Information about GB Non-native Species Risk Assessments

The Convention on Biological Diversity (CBD) emphasises the need for a precautionary approach towards non-native species where there is often a lack of firm scientific evidence. It also strongly promotes the use of good quality risk assessment to help underpin this approach. The GB risk analysis mechanism has been developed to help facilitate such an approach in Great Britain. It complies with the CBD and reflects standards used by other schemes such as the Intergovernmental Panel on Climate Change, European Plant Protection Organisation and European Food Safety Authority to ensure good practice.

Risk assessments, along with other information, are used to help support decision making in Great Britain. They do not in themselves determine government policy.

The Non-native Species Secretariat (NNSS) manages the risk analysis process on behalf of the GB Programme Board for Non-native Species. Risk assessments are carried out by independent experts from a range of organisations. As part of the risk analysis process risk assessments are:

- Completed using a consistent risk assessment template to ensure that the full range of issues recognised in international standards are addressed.
- Drafted by an independent expert on the species and peer reviewed by a different expert.
- Approved by an independent risk analysis panel (known as the Non-native Species Risk Analysis Panel or NNRAP) only when they are satisfied the assessment is fit-for-purpose.
- Approved for publication by the GB Programme Board for Non-native Species.
- Placed on the GB Non-native Species Secretariat (NNSS) website for a three month period of public comment.
- Finalised by the risk assessor to the satisfaction of the NNRAP.

To find out more about the risk analysis mechanism go to: www.nonnativespecies.org

Common misconceptions about risk assessments

To address a number of common misconceptions about non-native species risk assessments, the following points should be noted:

- Risk assessments consider only the risks posed by a species. They do not consider the practicalities, impacts or other issues relating to the management of the species. They therefore cannot on their own be used to determine what, if any, management response should be undertaken.
- Risk assessments are about negative impacts and are not meant to consider positive impacts that may also occur. The positive impacts would be considered as part of an overall policy decision.
- Risk assessments are advisory and therefore part of the suite of information on which policy decisions are based.
- Completed risk assessments are not final and absolute. Substantive new scientific evidence may prompt a re-evaluation of the risks and/or a change of policy.

Period for comment

Draft risk assessments are available for a period of three months from the date of posting on the NNSS website*. During this time stakeholders are invited to comment on the scientific evidence which underpins the assessments or provide information on other relevant evidence or research that may be available. Relevant comments are collated by the NNSS and sent to the risk assessor. The assessor reviews the comments and, if necessary, amends the risk assessment. The final risk assessment is then checked and approved by the NNRAP.

*risk assessments are posted online at:
https://secure.fera.defra.gov.uk/nonnativespecies/index.cfm?sectionid=51
comments should be emailed to nnss@fera.gsi.gov.uk

GB NON-NATIVE ORGANISM RISK ASSESSMENT SCHEME

For more information visit: www.nonnativespecies.org

	Name of Organism:	**North American bullfrog - *Rana catesbeiana***	
	Objectives:	Assess the risks associated with this species in GB	
	Version:	FINAL 30/03/11	
N	**QUESTION**	**RESPONSE**	**COMMENT**
1	What is the reason for performing the Risk Assessment?		Request from GB Programme Board
2	What is the Risk Assessment area?	GB	
3	Does a relevant earlier Risk Assessment exist?	NO OR UNKNOWN (Go to 5)	
4	If there is an earlier Risk Assessment is it still entirely valid, or only partly valid?		
A	**Stage 2: Organism Risk Assessment SECTION A: Organism Screening**		
5	Identify the Organism. Is the organism clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank?	YES (Give the full name & Go to 7)	North American bullfrog *Rana catesbeiana* Shaw, 1802. Synonym: *Lithobates catesbeianus* (Shaw, 1802). Taxonomic reference: Amphibian Species of the World Online reference, v5 [URL: http://research.amnh.org/herpetology/amphibia/index.php]. Important practical note: this species may be confused with the pig frog *Rana grylio,* which looks very similar, overlaps in natural range, and may occur in trade misattributed as *R. catesbeiana* .
6	If not a single taxonomic entity, can it be redefined?		
7	Is the organism in its present range known to be invasive, i.e. to threaten species, habitats or ecosystems?	YES (Go to 9)	
8	Does the organism have intrinsic attributes that indicate that it could be invasive, i.e. threaten species, habitats or ecosystems?		
9	Does the organism occur outside effective containment in the Risk Assessment area?	YES (Go to 10)	Currently (June 2009) known only from one UK site, in south Essex. Frequent reports of populations elsewhere in England, very occasional single animals found, but no further confirmed breeding populations. Previously one further population in Kent, now presumed eradicated since *c.* 2005 (though surveillance continues to ensure no further animals). Patchy records on one further breeding attempt in Hampshire in 1990s, now extinct.
10	Is the organism widely distributed in the Risk Assessment area?	NO (Go to 11)	
11	Does at least one species (for herbivores, predators and parasites) or suitable habitat vital for the survival, development and multiplication of the organism occur in the Risk Assessment area, in the open, in protected conditions or both?	YES (Go to 12)	This species is primarily aquatic, preferring large water bodies (permanent water bodies required for breeding), but utilising small streams when these are lacking (Conant & Collins, 1998). Such habitat is common in the risk assessment area.
12	Does the organism require another species for critical stages in its life cycle such as growth (e.g. root symbionts), reproduction (e.g. pollinators; egg incubators), spread (e.g. seed dispersers) and transmission, (e.g. vectors)?	NO (Go to 14)	
13	Is the other critical species identified in question 12 (or a similar species that may provide a similar function) present in the Risk Assessment area or likely to be introduced? If in doubt, then a separate assessment of the probability of introduction of this species may be needed.		
14	Does the known geographical distribution of the organism include ecoclimatic zones comparable with those of the Risk Assessment area or sufficiently similar for the organism to survive and thrive?	YES (Go to 16)	Natural and introduced range in North America spans a wide latitude e.g. southern Canada to northern Mexico (e.g. Conant & Collins, 1998; Stebbins, 1985). This range includes ecoclimatic zones comparable with those of the Risk Assessment area.
15	Could the organism establish under protected conditions (e.g. glasshouses, aquaculture facilities, terraria, zoological gardens) in the Risk Assessment area?		
16	Has the organism entered and established viable (reproducing) populations in new areas outside its original range, either as a direct or indirect result of man's activities?	YES (Go to 17)	Established in many temperate, tropical and sub-tropical countries, including: Brazil, Canada, Cuba, Dominican Republic, Germany, France, Haiti, Italy, Jamaica, Japan, Netherlands, Puerto Rico, Spain, United Kingdom, western states of USA, Venezuela (e.g. Ficetola, Coïc, Detaint, Berroneau, Lorvelec, & Miaud, 2007; Ficetola, Thuiller & Miaud, 2007; Banks, Foster, Langton & Morgan, 2000; Veenvliet & Veenvliet 2002; Fisher & Garner, in press; Doubledee, Muller & Nisbet, 2003; Govindarajulu, 2004; Li, Wu & Duncan, 2006).

17	Can the organism spread rapidly by natural means or by human assistance?	YES (Go to 18)	Natural dispersal is rapid in comparison with other amphibians (individual movements of > 3km). Global spread has been rapid due to human assistance (e.g. Baker, 1999).
18	Could the organism as such, or acting as a vector, cause economic, environmental or social harm in the Risk Assessment area?	YES OR UNCERTAIN (Go to 19)	Environmental harm possible, through predation of, and competition with, native species and spread of disease.
19	This organism could present a risk to the Risk Assessment area and a detailed risk assessment is appropriate.	Detailed Risk Assessment Appropriate GO TO SECTION B	
20	This organism is not likely to be a harmful non-native organism in the Risk Assessment area and the assessment can stop.		

B	SECTION B: Detailed assessment of an organism's probability of entry, establishment and spread and the magnitude of the economic, environmental and social consequences			
	Probability of Entry	**RESPONSE**	**UNCERTAINTY**	**COMMENT**
1.1	List the pathways that the organism could be carried on. How many relevant pathways can the organism be carried on?	many - 3	LOW - 0	This species is known to be capable of being introduced via: (1) release or escape from captive amphibian collections (including zoo and trade premises); (2) translocation from other wild population; (3) inadvertent importation with freshwater fish (Ficetola, Coïc, Detaint, Berroneau, Lorvelec, & Miaud, 2007; Detaint & Coïc, 2006). RA codes: "1. Transported commodities/international freight; 14. Pets, collection and domestic animals (escape/release)."
1.2	Choose one pathway from the list of pathways selected in 1.1 to begin the pathway assessments.			Pathway chosen: release or escape from captive amphibian collection. Reason for choice: recorded introductions in Europe seem to be mostly through this pathway, or via small scale translocations from wild populations for which similar issues arise (Ficetola *et al.* 2007).
1.3	How likely is the organism to be associated with the pathway at origin?	moderately likely - 2	MEDIUM -1	This species is infrequently kept in collections. Escapes and releases are infrequent relative to the sum total of amphibians (of all species) in captive collections.
1.4	Is the concentration of the organism on the pathway at origin likely to be high?	moderately likely - 2	MEDIUM -1	In general concentration likely to be low - but it is suspected that in two cases of populations establishing in the Risk Assessment area that concentrations were high.
1.5	How likely is the organism to survive existing cultivation or commercial practices?	likely - 3	LOW - 0	This species is robust and can tolerate a range of conditions.
1.6	How likely is the organism to survive or remain undetected by existing measures?	likely - 3	MEDIUM -1	Detection is not applicable to this pathway.
1.7	How likely is the organism to survive during transport /storage?	likely - 3	LOW - 0	This species is robust and can tolerate a range of conditions.
1.8	How likely is the organism to multiply/increase in prevalence during transport /storage?	very unlikely - 0	LOW - 0	Breeding is unlikely to occur or be successful in storage or transport, as specific habitat requirements are not met.
1.9	What is the volume of movement along the pathway?	minor - 1	MEDIUM -1	This species is infrequently kept in collections. Escapes and releases are infrequent relative to the sum total of amphibians in captive collections.
1.10	How frequent is movement along the pathway?	rarely - 1	MEDIUM -1	This species is infrequently kept in collections. Escapes and releases are infrequent relative to the sum total of amphibians in captive collections.
1.11	How widely could the organism be distributed throughout the Risk Assessment area?	widely - 3	LOW - 0	Depending on habitats present, this species has the capacity to disperse over long distances and increase numbers rapidly (Ficetola, Coïc, Detaint, Berroneau, Lorvelec, & Miaud, 2007; Ficetola, Thuiller & Miaud, 2007; Govindarajulu, 2004; Kupferberg, 1997).
1.12	How likely is the organism to arrive during the months of the year most appropriate for establishment ?	moderately likely - 2	MEDIUM -1	
1.13	How likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) or other material with which the organism is associated to aid transfer to a suitable habitat?	N/A		
1.14	How likely is the organism to be able to transfer from the pathway to a suitable habitat?	moderately likely - 2	LOW - 0	Depends on layout of premises and surrounding habitat, but this species has good dispersal abilities. There is evidence of frequent escapes from captive premises in other countries, although this appears to be rare in GB. It is considered likely that the potential for escape will increase with greater sale and ownership.

	Probability of Establishment	RESPONSE	UNCERTAINTY	COMMENT
1.15	How similar are the climatic conditions that would affect establishment in the Risk Assessment area and in the area of current distribution?	moderately similar - 2	LOW - 0	The natural range of this species includes a broad latitudinal range, and the species is also subject to varying local climatic conditions. It is known that the species can survive well in the UK (breeding, dispersal, feeding and hibernation all possible) (Banks, Foster, Langton & Morgan, 2000).
1.16	How similar are other abiotic factors that would affect establishment in the Risk Assessment area and in the area of present distribution?	moderately similar - 2	LOW - 0	This species is highly aquatic, and the waterbody types present in the Risk Assessment area share many broad similarities with those in the natural range of the species. One notable difference is that typical waterbody size tends to be smaller in the RA area; however, this has not prevented establishment as the species can occupy ponds of varying sizes.
1.17	How many species (for herbivores, predators and parasites) or suitable habitats vital for the survival, development and multiplication of the organism species are present in the Risk Assessment area? Specify the species or habitats and indicate the number.	very many - 4	LOW - 0	Main suitable habitats are medium-large waterbodies, ditches or streams used for breeding; these are present in abundance in RA area. There are many species suitable as prey for *R.catesbeiana* present in the RA area. Diet species include algae and pond microinvertebrates (for larvae), and invertebrates, amphibians, reptiles and mammals (for post-metamorphic stages). All of these are present, and locally abundant, in RA area.
1.18	How widespread are the species (for herbivores, predators and parasites) or suitable habitats vital for the survival, development and multiplication of the organism in the Risk Assessment area?	widespread - 4	LOW - 0	*R. catesbeiana* is a generalist predator and does not have highly specific habitat requirements, aside from permanent water bodies to allow metamorphosis. The species and habitats it requires to persist are widespread in the RA area.
1.19	If the organism requires another species for critical stages in its life cycle then how likely is the organism to become associated with such species in the risk assessment area?	N/A	LOW - 0	*R. catesbeiana* is not dependent on any particular species.
1.20	How likely is it that establishment will not be prevented by competition from existing species in the Risk Assessment area?	very likely - 4	LOW - 0	Interspecific competition for prey and other resources is unlikely to disadvantage *R. catesbeiana* . It is most probably a superior competitor to the native amphibians. Competition with non-amphibian species is unlikely to be significant or limiting (Ficetola, Thuiller & Miaud, 2007; Govindarajulu, 2004; Kupferberg, 1997; Kiesecker, Blaustein & Miller, 2001; Pearl, Adams, Bury, & McCreary, 2004).
1.21	How likely is it that establishment will not be prevented by natural enemies already present in the Risk Assessment area?	very likely - 4	LOW - 0	Predation on *R. catesbeiana* in the RA area is likely to be minimal. Larvae are unpalatable to most vertebrate predators and can have unusually high survival rates in the RA area. Post-metamorphic stages have effective predator avoidance behaviours. Low-level predation by grey herons *Ardea cinerea* has been observed in RA area, but this is unlikely to prevent establishment except possibly where very low numbers of founders are involved.
1.22	If there are differences in man's management of the environment/habitat in the Risk Assessment area from that in the area of present distribution, are they likely to aid establishment? (specify)	N/A	MEDIUM -1	Difficult to generalise as the current natural range includes a vast area encompassing many different management practices. However, broadly there are probably few significant differences.
1.23	How likely is it that existing control or husbandry measures will fail to prevent establishment of the organism?	likely - 3	LOW - 0	Some control measures are effective, but there is still concern as to the level of security.
1.24	How often has the organism been recorded in protected conditions, e.g. glasshouses, elsewhere?	rare - 1	MEDIUM -1	Sometimes kept in private or public animal collections.
1.25	How likely is the reproductive strategy of the organism and duration of its life cycle to aid establishment?	very likely - 4	LOW - 0	*R. catesbeiana* is one of the most fecund amphibian species, with each female capable of laying up to *c.* 30,000 eggs per season. In favourable conditions females can lay multiple clutches in a given season. Egg masses can be difficult to locate. Larval survival can be high in the absence of certain invertebrate predators.
1.26	How likely is it that the organism's capacity to spread will aid establishment?	likely - 3	LOW - 0	Dispersal can be considerable, with rapid individual movements >3km recorded. Point source introductions in RA area show that some dispersal to nearby sites may occur, probably aided by stream corridors. Successful establishment following translocation by humans is known in continental Europe and other non-range areas (Ficetola, Coïc, Detaint, Berroneau, Lorvelec, & Miaud, 2007; Ficetola, Thuiller & Miaud, 2007).
1.27	How adaptable is the organism?	very adaptable - 4	LOW - 0	Species is known to thrive in a wide range of habitats (natural, semi-natural and highly artificial) and climatic conditions. Polymorphisms not well investigated in this species, but in any case of no significance to establishment.
1.28	How likely is it that low genetic diversity in the founder population of the organism will not prevent establishment?	likely - 3	MEDIUM -1	Low genetic diversity does not appear to be related to probability of establishment for this species. Farmed bullfrogs, likely to have reduced genetic diversity, are still capable of wild population establishment.
1.29	How often has the organism entered and established in new areas outside its original range as a result of man's activities?	very many - 4	LOW - 0	Recorded from many temperate, tropical and sub-tropical countries, including: Brazil, Canada, Cuba, Dominican Republic, Germany, France, Haiti, Italy, Jamaica, Japan, Netherlands, Puerto Rico, Spain, United Kingdom, Venezuela and the western states of the US, including Hawaii (e.g. Ficetola, Coïc, Detaint, Berroneau, Lorvelec, & Miaud, 2007; Ficetola, Thuiller & Miaud, 2007; Banks, Foster, Langton & Morgan, 2000; Veenvliet & Veenvliet 2002; Fisher & Garner, in press; Doubledee, Muller & Nisbet, 2003; Govindarajulu, 2004; Li, Wu & Duncan, 2006).
1.30	How likely is it that the organism could survive eradication campaigns in the Risk Assessment area?	moderately likely - 2	LOW - 0	Experience shows that - using currently understood methods - eradication is only practically possible when detected at early stages of population establishment, or when dispersal is strictly limited (Adams & Pearl, 2007; Banks, Foster, Langton & Morgan, 2000; Detaint & Coïc, 2006; Doubledee, Muller & Nisbet 2003; Govindarajulu, Altwegg & Anholt, 2005).

1.31	Even if permanent establishment of the organism is unlikely, how likely is it that transient populations will be maintained in the Risk Assessment area through natural migration or entry through man's activities (including intentional release into the outdoor environment)?	moderately likely - 2	HIGH -2	Some inadvertent releases may occur through accidental import and subsequent poor captive control.

	Spread	RESPONSE	UNCERTAINTY	COMMENT
2.1	How rapidly is the organism liable to spread in the Risk Assessment area by natural means?	rapid - 3	LOW - 0	Evidence from other non-range states indicates spread may be rapid. E.g. in SW France the species is now distributed over *c.* 2000 km sq following initial introduction in 1960s (Detaint & Coïc, 2006; Ficetola, Coïc, Detaint, Berroneau, Lorvelec, & Miaud, 2007; Ficetola, Thuiller & Miaud, 2007).
2.2	How rapidly is the organism liable to spread in the Risk Assessment area by human assistance?	rapid - 3	LOW - 0	Evidence in other non-range states indicates that translocation by humans often complements natural spread. The species is often seen as charismatic and may be subject to collection and release by interested members of the public, or may be spread unintentionally (Ficetola, Coïc, Detaint, Berroneau, Lorvelec, & Miaud, 2007).
2.3	How difficult would it be to contain the organism within the Risk Assessment area?	very difficult - 4	LOW - 0	Long-term containment unlikely, impractical and very costly. Only likely to be possible in very limited circumstances, e.g. in a highly fragmented habitat with few suitable waterbodies present.
2.4	Based on the answers to questions on the potential for establishment and spread define the area endangered by the organism.		MEDIUM -1	Lowland UK where there are medium-large waterbodies and few barriers to dispersal. This will cover much of the UK outside upland areas, coastal strips and heavily urbanised areas. The expanding range of this species in broadly comparable areas in France and western North America provides some evidence for this (Detaint & Coïc, 2006; Adams & Pearl, 2007).

	Impacts	RESPONSE	UNCERTAINTY	COMMENT
2.5	How important is economic loss caused by the organism within its existing geographic range?	minimal - 0	MEDIUM -1	Unclear what the economic impact of establishment is. Possible that the species may interfere with fishing and aquaculture activities. Direct effects on agriculture (crop yield etc) are unlikely.
2.6	Considering the ecological conditions in the Risk Assessment area, how serious is the direct negative economic effect of the organism, e.g. on crop yield and/or quality, livestock health and production, likely to be? (describe) in the Risk Assessment area, how serious is the direct negative economic effect of the organism, e.g. on crop yield and/or quality, likely to be?	minimal - 0	MEDIUM -1	
2.7	How great a loss in producer profits is the organism likely to cause due to changes in production costs, yields, etc., in the Risk Assessment area?	minimal - 0	LOW - 0	
2.8	How great a reduction in consumer demand is the organism likely to cause in the Risk Assessment area?	minimal - 0	LOW - 0	
2.9	How likely is the presence of the organism in the Risk Assessment area to cause losses in export markets?	very unlikely - 0	LOW - 0	
2.10	How important would other economic costs resulting from introduction be? (specify)	minor - 1	MEDIUM -1	Costs would accrue from survey and control efforts.
2.11	How important is environmental harm caused by the organism within its existing geographic range?	minimal - 0	MEDIUM -1	
2.12	How important is environmental harm likely to be in the Risk Assessment area?	major - 3	LOW - 0	Concern relates to harm through predation, competition and disease transmission. This may result in reduction, displacement or elimination of native species, including those of conservation importance (Adams & Pearl, 2007; Kupferberg, 1997; Cunningham, Garner, Aguilar-Sanchez, Banks, Foster, Sainsbury, Perkins, Walker, Hyatt & Fisher, 2005; Doubledee, Muller & Nisbet 2003; Govindarajulu, Altwegg & Anholt, 2005; Fisher & Garner, in press; Garner, Perkins, Govindarajulu, Seglie, Walker, Cunningham & Fisher, 2006; Hanselmann, Rodriguez, Lampo, Fajardo-Ramos, Aguirre, Kilpatrick, Rodriguez & Daszak, 2004; Kiesecker, Blaustein & Miller, 2001; Mazzoni, Cunningham, Daszak, Apolo, Perdomo & Speranza, 2003; Pearl, Adams, Bury & McCreary 2004).
2.13	How important is social and other harm caused by the organism within its existing geographic range?	minimal - 0	LOW - 0	
2.14	How important is the social harm likely to be in the Risk Assessment area?	minor - 1	HIGH -2	Possible that people would be concerned by presence of large numbers of invasive frogs (indeed evidence at two UK establishment sites is that local people are worried about the sudden appearance of bullfrogs). Some annoyance or disturbance may be caused by male vocalisations in summer (Foster, pers obs).
2.15	How likely is it that genetic traits can be carried to native species, modifying their genetic nature and making their economic, environmental or social effects more serious?	very unlikely - 0	LOW - 0	*R. catesbeiana* would not breed successfully with native species.
2.16	How probable is it that natural enemies, already present in the Risk Assessment area, will have no affect on populations of the organism if introduced?	likely - 3	LOW - 0	See response to 1.21.
2.17	How easily can the organism be controlled?	difficult - 3	LOW - 0	Extremely difficult to control unless initiated at very early stage of establishment (Ficetola, Thuiller & Miaud, 2007; Banks, Foster, Langton & Morgan, 2000).
2.18	How likely are control measures to disrupt existing biological or integrated systems for control of other organisms?	very unlikely - 0	MEDIUM -1	
2.19	How likely is the organism to act as food, a host, a symbiont or a vector for other damaging organisms?	very likely - 4	LOW - 0	Known to be a vector of *Batrachochytrium dendrobatidis*, the causative agent for chytridiomycosis, a potentially catastrophic fungal disease of amphibians. *R. catesbeiana* appears to be an asymptomatic carrier for the chytrid fungus, and has been implicated in its spread in several countries (See refs for 2.12, esp. Fisher & Garner, in press).
2.20	Highlight those parts of the endangered area where economic, environmental and social impacts are most likely to occur			Impacts most likely to be severe in areas of the UK where there are high densities of medium-large sized water bodies and streams, within or close to areas designated for their importance for amphibian and other wetland biodiversity. Impossible to list here as there are numerous such areas across lowland UK outside major urban centres. Areas subject to economic and social impacts are unknown or unlikely (Ficetola, Thuiller & Miaud, 2007; Banks, Foster, Langton & Morgan, 2000).

Summarise Entry	moderately likely - 2	HIGH -2	Entry is only moderately likely as importing this species into Europe has been prohibited since 1997. However, movement/trade within the EU is legal. The species still occurs in at least one wild population in the Risk Assessment area, and occurs in large numbers in other EU member states, from which translocations are possible. The species is occasionally kept in captivity and escapes are possible. The species also occurs in close proximity with fish traded internationally, and unintentional releases may be possible via this pathway. High uncertainty as the exact mechanism for bullfrogs to reach the wild is complex and variable depending on pathway. Pathways in order of importance: (1) release or escape from captive amphibian collections (including zoo and trade premises); (2) translocation from other wild population; (3) inadvertent importation of freshwater fish.
Summarise Establishment	likely - 3	LOW - 0	Establishment is likely once the species arrives in wild under the following conditions: at least one frog of each sex in founder stock; suitable breeding pond present nearby; low vigilance toward invasive amphibians in the local area. Least likely in areas where there are few ponds, or ponds are very small and fragmented by large areas of built land.
Summarise Spread	rapid - 3	LOW - 0	*R. catesbeiana* is known to spread rapidly when habitat conditions are favourable. Much of lowland UK outside highly urbanised areas could be at risk.
Summarise Impacts	major - 3	LOW - 0	Most important potential environmental impacts are reduction in abundance and diversity of amphibian fauna, and possibly other fauna, through predation, competition and disease transmission. Economic and social harm is likely to be minimal.
Conclusion of the risk assessment	HIGH -2		Entry is only moderately likely as importing this species into Europe has been prohibited since 1997. However, movement/trade within the EU is legal. The species still occurs in at least one wild population in the Risk Assessment area, and occurs in large numbers in other EU member states, from which translocations are possible. The species is occasionally kept in captivity and escapes are possible. The species also occurs in close proximity with fish traded internationally, and unintentional releases may be possible via this pathway. High uncertainty as the exact mechanism for bullfrogs to reach the wild is complex and variable depending on pathway. Pathways in order of importance: (1) release or escape from captive amphibian collections (including zoo and trade premises); (2) translocation from other wild population; (3) inadvertent importation of freshwater fish. Establishment is likely once the species arrives in wild under the following conditions: at least one frog of each sex in founder stock; suitable breeding pond present nearby; low vigilance toward invasive amphibians in the local area. Least likely in areas where there are few ponds, or ponds are very small and fragmented by large areas of built land. *R. catesbeiana* is known to spread rapidly when habitat conditions are favourable. Much of lowland UK outside highly urbanised areas could be at risk. Most important potential environmental impacts are reduction in abundance and diversity of amphibian fauna, and possibly other fauna, through predation, competition and disease transmission. Economic and social harm is likely to be minimal.
Conclusions on Uncertainty		LOW - 0	

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