

Risk Assessment of *Gunnera manicata*

Name of Organism:	<i>Gunnera manicata</i> (Linden ex André) – Brazilian Giant-rhubarb
Objective:	Assess the risks associated with this species in Ireland
Version:	Final 15/09/2014
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Expert reviewer	Bruce Osborne

Stage 1 - Organism Information

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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.

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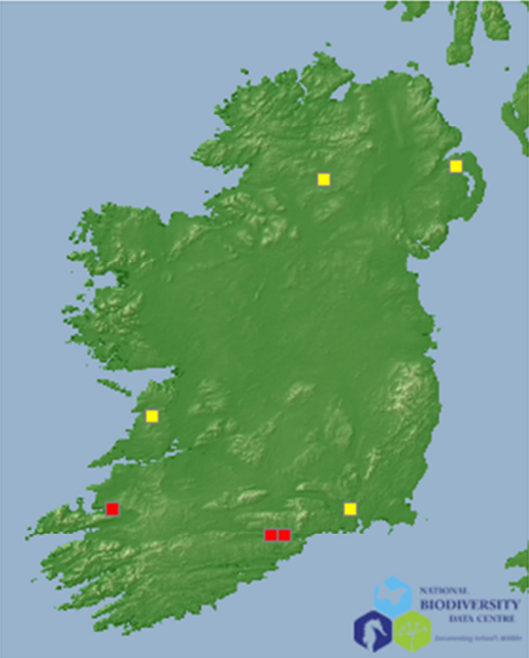
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Stage 1 - Organism Information			
<i>The aim of this section is to gather basic information about the organism.</i>			
N	QUESTION	RESPONSE	COMMENT
1	What is the reason for performing the risk assessment?		A risk assessment is required as this species 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>Gunnera manicata</i> (Linden ex André) – Brazilian Giant-rhubarb Taxonomy: Class: Angiosperm Order: Gunnerales Family: Gunneraceae Subgenus: Panke Genus: Gunnera Species: manicata Synonyms: <i>Gunnera brasiliensis</i> Schind Common names: Brazilian rhubarb, Chilean rhubarb, Giant Gunnera, Giant rhubarb, parasol de los pobres (Spanish), poor man's umbrella (Ecuador) (GISD, 2005; Pilkington, 2011).
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	The taxonomy of this species and the related <i>G. tinctoria</i> is somewhat unclear. The inflorescences are typically rather open in <i>G. manicata</i> and closed in <i>G. tinctoria</i> (club-like) but these visual differences between the two species may be much smaller than often thought. Although it cannot be verified at this time, there may be any intermediate form i.e. both types of inflorescences have been noted on the same plant (Bruce Osborne, per. comm., 19 th March 2014).
4	Describe the organism.	-	<i>Gunnera manicata</i> is a rhizomatous perennial herb. It has inflorescences ≤ 1.2 m, with slender branches >10 cm; petiole ≤ 2 m, with reddish bristles and spines; and leaves often >2 m across, peltate (Stace, 1997). It is difficult to tell <i>G. manicata</i> apart from <i>G. tinctoria</i> ; the spike shape and dimensions prove the most easily distinguishable features (Sheehy Skeffington and Hall, 2011).
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>Gunnera manicata</i> as a "medium risk" invasive species.

Stage 1 - Organism Information			
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N	QUESTION	RESPONSE	COMMENT
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?	-	The origin of <i>G. manicata</i> has been described from both Colombia and Brazil (Wanntorp <i>et al.</i> , 2002). Wanntorp <i>et al.</i> (2002), indicates that the cultivated <i>G. manicata</i> , and that presumed introduced to Ireland, comes from Brazil and that the Colombian <i>G. manicata</i> needs to be re-classified.
8	What is the current global distribution of the organism (excluding Ireland)?	-	Including its native range the species has a current global distribution spanning Australia, Chatham Islands, Germany, Ireland, New Zealand, Switzerland and the United Kingdom (GISD, 2010).
9	What is the current distribution of the organism in Ireland?	-	<i>Gunnera manicata</i> has only recently been reported in Ireland and Sheehy Skeffington and Hall (2011) describe the records of this species as random. The presence of <i>G. manicata</i> in Ireland was suggested to be primarily a result of its planting, while some have presumably arose from discarded rhizomes. The National Biodiversity Data Centre have ten verified recordings of the species; Knochdrumagh, Co. Clare; Skahagh and Kilduff, Tralee, Co. Kerry; Stancully Quay and Dromana Bridge, Co. Waterford; Campile, New Ross, Co. Wexford; Omagh, Co. Tyrone and Belfast, Co. Down (Figure 1; National Biodiversity Data Centre, 2014). Sheehy Skeffington and Hall (2011), during their study of <i>Gunnera</i> spp. in north west Connemara, confirmed four recordings of <i>G. manicata</i> ; one at Corr na Mona, either side of the road, one at the side of the Galway Clifden road near Recess, one by a ditch downhill from a garden where it is planted, north of Corr na Mona and a cluster of plants opposite the Lough Inagh Lodge Hotel in the Inagh Valley, which were planted about 20 years ago. Elsewhere in Co. Galway Sheehy Skeffington and Hall (2011) report the presence of one <i>G. manicata</i> at the Doorus Peninsula (the source of the Corr na Mona garden plants), one in the Oughterard (the source of the Lough Inagh Lodge Hotel plants and originally from the Kennedy Arboretum in Wexford) and one in the Ross Lake Hotel grounds, south east of Oughterard.

Stage 1 - Organism Information

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

N	QUESTION	RESPONSE	COMMENT
			 <p>Figure 2. Map showing ten records for <i>Gunnera manicata</i> (Brazilian Giant-rhubarb) per 10km² in Ireland. Colour scale bar shows density of records per 10km² (National Biodiversity Data Centre, 2014).</p>
10	Is the organism known to be invasive anywhere in the world?	UNKNOWN	<p><i>Gunnera manicata</i> is listed on the Global Invasive Species Database (GISD, 2010) but the invasiveness of the species is unknown in many regions (GISD, 2010; Pilkington, 2011). Its similarity to <i>G. tinctoria</i> makes <i>G. manicata</i> a target for monitoring and control, along with <i>G. tinctoria</i>. Perhaps the greatest threat is posed when <i>G. tinctoria</i> is sold under the name <i>G. manicata</i> (GISD, 2010). In New Zealand, giant <i>Gunnera</i> (<i>G. manicata</i>, <i>G. tinctoria</i>), displace culturally important species for the Maori including flax (<i>Phormium tenax</i>) and edible watercress (<i>Lepidium sativum</i>) (Pfeiffer and Voeks, 2008); note that the authors do not differentiate between the two <i>Gunnera</i> spp. The Invasive Species Ireland risk</p>

Stage 1 - Organism Information

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

N	QUESTION	RESPONSE	COMMENT
			assessment and prioritization access database concluded that <i>G. manicata</i> is morphologically very similar to the highly invasive <i>G. tinctoria</i> , however, the populations of <i>G. manicata</i> have not expanded to the levels of <i>G. tinctoria</i> seen in the west of Ireland and elsewhere; the species should be monitored and reported for any expansion in range (ISI, 2014).

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	MEDIUM	There are very few active/future pathways relevant to the entry of <i>G. manicata</i> .
1.02	List <u>significant</u> 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 for use as a popular ornamental garden plant. What's more, its seeds can be purchased over the internet from a range of gardens (Gioria and Osborne, 2013). From gardens to which it is introduced it may spread through accidental transfer of rhizome parts.

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	MEDIUM	The species may be imported for the horticultural trade.
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	Movement of <i>G. manicata</i> along this pathway would be dependent on the level of supply and demand.
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, particular as seed via internet trade
1.06	How likely is the organism to survive during passage along the pathway?	LIKELY	MEDIUM	Likely for the species housing requirements to be catered for by the horticultural trader and subsequent by the gardener.
1.07	How likely is the organism to arrive during the months of the year appropriate for establishment?	LIKELY	MEDIUM	Establishment would be aided by the cultivation of adult plants or seed before the start of the growing season (March-August/September). Experienced gardeners are likely to plant the species at this time.

Pathway 1 – Horticultural trade				
N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
1.08	How likely is the organism to be able to transfer from the pathway to a suitable habitat or host?	LIKELY	MEDIUM	The species is intentionally planted domestically in horticultural habitat i.e. gardens. It has some capacity to spread naturally from where originally planted but most likely spread is as a result of garden discards. The species prefers lowland habitats offering shelter and wet ground, typically in the vicinity of lakes and watercourses and in woodland (Pilkington, 2011), which it is likely to encounter in the Irish landscape (Fossitt, 2000).
1.09	Estimate the overall likelihood of entry into Ireland based on this pathway?	MODERATELY LIKELY	MEDIUM	<i>Gunnera manicata (and G. tinctoria)</i> is one of the most popular architectural garden plants, promoted for use around ponds and in damp areas (GISD, 2005, 2010) and received the Award of Garden Merit in 2006 by the Royal Horticultural Society (Giora and Osborne, 2013; Pilkington, 2011). It is moderately likely for the species to be sourced through the horticultural trade and planted domestically in horticultural habitat i.e. gardens.
1.10	Do other pathways need to be considered?	NO	MEDIUM	

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).	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')	NO	MEDIUM	The species has a scattered population across Ireland (refer to Question 9) and most of the records relate to deliberate planting or discarded plants/rhizomes. It is suggested the both in Ireland and in Britain that <i>G. manicata</i> requires confirmation as a distinct species from <i>G. tinctoria</i> (refer to Question 3).
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?	LIKELY	LOW	<i>Gunnera manicata</i> is able to grow in a wide range of climates and soil conditions (GISD, 2010). Climates and habitats occupied are likely to be similar to <i>G. tinctoria</i> (Wanntorp <i>et al.</i> , 2002)
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?	LIKELY	MEDIUM	It is likely that the species could establish in Ireland due to the similarities with <i>G. tinctoria</i> , which is established in the west and has a scattered distribution elsewhere across the country.
2.04	How likely is the organism to encounter habitats necessary for the survival, development and multiplication of the organism in Ireland?	LIKELY	LOW	The species prefers lowland habitats offering shelter and wet ground, typically in the vicinity of lakes and watercourses and in woodland (Pilkington, 2011), which it is likely to encounter in the Irish landscape (Fossitt, 2000).
2.05	How likely is it that establishment will occur despite competition from existing species in Ireland?	LIKELY	LOW	It has no significant competitors and it quickly outgrows all but the largest gardens and estates (Pilkington, 2011)
2.06	How likely is it that establishment will occur despite predators, parasites or pathogens already present in Ireland?	LIKELY	LOW	It has no significant predators parasites or pathogens (Pilkington 2011)
2.07	How likely is it that establishment will occur despite existing management practices?	N/A	N/A	There are no existing management practices for the control of <i>G. manicata</i> .
2.08	How likely is it that management practices in Ireland will facilitate the establishment of the organism?	LIKELY	LOW	Management activities are likely to aid the establishment of the species; with garden discards the most likely cause of establishment and spread.
2.09	How likely is it that the biological characteristics of the organism would allow it to survive eradication campaigns in Ireland?	N/A	N/A	There are no existing management practices for the control of <i>G. manicata</i> .

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
2.10	How likely is it that the biological characteristics of the organism will facilitate its establishment?	MODERATELY LIKELY	LOW	Although it produces a large amount of seed, which are dispersed via wind, water and birds, seed does not appear to have high germination success i.e. the seed is not viable (Pilkington, 2011). As with <i>G. tinctoria</i> , <i>G. manicata</i> has a symbiotic relationship with nitrogen-fixing cyanobacteria and this may confer an advantage to young plants growing in nitrogen-deficient soils (Pilkington, 2011).
2.11	How likely is it that the organism's capacity to spread will facilitate its establishment?	UNLIKELY	LOW	Unlike <i>G. tinctoria</i> , <i>G. manicata</i> does not set viable seed (Pilkington, 2011). <i>G. manicata</i> appears to spread through accidental transfer of rhizome parts (Sheehy Skeffington and Hall, 2011).
2.12	How likely is it that the organism's adaptability will facilitate its establishment?	MODERATELY LIKELY	LOW	In the species cold weather regions the large leaves die back and the plant overwinters as a dominant rhizome (Pilkington, 2011)
2.13	How likely is it that the organism could establish despite low genetic diversity in the founder population?			There is a paucity of information.
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			There is a paucity of information.
2.15	If the organism does not establish, then how likely is it that transient populations will continue to occur?	LIKELY	LOW	Existing plants would be expected to be long-lived and persist without any reproduction taking place.
2.16	Estimate the overall likelihood of establishment. Mention any key issues in the comments box	MODERATELY LIKELY	LOW	The species' has presumably similar climatic and environmental requirements as <i>G. tinctoria</i> which is established in Ireland. Although it produces a large amount of seed, which are dispersed via wind, water and birds, seed does not appear to have high germination success (Pilkington, 2011). <i>G. manicata</i> appears to spread through accidental or deliberate transfer of rhizome parts (Sheehy Skeffington and Hall, 2011). Garden discards of the most likely cause of establishment and spread.

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%)?	0% - 10%	LOW	The species prefers lowland habitats offering shelter and wet ground, typically in the vicinity of lakes and watercourses and in woodland (Pilkington, 2011), which it is likely to encounter in the Irish landscape (Fossitt, 2000).
3.02	How important is the expected spread of this organism in Ireland by <u>natural</u> means (minimal, minor, moderate, major or massive)?	MINOR	LOW	Spread of the species by natural means is not considered significant relative to human assisted spread (Pilkington, 2011)
3.03	How important is the expected spread of this organism in Ireland by <u>human assistance</u> (minimal, minor, moderate, major or massive)?	MODERATE	LOW	<i>G. manicata</i> appears to spread through accidental/deliberate transfer of rhizome parts (Sheehy Skeffington and Hall, 2011).
3.04	Within Ireland, how difficult would it be to contain the organism (minimal, minor, moderate, major or massive)?	MINOR	LOW	The current lack of manifested invasive traits would allow for containment of the species.
3.05	What proportion (%) of the area in Ireland suitable for establishment, if any, has already been colonised by the organism?	0-10%	LOW	The species has a scattered population across Ireland (refer to Question 9)
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%	LOW	
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	LOW	

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
3.08	In this timeframe, what proportion of the area (including any currently occupied areas) is likely to have been invaded by this organism?	0-10%	LOW	
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.	-	LOW	Lakes, watercourses and damp woodland may be endangered (Pilkington, 2011),
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 .	SLOWLY	LOW	The rate of vegetative spread is slow, making spread and establishment depended on the success of detached rhizomes (Pilkington, 2011).

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
4.01	How great is the economic loss caused by the organism within its global distribution (excluding Ireland), including the cost of any current management?			No knowledge of any economic costs within the species global distribution/there is a paucity of information.
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	N/A	No knowledge of any economic costs to-date in Ireland.
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.	MODERATE	LOW	May block drains and streams, increasing the risk of local flooding when water levels are high (Pilkington, 2011).
4.04	How great have the economic costs of managing this organism been in Ireland from the <u>time of introduction to the present</u> ?	N/A	N/A	No knowledge of any economic costs to-date in Ireland.
4.05	How great is the economic cost of managing this organism likely to be in the <u>future</u> in Ireland?	MODERATE	LOW	May be difficult and costly to eradicate, presenting an economic burden to landowners and organisations charged with its management (Pilkington, 2011).
4.06	How important is environmental harm caused by the organism within its global distribution?	MINOR	LOW	In New Zealand, giant <i>Gunnera</i> (<i>G. manicata</i> , <i>G. tinctoria</i>), displace culturally important species for the Maori including flax (<i>Phormium tenax</i>) and edible watercress (<i>Lepidium sativum</i>) (Pfeiffer and Voeks, 2008); note that the authors do not differentiate between the two <i>Gunnera</i> spp.
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	N/A	N/A	No knowledge of any impact of the organism on biodiversity to-date in Ireland.
4.08	How important is the impact of the organism on biodiversity likely to be in the <u>future</u> in Ireland?	MINOR	LOW	The large leaves of the plant prevent other species from growing beneath them and colonies can reduce natural biodiversity and alter ecosystems (Pilkington, 2011). Refer also to Question 4.06.

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

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
4.09	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	N/A	N/A	No knowledge of any alteration of ecosystem function caused by the organism to-date in Ireland.
4.10	How important is alteration of ecosystem function caused by the organism likely to be in Ireland in the <u>future</u> ?			There is a paucity of information.
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.	N/A	N/A	No knowledge of a decline in conservation status caused by <i>G. manicata</i> in Ireland to-date.
4.12	How important is decline in conservation status caused by the organism likely to be in the <u>future</u> in Ireland?			There is a paucity of information.
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?	MINOR	LOW	In winter, the large prostrate brown rhizomes are exposed and look unsightly and this is compounded when they trap litter (Pilkington, 2011)
4.14	How important is social or human health harm (not directly included in economic and environmental categories) caused by the organism within Ireland?			There is a paucity of information.
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?	MINIMAL	LOW	No confirmed knowledge of the species forming hybrids (Sheehy Skeffington and Hall, 2011, but refer to Question 3.
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)?			There is a paucity of information.

Stage 2 - Detailed assessment: Section D - Impact

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

N	QUESTION	RESPONSE	CONFIDENCE	JUSTIFICATION
4.17	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	LOW	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?	MODERATE	LOW	Species has no significant predators or herbivores (Pilkington, 2011)
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.	-	LOW	Any potential impacts of <i>G. manicata</i> in Ireland are mostly likely to occur in gardens, lakes, watercourses and damp woodland.
4.20	Estimate the overall potential impact of this organism in Ireland. Use the justification box to indicate any key issues.	MINIMAL	LOW	There is a paucity of information to estimate the overall impact of this organism in Ireland.

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	MINIMAL	LOW	<p><i>Gunnera manicata</i> (and <i>G. tinctoria</i>) is one of the most popular architectural garden plants, promoted for use around ponds and in damp areas (GISD, 2005, 2010) and received the Award of Garden Merit in 2006 by the Royal Horticultural Society (Giora and Osborne, 2013; Pilkington, 2011). It is moderately likely for the species to be sourced through the horticultural trade and planted domestically in horticultural habitat i.e. gardens.</p> <p>The species' has similar climatic and environmental requirements as <i>G. tinctoria</i> which is established in Ireland. Although it produces a large amount of seed, which are dispersed via wind, water and birds, seed does not appear to have high germination success (Pilkington, 2011). <i>G. manicata</i> appears to spread through accidental transfer of rhizome parts (Sheehy Skeffington and Hall, 2011). Garden discards of the most likely cause of establishment and spread.</p> <p>The rate of vegetative spread is slow, making spread and establishment depended on the success of detached rhizomes (Pilkington, 2011). The species prefers lowland habitats offering shelter and wet ground, typically in the vicinity of lakes and watercourses and in woodland (Pilkington, 2011), which it is likely to encounter in the Irish landscape (Fossitt, 2000).</p> <p>There is a paucity of information with respect to the economic, environmental and social impact of the species. In New Zealand, giant <i>Gunnera</i> (<i>G. manicata</i> and <i>G. tinctoria</i>), displace culturally important species for the Maori including flax (<i>Phormium tenax</i>) and edible watercress (<i>Lepidium sativum</i>; Pfeiffer and Voeks, 2008); note that the authors do not differentiate between the two <i>Gunnera</i> spp.</p> <p><i>Gunnera manicata</i> is listed on the Global Invasive Species Database (GISD, 2010) but the invasiveness of the species is unknown in many regions (GISD, 2010; Pilkington, 2011). Its similarity to <i>G. tinctoria</i> makes <i>G. manicata</i> a target for monitoring and control, along with <i>G. tinctoria</i>. Perhaps, the greatest threat is posed when <i>G. tinctoria</i>, a known invasive species, is sold under the name <i>G. manicata</i> (GISD, 2010).</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?	-	LOW	<i>Gunnera manicata</i> is able to grow in a wide range of climates (GISD, 2010). Unlike <i>G. tinctoria</i> , which has established a stronghold in the west of Ireland, reflecting a very strong preference for the climatic conditions of this region, <i>G. manicata</i> has only recently been reported in the wild in Ireland; it has a random distribution; and little is known with respect to the species potential invasiveness. Modelling projections of Fennell <i>et al.</i> (2013) indicate that habitat availability may have a greater impact on spread of <i>G. tinctoria</i> than climate change and this may also be an important consideration for <i>G. manicata</i> . It is not possible at this time to make an assessment of what aspects of climate change, if any, are likely to affect the risk assessment for <i>G. manicata</i> .
6.02	What is the likely timeframe for such changes (5, 10, 15, 20, 50 or 100 years)?	100	LOW	As <i>G. manicata</i> has only recently been reported in the wild in Ireland and little is known with respect to the species potential invasiveness, a long timeframe for any potential changes to the status of the species due to climate change would be expected.
6.03	What aspects of the risk assessment are most likely to change as a result of climate change	-		Refer to Question 6.01
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.	-	LOW	There needs to be a proper taxonomic (molecular) assessment of a range of introduced and cultivated <i>G. manicata</i> to confirm the initial records. Given the similar morphology and ecology of <i>G. tinctoria</i> and <i>G. manicata</i> there is a real need to identify, through comparative studies, what makes <i>G. tinctoria</i> invasive whilst <i>G. manicata</i> has a more restricted distribution.

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