

Risk Assessment of *Rubus spectabilis*

Name of Organism:	<i>Rubus spectabilis</i> Pursh – Salmonberry
Objective:	Assess the risks associated with this species in Ireland
Version:	Final 15/09/2014
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Stage 1 - Organism Information

Stage 2 - Detailed Assessment

Section A - Entry
Section B - Establishment
Section C - Spread
Section D - Impact
Section E - Conclusion
Section F - Additional Questions

About the risk assessment

This risk assessment is based on the **Non-native species Application based Risk Analysis (NAPRA)** tool (version 2.66). NAPRA is a computer based tool for undertaking risk assessment of any non-native species. It was developed by the European and Mediterranean Plant Protection Organisation (EPPO) and adapted for Ireland and Northern Ireland by Invasive Species Ireland. It is based on the Computer Aided Pest Risk Analysis (CAPRA) software package which is a similar tool used by EPPO for risk assessment.

Notes: Confidence is rated as low, medium, high or very high.
Likelihood is rated as very unlikely, unlikely, moderately likely, likely or very likely.
The percentage categories are 0% - 10%, 11% - 33%, 34% - 67%, 68% - 90% or 91% - 100%.
N/A = not applicable.

This is a joint project by Inland Fisheries Ireland and the National Biodiversity Data Centre to inform risk assessments of non-native species for the European Communities (Birds and Natural Habitats) Regulations 2011. It is supported by the National Parks and Wildlife Service.

DOCUMENT CONTROL SHEET

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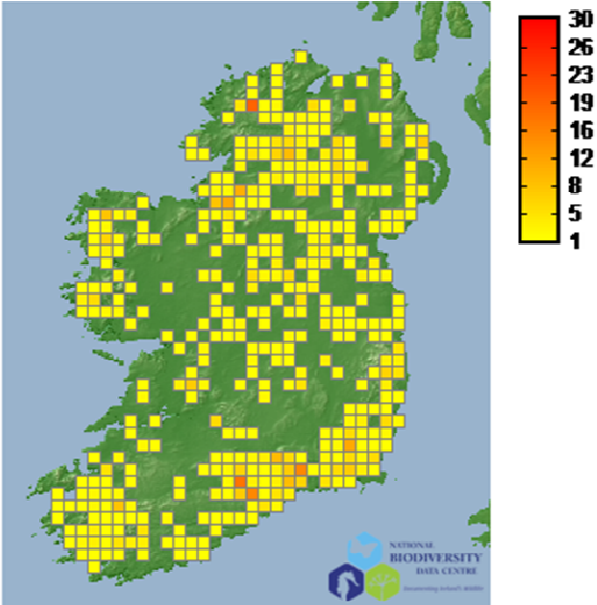
Version Control Table

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Draft 1	Complete	Dr Erin O'Rourke	Dr Liam Lysaght		30/06/2014
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Stage 1 - Organism Information			
<i>The aim of this section is to gather basic information about the organism.</i>			
N	QUESTION	RESPONSE	COMMENT
1	What is the reason for performing the risk assessment?		A risk assessment is required as this species is listed as a "Non-native species subject to restrictions under Regulations 49 and 50" in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011, SI 477/2011.
2	Identify the organism. Is it clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank?	YES	<i>Rubus spectabilis</i> Pursh – Salmonberry Taxonomy: Kingdom: Plantae Phylum: Eudicotyledone Class: Magnoliophyta Order: Rosales Family: Rosaceae Genus: <i>Rubus</i> Species: <i>spectabilis</i> Synonyms: <i>Rubus stenopetalus</i> Cham., <i>Rubus franciscanus</i> Rydb. Common name (English): Salmonberry
3	If not a single taxonomic entity, can it be redefined? (if necessary use the response box to re-define the organism and carry on)	N/A	
4	Describe the organism.	-	<i>R. spectabilis</i> is a deciduous, vigorous, suckering shrub, naturalised in woods and hedges, often forming large thickets (McCosh, 2002). Stace (1997) describes the plant as having "stems to 2m, ± erect, with weak spines mostly below, otherwise ± glabrous; leaves ternate, with ovate ± glabrous leaflets; flowers usually solitary on lateral branches, pink, 2-3cm across; fruit orange".
5	Does a relevant earlier risk assessment exist? (give details of any previous risk assessment for Ireland)	YES	In Ireland, a preliminary risk assessment was previously carried out. This was a prioritisation risk assessment as part of the Risk Analysis and Prioritisation for Invasive and Non-native Species in Ireland and Northern Ireland (ISI, 2012). It designated <i>Rubus spectabilis</i> as a "medium risk" invasive species.
6	If there is an earlier Risk Assessment is it still entirely valid, or only partly valid?	PARTIAL	Only a preliminary risk assessment was previously conducted in Ireland (refer to Question 5)
7	Where is the organism native?		<i>R. spectabilis</i> is a deciduous shrub from western North America (ISI, 2012; McCosh, 2002; Parnell and Curtis, 2012; Stace, 1997). Its native range is from southeast Alaska to the Santa Cruz Mountains of California, and from the Pacific Ocean eastward into Idaho and Montana (Jensen <i>et al.</i> , 1995).

Stage 1 - Organism Information

The aim of this section is to gather basic information about the organism.

N	QUESTION	RESPONSE	COMMENT
8	What is the current global distribution of the organism (excluding Ireland)?		Including <i>R. spectabilis</i> 's native range (refer to Question 7) the species has been introduced to Belgium, Britain, Denmark, France, Germany, Netherlands, Norway and Sweden (DAISIE, 2014). It is considered established in the Netherland, Norway and Sweden (NOBANIS, 2014)
9	What is the current distribution of the organism in Ireland?		<p>The species is common in Ireland; naturalised in many areas such as parks, river banks, demesnes, broadleaved and coniferous woodland (ISI, 2012). There are 288 records of plant covering 116 10km² verified in Ireland by the National Biodiversity Data Centre; (Figure 1; National Biodiversity Data Centre, 2014).</p>  <p>Figure 1. Map showing most of the verified records for <i>Rubus spectabilis</i> per 10km² in Ireland. Colour scale bar shows density of records per 10km (National Biodiversity Data Centre, 2014).</p>

Stage 1 - Organism Information

The aim of this section is to gather basic information about the organism.

N	QUESTION	RESPONSE	COMMENT
10	Is the organism known to be invasive anywhere in the world?	YES	<i>R. spectabilis</i> is considered potentially invasive in Ireland (i.e. known to have intrinsic attributes that indicate a species is, or could be, threatening to other species, habitats or ecosystems), with possible competitive displacement of native flora, resulting in habitat alteration (National Biodiversity Data Centre, 2014; NOBANIS, 2014). As it forms dense thickets, it may locally inhibit the regeneration of companion plant species, such as native trees in woodland (ISI, 2012). It is not known to have any immediate adverse effect on animal life but disappearance of other native plant species in its immediate area which are host species for insects may have an effect on animal life (ISI, 2010). In its native range the plant is sometimes considered a nuisance of commercial forestry and may need to be controlled in order to encourage the growth of other plants (Jensen <i>et al.</i> , 1995).

Stage 2 - Detailed assessment: Section A - Entry

This section evaluates the probability of entry of an organism into Ireland. For organisms which are already present, only complete the entry section for currently active pathways of entry and potential future pathways. The entry section need not be completed for pathways which have allowed an organism to enter in the past but are no longer active.

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
1.01	How many active/future pathways are relevant to the potential entry of this organism (n/a, very few, few, moderate number, many or very many)?	VERY FEW	HIGH	The main pathway of introduction of <i>R. spectabilis</i> is the horticultural trade.
1.02	List significant pathways through which the organism could enter. Where possible give detail about the specific origins and end points of the pathways.	1. Horticultural trade	HIGH	Potential for the species to be sourced through the horticultural trade, via garden centres, mail order seed companies and the Internet, for use as an ornamental plant and/or of game cover (ISI, 2012; McCosh, 2002). From habitats into which the plant is introduced it can escape (i.e. spread), becoming naturalized and/or invasive in the wild (Reynolds, 2002).

Pathway 1 – Horticultural trade

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
1.03	Is entry along this pathway intentional (e.g. the organism is imported for trade) or accidental (e.g. the organism is a contaminant of imported goods)?	INTENTIONAL	HIGH	Entry of the plant is deliberate.
1.04	How likely is it that large numbers of the organism will travel along this pathway from the point(s) of origin over the course of one year?	MODERATELY LIKELY	MEDIUM	There are no reliable data that exists to allow a reasonable assessment to be made of the number of animals that may, or may not, be brought into Ireland e.g. no figures available on the number of plants sold and subsequently planted. However, movement would be dependent on the level of supply and demand. Expectation would be that traders, gardeners and land managers have a developing appreciation for the potential invasiveness of the plant resulting in a relatively low demand. However, for a viable population to develop only a small number of plants are needed and suitable wild habitat is plentiful and in close proximity to human habitation.
1.05	How likely is the organism to enter Ireland undetected or without the knowledge of relevant competent authorities?	LIKELY	MEDIUM	It is likely that the species could enter Ireland undetected and without the knowledge of the relevant authority, particularly as seed via the internet trade. This is substantiated by the records of the plant recorded in Ireland (refer to Question 9) that indicate successful introduction(s) have taken place without the knowledge of the competent authorities. It may be less likely for the species to

Pathway 1 – Horticultural trade				
N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
				go undetected as a plant, especially if it is labeled and checked at an entry point into the country. Introduction is most likely detected when the plant flowers in early spring (March) (ISI, 2012).
1.06	How likely is the organism to survive during passage along the pathway?	LIKELY	MEDIUM	Likely for the species nutritional and housing requirements to be catered for by the importer.
1.07	How likely is the organism to arrive during the months of the year appropriate for establishment?	LIKELY	MEDIUM	Horticultural traders and gardeners are likely to stock and buy <i>R. spectabilis</i> at the time of year most appropriate to planting; with most sales probably taking place in the spring or autumn planting seasons. Seed are best sown in October and November (Jensen <i>et al.</i> , 1995).
1.08	How likely is the organism to be able to transfer from the pathway to a suitable habitat or host?	LIKELY	HIGH	<i>R. spectabilis</i> is typically a garden escape, naturalising in conifer, broadleaf and mixed woodland, along hedgerows and river banks, and in park and demesnes (ISI, 2012; Reynolds, 2002). The species is likely to encounter and/or be introduced to such suitable habitat within the Irish landscape (CORINE, 2006; Fossitt, 2000).
1.09	Estimate the overall likelihood of entry into Ireland based on this pathway?	MODERATELY LIKELY	MEDIUM	Horticultural trade is the main pathway for <i>R. spectabilis</i> into the country, most likely planted for ornamental purposes and perhaps more historically for game cover. The entry of plant, followed by the subsequent establishment and spread has resulted in the presence of the species in 116 of the ~1018 10 km squares which constitute Ireland (National Biodiversity Data Centre, 2014). It can only assume the future entry of the species via horticultural trade is as a result of trade and consumer ignorance to the potential invasiveness of this species.
1.10	Do other pathways need to be considered?	NO	HIGH	Accidental introduction through seed-contaminated soil is probably remote.

Overall likelihood				
N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
1.11	Estimate the overall likelihood of entry into Ireland based on all pathways (comment on the key issues that lead to this conclusion).	MODERATELY LIKELY	MEDIUM	Refer to Question 1.09

Stage 2 - Detailed assessment: Section B – Establishment

This section evaluates the probability of establishment of an organism within Ireland. For organisms which are already well established in Ireland there is no need to complete this section - move straight to the Spread section.

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
2.01	Is the organism well established in Ireland (if there is any uncertainty answer 'unsure')	YES	HIGH	<i>R. spectabilis</i> is common in Ireland (ISI, 2012). It is present in 116 of the ~1018 10 km squares which constitute the country (National Biodiversity Data Centre, 2014). The remainder of section B – Establishment is completed to identify reasons for the existing, and possible further, establishment of the plant.
2.02	How likely is it that the organism will be able to establish in Ireland based on the similarity between local <u>climatic conditions</u> and the organism's current global distribution?	VERY LIKELY	HIGH	<i>R. spectabilis</i> native and introduced range covers mainly the north temperate, but also slightly extends into the polar climate zone. It has established in Ireland; a country with a temperate oceanic climate which is mild, moist and changeable, with abundant rainfall and lack of temperature extremes (Keane and Collins, 2004).
2.03	How likely is it that the organism will be able to establish in Ireland based on the similarity between other local <u>abiotic conditions</u> and the organism's current global distribution?	VERY LIKELY	HIGH	Salmonberry favours moist conditions and open sites but is also moderately shade tolerant (Jenson <i>et al.</i> , 1995; ISI, 2012).
2.04	How likely is the organism to encounter habitats necessary for the survival, development and multiplication of the organism in Ireland?	VERY LIKELY	HIGH	<i>R. spectabilis</i> is typically a garden escape, naturalising in conifer, broadleaf and mixed woodland, along hedgerows and river banks, and in park and demesnes (ISI, 2012; Reynolds, 2002). The species is likely to encounter and/or be introduced to such suitable habitat within the Irish landscape (CORINE, 2006; Fossitt, 2000).
2.05	How likely is it that establishment will occur despite competition from existing species in Ireland?	VERY LIKELY	HIGH	Competition is not likely to be an impinging factor in the establishment of the species. At open sites <i>R. spectabilis</i> is capable of fully occupying a site through vegetative regeneration, making it extremely difficult for other species to become established (Jensen <i>et al.</i> , 1995). It is also capable of persisting in moderately dense conifer stands but in dense conifer stands, it may be completely eliminated within 30-40 years of canopy closure. <i>R. spectabilis</i> produces leaves earlier in the spring than many other species and can photosynthesize at low temperatures, giving it an edge over most competitors (Jensen <i>et al.</i> , 1995).
2.06	How likely is it that establishment will occur despite predators, parasites or pathogens already present in Ireland?			The plant is already well established in Ireland and shows no ill effects from predators, parasites or pathogens except at a local level.

Stage 2 - Detailed assessment: Section B – Establishment

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N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
2.07	How likely is it that establishment will occur despite existing management practices?	VERY LIKELY	HIGH	There is no knowledge of any <i>R. spectabilis</i> control or eradication campaigns in Ireland.
2.08	How likely is it that management practices in Ireland will facilitate the establishment of the organism?	VERY LIKELY	MEDIUM	<i>R. spectabilis</i> seeds stored in the forest floor are stimulated to germinate by disturbances such as windthrow, low-intensity fire or human activities such as forestry harvesting (Jensen <i>et al.</i> , 1995). Once established, stands of <i>R. spectabilis</i> respond favourably to any openings that occur. Forestry clearance, thinning and harvesting activities are all likely to stimulate growth and development (Jensen <i>et al.</i> , 1995). When such human activities causes gaps or clearances existing plants can extend their rhizomes, making it difficult for other trees and shrubs to become established (Jensen <i>et al.</i> , 1995).
2.09	How likely is it that the biological characteristics of the organism would allow it to survive eradication campaigns in Ireland?	VERY LIKELY	HIGH	If there is a future need to control the plant, existing management practices can be drawn from North America where the plant is at times considered a nuisance and controlled using cultural, mechanical and chemical means (Jensen <i>et al.</i> , 1995; ISI, 2012). Even if <i>R. spectabilis</i> is eliminated from an area, seeds stored in the soil seed bank may permit re-establishment (Tappeiner and Zasada, 1993).
2.10	How likely is it that the biological characteristics of the organism will facilitate its establishment?	VERY LIKELY	HIGH	Salmonberry reproduces sexually, often from seeds stored in the soil for long periods of time, and vegetatively, via layering, basal sprouting, and rhizomes (Jensen <i>et al.</i> , 1995; ISI, 2012). Flowers are pollinated by insects and birds (Haeussler <i>et al.</i> 1990). The seeds, contained within the fruit, are dispersed by animals (<i>e.g.</i> rodents, and birds), which consume the fruits while foraging and pass the seeds through their digestive tracts, effectively transporting the seeds to new sites (Barber 1976). Only a small percentage of salmonberry seeds germinate during the spring following dispersal; most lie dormant in the soil for many years, perhaps even decades, creating a large seed bank. Seeds in the seed bank are stimulated to germinate by disturbances such as windthrow or fire or by human activities such as harvesting (Jensen <i>et al.</i> , 1995). The plant has numerous buds, located above ground along aerial stems and near the base of each stem and also underground in the root crown and along rhizomes; all of these buds have the capacity to produce new

Stage 2 - Detailed assessment: Section B – Establishment

This section evaluates the probability of establishment of an organism within Ireland. For organisms which are already well established in Ireland there is no need to complete this section - move straight to the Spread section.

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
				plants through layering of above-ground stems, basal sprouting, and sprouting from rhizomes (Jensen <i>et al.</i> , 1995). Sprouting from the extensive underground rhizome system is primarily responsible for the rapid growth and development of the plant (Jensen <i>et al.</i> , 1995).
2.11	How likely is it that the organism's capacity to spread will facilitate its establishment?	VERY LIKELY	HIGH	<p>The main mode of <i>R. spectabilis</i> spread is via vegetative reproduction (also detailed in Question 2.10). Layering occurs when a stem is pinned to the soil surface by objects such as fallen branches or trees; buds on the upper side of the stem form new aerial shoots, while adventitious roots form on the lower surface (Jensen <i>et al.</i>, 1995). Basal sprouting results from buds located near the base of each stem or in the root crown; basal sprouting is especially important in re-establishing plants when aerial stems have been damaged or destroyed (Jensen <i>et al.</i>, 1995). Sprouting from the extensive underground rhizome system is primarily responsible for the rapid spread. Rhizomes typically grow within several feet of the soil surface, but they may be deeper; often they form dense, interwoven mats (Jensen <i>et al.</i>, 1995). Because rhizomes have the potential to produce buds every 1/2 to 1 inch, a single network can contain hundreds of thousands of buds per acre. Rhizomes grow rapidly, often several feet per year, especially following disturbance.</p> <p>The seeds are dispersed by animals (<i>e.g.</i> rodents, and birds), which consume the fruits while foraging and pass the seeds through their digestive tracts, effectively transporting the seeds to new sites (Barber 1976). Only a small percentage of salmonberry seeds germinate during the spring following dispersal; most lie dormant in the soil for many years, perhaps even decades, creating a large seed bank. Seeds in the seed bank are stimulated to germinate by disturbances such as windthrow or fire or by human activities such as harvesting (Jensen <i>et al.</i>, 1995).</p>
2.12	How likely is it that the organism's adaptability will facilitate its establishment?	VERY LIKELY	HIGH	<i>R. spectabilis</i> has highly adaptive means of reproduction and spread (refer to Questions 2.10 and 2.11). It is perhaps slightly limited by its environmental requirements i.e. preference for wet, open sites (refer to Questions 2.03).
2.13	How likely is it that the organism could establish despite low genetic diversity in the founder population?	VERY LIKELY	HIGH	Low genetic diversity in the founder population is unlikely to prevent establishments (refer to Question 2.10).

Stage 2 - Detailed assessment: Section B – Establishment

This section evaluates the probability of establishment of an organism within Ireland. For organisms which are already well established in Ireland there is no need to complete this section - move straight to the Spread section.

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
2.14	Based on the history of invasion by this organism elsewhere in the world, how likely is it to establish in Ireland? If possible, specify the instances of invasion elsewhere in the justification box	VERY LIKELY	HIGH	In Britain the species was introduced into cultivation in 1827 and reported in the wild by 1899 (McCosh, 2002). In Ireland it was first recorded in the wild in 1931, where it is now established and common (ISI, 2012; National Biodiversity Data Centre, 2014). It is likely that the species is increasing in some areas (McCosh, 2002).
2.15	If the organism does not establish, then how likely is it that transient populations will continue to occur?	VERY UNLIKELY	HIGH	The species is established and there are no known reports of short-lived <i>R. spectabilis</i> individuals or populations.
2.16	Estimate the overall likelihood of establishment. Mention any key issues in the comments box	VERY LIKELY	HIGH	The climatic and abiotic conditions and habitats necessary for the establishment of <i>R. spectabilis</i> exist in Ireland, with the species presently having a common distribution across the country. The species possesses biological traits which are highly conducive to successful establishment and which may also hamper any future employment of control measures. It has highly adaptive means of reproduction and spread. Competition is not likely to significantly prevent growth and development. There is a paucity of information with respect to the potential influence of natural enemies. Existing management practices, particularly within the forestry sector are likely to aid further establishment.

Stage 2 - Detailed assessment: Section C – Spread

This section evaluates the probability of spread of an organism within Ireland. Spread is defined as the expansion of the geographical distribution of an organism within the risk assessment area.

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
3.01	What area (given in % or 10km squares) in Ireland could the organism establish (0% - 10%, 11% - 33%, 34% - 67%, 68% - 90% or 91% - 100%)?	11%-33%	MEDIUM	<i>R. spectabilis</i> is typically a garden escape, naturalising in conifer, broadleaf and mixed woodland, along hedgerows and river banks, and in park and demesnes (ISI, 2012; Reynolds, 2002). The plant has a preference for moist habitat. With references to the CORINE land cover data <i>R. spectabilis</i> has the potential to inhabit 11%-33% of the Irish land surface: coniferous woodland (3.23%), deciduous woodland (0.41%), mixed woodland (0.42%), transitional woodland (5.89%), moors and heaths (0.78%), stream courses (0.11%), sparsely vegetated areas (0.29%) and green urban areas (0.04%) (CORINE, 2006). It is of note that CORINE land cover data does not define the size of gardens, demesnes and hedgerows, which represent important habitat for the species. However, it is suspected that even if these habitat features were accounted for, the area in Ireland that the species has the potential to establish would still lie between 11%-33%.
3.02	How important is the expected spread of this organism in Ireland by <u>natural</u> means (minimal, minor, moderate, major or massive)?	MAJOR	HIGH	<i>R. spectabilis</i> has several means of vegetative spread. Sprouting from the extensive underground rhizome system is primarily responsible for the rapid spread (Jensen <i>et al.</i> , 1995; ISI, 2012). For further details regarding natural spread of the plant refer to Question 2.11.
3.03	How important is the expected spread of this organism in Ireland by <u>human assistance</u> (minimal, minor, moderate, major or massive)?	MINIMAL	HIGH	Accidental human assisted spread may occur via the careless disposal of garden waste containing <i>R. spectabilis</i> (ISI, 2012).
3.04	Within Ireland, how difficult would it be to contain the organism (minimal, minor, moderate, major or massive)?	MAJOR	MEDIUM	As there are no known control or eradication campaigns for the <i>R. spectabilis</i> in Ireland it is difficult to provide an informed answer. This fast growing species has become common in the wild in a relatively short period of time (refer to Question 2.14) and it is likely that major difficulties would be encountered in the containment of the species. Sectoral management practices e.g. commercial forestry, are likely to aid spread (refer to Question 2.08). <i>R. spectabilis</i> preference of moist habitat likely plays the biggest factor in containment of the plant.
3.05	What proportion (%) of the area in Ireland suitable for establishment, if any, has already been colonised by the organism?	0%-10%	MEDIUM	Although <i>R. spectabilis</i> has, under favourable conditions, the potential to spread to 11%-33% of the Irish land cover (refer to Question 3.01), at present it is most likely that 0%-10% of land area has been colonised by the species.

Stage 2 - Detailed assessment: Section C – Spread

This section evaluates the probability of spread of an organism within Ireland. Spread is defined as the expansion of the geographical distribution of an organism within the risk assessment area.

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
3.06	What proportion of the area in Ireland suitable for establishment, if any, do you expect to have been invaded by the organism five years from now (including any current presence)?	0%-10%	MEDIUM	The species has probably been very widely spread through the horticultural trade and will no doubt continue to establish from these cultivated founder populations.
3.07	What other timeframe would be appropriate to estimate any significant further spread of the organism (10, 20, 40, 80 or 160 years)? Please comment on why this timeframe is chosen.	10	MEDIUM	Because vegetative spread is rapid the shortest period of 10 years would be appropriate to estimate any significant further spread.
3.08	In this timeframe, what proportion of the area (including any currently occupied areas) is likely to have been invaded by this organism?	0%-10%	MEDIUM	Whilst the geographical spread of the species will probably increase slowly, local populations will consolidate rapidly and the resulting propagule pressure is likely to cause the species to dominate habitats currently occupied by native <i>Rubus</i> species.
3.09	Based on the answers to questions on the potential for establishment and spread in Ireland, define the area endangered by the organism. Be as specific as possible. If available, provide a map showing the area most likely to be endangered.	-	MEDIUM	Coniferous, broadleaved and mixed woodland, hedgerows and river banks, and park and demesnes are most at risk to invasion by the species (ISI, 2012; Reynolds, 2002). The species likely threatens the conservation value of protected woodlands and riparian zones.
3.10	Estimate the overall potential for future spread for this organism in (very slowly, slowly, moderately, rapidly or very rapidly). Use the justification box to indicate any key issues.	RAPIDLY	MEDIUM	<i>R. spectabilis</i> is typically a garden escape, naturalising in conifer, broadleaf and mixed woodland, along hedgerows and river banks, and in park and demesnes (ISI, 2012; Reynolds, 2002). The species has the potential to inhabit a large percentage of the Irish land cover and at present it is most likely that 0%-10% has been colonised by the species. This fast growing species has become common in the wild in a relatively short period of time and it is likely that major difficulties would be encountered in any further efforts to contain the plant. Sprouting from the extensive underground rhizome system is primarily responsible for the rapid growth and development of the plant, especially following disturbance (Jensen <i>et al.</i> , 1995).

Stage 2 - Detailed assessment: Section D – Impact*This section evaluates the probability of impact of an organism within Ireland.*

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
4.01	How great is the economic loss caused by the organism within its global distribution (excluding Ireland), including the cost of any current management?	N/A	MEDIUM	There is no knowledge of any global economic costs incurred to-date. In its native range <i>R. spectabilis</i> is considered a nuisance of commercial forestry as dense thickets can inhabit the establishment of coniferous and broadleaved species (Jensen <i>et al.</i> , 1995).
4.02	How great has the economic cost of the organism been in Ireland from the <u>time of introduction to the present</u> ? Exclude any costs associated with managing the organism from your answer.	N/A	MEDIUM	There is no knowledge of any economic costs incurred in Ireland to-date.
4.03	How great is the economic cost of the organism likely to be in the <u>future</u> in Ireland? Exclude any costs associated with managing the organism from your answer.	N/A	MEDIUM	If any economic costs were to be incurred they are likely to only be associated with management of the species.
4.04	How great have the economic costs of managing this organism been in Ireland from the time of introduction to the present?	N/A	MEDIUM	There is no knowledge of any economic costs incurred to-date
4.05	How great is the economic cost of managing this organism likely to be in the future in Ireland?	MAJOR	MEDIUM	Economic cost would only arise if the species was to become subject to control measures. As the species is already common, eradication may be considered both uneconomic and undesirable. If the species impacts upon the human enterprise, most likely the Irish forestry sector, or the conservation status of protected sites, control measures may be employed and which could come at a major cost. If <i>R. spectabilis</i> does not impact upon the economic viability of commercial forestry practices, it is perhaps more likely for it to become accepted as a naturalised species of the habitats it occupies.
4.06	How important is environmental harm caused by the organism within its global distribution?	MODERATE	MEDIUM	In its native range the plant is sometimes considered a nuisance of commercial forestry and may need to be controlled in order to encourage the growth of other plants (Jensen <i>et al.</i> , 1995).

Stage 2 - Detailed assessment: Section D – Impact

This section evaluates the probability of impact of an organism within Ireland.

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
4.07	How important has the impact of the organism on biodiversity* been in Ireland from the time of introduction to the present? *e.g. decline in native species, changes in community structure, hybridisation	MODERATE	MEDIUM	<i>R. spectabilis</i> is considered potentially invasive in Ireland, with possible competitive displacement of native flora, resulting in habitat alteration (National Biodiversity Data Centre, 2014; NOBANIS, 2014). As it forms dense thickets, it will locally inhibit the regeneration of companion plant species, such as native trees in woodland (ISI, 2012). It is not known to have any immediate adverse effect on animal life but disappearance of other native plant species in its immediate area which are host species for insects may have an effect on animal life (ISI, 2010).
4.08	How important is the impact of the organism on biodiversity likely to be in the <u>future</u> in Ireland?	MAJOR	MEDIUM	<i>R. spectabilis</i> is already likely impacting upon biodiversity and causing habitat change. If the species establishes and spreads further, the threat to biodiversity is likely to increase. Spread of the species to native woodland and the potential for the species to form dense monocultural thickets, may pose a threat to indigenous biodiversity and ecosystem structure and function.
4.09	How important has alteration of ecosystem function* caused by the organism been in Ireland from the time of introduction to the present? *e.g. habitat change, nutrient cycling, trophic interactions	MODERATE	MEDIUM	Refer to Question 4.07
4.10	How important is alteration of ecosystem function caused by the organism likely to be in Ireland in the <u>future</u> ?	MAJOR	MEDIUM	Refer to Question 4.07
4.11	How important has decline in conservation status* caused by the organism been in Ireland from the time of introduction to the present? *e.g. sites of nature conservation value, WFD classification, etc.	MODERATE	MEDIUM	There are no known reports of the impact <i>R. spectabilis</i> is having on the conservation objectives of areas of conservation interest and protection. It can only be assumed that it may be a problem in several National Parks and Nature Reserves, especially where these are located on or near to sites of former demesne lands.
4.12	How important is decline in conservation status caused by the organism likely to be in the <u>future</u> in Ireland?	MAJOR	MEDIUM	<i>R. spectabilis</i> is most likely already impacting upon the conservation status of protected and/or important sites and it is not expected that these negative impacts will change in the future unless management campaigns are put in place.
4.13	How important is social or human health harm (not directly included in economic and environmental categories) caused by the organism within its global distribution?	N/A	MEDIUM	There is no knowledge of any social or human health harm to-date.

Stage 2 - Detailed assessment: Section D – Impact				
<i>This section evaluates the probability of impact of an organism within Ireland.</i>				
N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
4.14	How important is social or human health harm (not directly included in economic and environmental categories) caused by the organism within Ireland?	MINOR	MEDIUM	Countryside walks, forest trail and hiking routes may be impeded by the growth and development of <i>R. spectabilis</i> .
4.15	How important is it that genetic traits of the organism could be carried to other organisms / species, modifying their genetic nature and making their economic, environmental or social effects more serious?			There is a paucity of information, but hybridisation with native taxa is possible as most <i>Rubus</i> taxa share a common chromosome number (Thompson 1995). Such hybrids may share the invasive tendency of <i>R. spectabilis</i> .
4.16	How important is the impact of the organism as food, a host, a symbiont or a vector for other damaging organisms (e.g. diseases)?	N/A	MEDIUM	The species is not known as a host or habitat for pests or diseases. Conversely, <i>R. spectabilis</i> thickets can provide an important source of food and hiding cover for small mammals, insects and birds (Jensen <i>et al.</i> , 1995). Both leaves and fruits are highly palatable. In its native and introduced range mountain beavers, deer, elk, rabbits, beavers, bears, chipmunks, deer mice, raccoons, and various birds use the plant for cover and forage (Jensen <i>et al.</i> , 1995). The fruit is edible but rather tasteless to the human palate, looking like a large raspberry (ISI, 2012).
4.17	How important might other impacts not already covered by previous questions be resulting from introduction of the organism? Specify in the justification box.	N/A	MEDIUM	We are not aware of any other impacts the introduction of this species would have.
4.18	How important are the expected impacts of the organism despite any natural control by other organisms, such as predators, parasites or pathogens that may already be present in Ireland?	UNKNOWN	MEDIUM	There is a paucity of information.
4.19	Indicate any parts of where economic, environmental and social impacts are particularly likely to occur. Provide as much detail as possible, where possible include a map showing vulnerable areas.	-	MEDIUM	It is a potential economic problem in commercial forestry, recreational land (e.g. land used for hunting and hiking) and conservation sites.

Stage 2 - Detailed assessment: Section D – Impact

This section evaluates the probability of impact of an organism within Ireland.

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
4.20	Estimate the overall potential impact of this organism in Ireland. Use the justification box to indicate any key issues.	MAJOR	MEDIUM	<p><i>R. spectabilis</i> is considered potentially invasive in Ireland, with possible competitive displacement of native flora, resulting in habitat alteration (National Biodiversity Data Centre, 2014; NOBANIS, 2014). As it forms dense thickets, it may locally inhibit the regeneration of companion plant species, such as native trees in woodland (ISI, 2012). It is not known to have any immediate adverse effect on animal life but disappearance of other native plant species in its immediate area which are host species for insects may have an effect on animal life (ISI, 2010).</p> <p>In its native range the plant is sometimes considered a nuisance of commercial forestry and may need to be controlled in order to encourage the growth of other plants (Jensen <i>et al.</i>, 1995). Economic cost would only arise if the species was to become subject to control measures. As the species is already common, eradication may be considered both uneconomic and undesirable. If the species impacts upon the human enterprise, most likely the Irish forestry sector, or the conservation status of protected sites, control measures may be employed and which could come at a major cost. Countryside walks, forest trail and hiking routes may be impeded by the growth and development of <i>R. spectabilis</i>.</p>

Stage 2 - Detailed assessment: Section E - Conclusion

This section requires the assessor to provide a score for the overall risk posed by an organism, taking into account previous answers to entry, establishment, spread and impact questions.

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
5.01	Estimate the overall risk of this organism in Ireland. Noting answers given in 1.11, 2.16, 3.10 & 4.20	MODERATE - MAJOR	HIGH	<p>Horticultural trade is the main pathway for <i>R. spectabilis</i> into the country, most likely planted for ornamental purposes and perhaps more historically for game cover. The entry of plant, followed by the subsequent establishment and spread has resulted in the presence of the species in 116 of the ~1018 10 km squares which constitute Ireland (National Biodiversity Data Centre, 2014). It can only assume the future entry of the species via horticultural trade is as a result of trade and consumer ignorance to the potential invasiveness of this species.</p> <p>The climatic and abiotic conditions and habitats necessary for the establishment of <i>R. spectabilis</i> exist in Ireland, with the species presently having a common distribution across the country. The species possesses biological traits which are highly conducive to successful establishment and which may also hamper any future employment of control measures. It has highly adaptive means of reproduction and spread. Competition is not likely to significantly prevent growth and development. Existing management practices, particularly within the forestry sector are likely to aid further establishment.</p> <p><i>R. spectabilis</i> is typically a garden escape, naturalising in conifer, broadleaf and mixed woodland, along hedgerows and river banks, and in park and demesnes (ISI, 2012; Reynolds, 2002). The species has the potential to inhabit a large percentage of the Irish land cover and at present it is most likely that 0%-10% has been colonised by the species. This fast growing species has become common in the wild in a relatively short period of time and it is likely that major difficulties would be encountered in any further efforts to contain the plant. Sprouting from the extensive underground rhizome system is primarily responsible for the rapid growth and development of the plant, especially following disturbance (Jensen <i>et al.</i>, 1995).</p> <p><i>R. spectabilis</i> is considered potentially invasive in Ireland, with possible competitive displacement of native flora, resulting in habitat alteration (National Biodiversity Data Centre, 2014; NOBANIS, 2014). As it forms dense thickets, it may locally inhibit the regeneration of companion plant species, such as native trees in woodland (ISI, 2012). It is not known to have any immediate adverse effect on animal life but disappearance of other native plant species in its immediate area which are host species</p>

Stage 2 - Detailed assessment: Section E - Conclusion

This section requires the assessor to provide a score for the overall risk posed by an organism, taking into account previous answers to entry, establishment, spread and impact questions.

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
				<p>for insects may have an effect on animal life (ISI, 2010). Where established <i>R. spectabilis</i> is likely to displace native <i>Rubus taxa</i>. Structurally it may not affect present habitats other than increasing their vigour.</p> <p>In its native range the plant is sometimes considered a nuisance of commercial forestry and may need to be controlled in order to encourage the growth of other plants (Jensen <i>et al.</i>, 1995). Economic cost would only arise if the species was to become subject to control measures. As the species is already common, eradication may be considered both uneconomic and undesirable. If the species impacts upon the human enterprise, most likely the Irish forestry sector, or the conservation status of protected sites, control measures may be employed and which could come at a major cost. Countryside walks, forest trail and hiking routes may be impeded by the growth and development of <i>R. spectabilis</i>.</p>

Stage 2 - Detailed assessment: Section F – Additional questions

This section is used to gather information about the potential effects of climate change on the risk posed by an organism. It is also an opportunity for the risk assessor to highlight high priority research that could help improve the risk assessment.

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
6.01	What aspects of climate change, if any, are most likely to affect the risk assessment for this organism?	-	MEDIUM	<i>R. spectabilis</i> is largely restricted to the north temperate climate. Future scenarios on climate alteration suggest increases in mean temperature, higher winter rainfall and more intense storm events (Sweeney <i>et al.</i> , 2003). It is unclear as to what effect such change may have on <i>R. spectabilis</i> . A moister climate, given the species preference for damp habitat will likely favour establishment and spread.
6.02	What is the likely timeframe for such changes (5, 10, 15, 20, 50 or 100 years)?	5-100	MEDIUM	Any timeframe during which the Irish climate experiences higher rainfall may be significant to the further spread of the species.
6.03	What aspects of the risk assessment are most likely to change as a result of climate change	-	MEDIUM	Climatic changes in Ireland as a result of climate alteration may require for the risk assessment on the invasiveness of <i>R. spectabilis</i> to reconsider establishment and spread and the species associated impacts to the Irish economy, environment and society.
6.04	If there is any research that would significantly strengthen confidence in the risk assessment, please note this here. If more than one research area is provided, please list in order of priority.	-	MEDIUM	An evaluation of <i>R. spectabilis</i> existing and potential invasiveness in Ireland is required. Modelling of the species potential rate of spread and likely distribution in Ireland would significantly strengthen the confidence in this risk assessment.

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