oppose a sales ban of the five species specifically listed in that campaign (Floating Pennywort – *Hydrocotyle ranunculoides*, New Zealand Pigmyweed – *Crassula helmsii*, Parrot's Feather – *Myriophyllum aquaticum*, Water fern – *Azolla filiculoides*, Water-Primrose – *Ludwigia grandiflora*.) Such a ban would serve to very positively:

- support those businesses that have voluntarily withdrawn these species from sale and by doing so foregone any profit they might otherwise have made to date and in the future.
- reinforce the Be Plant wise campaign.

Indeed for Water-Primrose (*L. grandiflora*) there seems an overwhelmingly logic to progressing to a sales ban. This species is not yet widely on sale and DEFRA, or other government agencies, are making strenuous efforts to eradicate the few populations in the wild. It appears this could be a case where early detection will lead to prevention of an invasion by a damaging species.

We must equally emphasise that we will not support sales bans on any other species. We think the enthusiasm shown by the trade to engage with the Be Plant Wise campaign will result in far wider public awareness of the issues and hence responsible behaviours. Extending any list of banned species beyond those listed above may undermine support for on going efforts to communicate the Be Plant wise campaigns message,

Yours sincerely,

Keith Davenport  
Chief Executive