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	***Eucalyptus glaucescens* - Tingiringi Gum**
	Objectives:	Assess the risks associated with this species in GB
	Version:	Original draft 26/09/11
	Author:	Bryan Dickinson
	Suggested citation:	Dickinson, B. (2011). GB Non-native Organism Risk Assessment for *Eucalyptus glaucescens* . www.nonnativespecies.org

N	QUESTION	RESPONSE	COMMENT
1	What is the reason for performing the Risk Assessment?		Request by the GB Programme Board for Non-native Species. *E. glaucescens* (also known as "Tingiringi Gum") is mainly used as an ornamental shrub / amenity tree or grown for its attractive cut foliage. There is interest in its potential use as a short rotation crop for biomass in GB (Purse 2009).
2	What is the Risk Assessment area?	Great Britain	
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?		
	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)	*Eucalyptus glaucescens* Maiden & Blakely [Crit. revis. Eucalyptus 8:56. 1929]. There is little information on the potential for hybridisation but is known to hybridise with *E. nitens* (Tibbits 2000) and E viminalis (Pryor 1951) and it is closely related to *E gunnii* , so other hybrids may well be possible.
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?	NO or Uncertain (Go to 8)	*E glaucescens* is listed as 'potentially invasive" in Australia (presumably outside its natural range) (FAO 2009) but there seems to be no evidence to show that this species is problematic and it is not currently listed in this database as either invasive or potentially invasive elsewhere.
8	Does the organism have intrinsic attributes that indicate that it could be invasive, i.e. threaten species, habitats or ecosystems?	YES or UNCERTAIN (Go to 9)	Mature trees can produce large quantities of viable seed, though fruiting capsules may need to be ripened artificially (Jungleseeds 2009). Seed is fairly small (210 - 260 per gram, (National Herbarium of NSW, Royston Petrie Seeds, Forestart, UK 2009) and numerous, and presumably liable to some wind dispersal. It can show rapid growth and can tolerate coppicing by further growth from lignotubers (Murphy et al 1999). E glaucescens is originally from upland areas of Victoria and New South Wales, Australia (George, A.S. ed. 1980), areas with similar climatic conditions to parts of GB. However, although mature trees are considered frost tolerant (CABI 2005), some growers in GB have found them somewhat sensitive and it is likely that frost hardiness is very variable between seed provenances. In GB, planting has been intentional and to date there is no indication that natural regeneration is a significant problem. There is no indication that it would not be susceptible to standard herbicides if control was needed.
9	Does the organism occur outside effective containment in the Risk Assessment area?	NO (Go to 11)	
10	Is the organism widely distributed in the Risk Assessment area?		
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)	E. glaucescens is currently grown in controlled areas in several regions of GB, as an amenity tree or plantation crop in GB and appears to survive well.
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)?	YES (Go to 13)	Most eucalypts require generalist pollinators, e.g. bees and other insects (Free 1993). For Eucalypts in general, growth is improved by the presence of microrrhizal fungi, but not essential. (CABI 2005)
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.	YES (Go to 14)	Suitable pollinators are present in GB.
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)	Yes, the climate of its native area (the high mountain country of the Great Dividing Range in south-eastern New South Wales and in eastern Victoria, Australia) and other areas where it is now grown (e.g. Pacific northwest USA, New Zealand) is somewhat comparable to parts of GB.

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)	The species is intentionally planted and grown to maturity when viable seed is produced. However, there is little information on successful self-seeding of E. glaucescens, and natural regeneration outside controlled areas is considered unlikely.
17	Can the organism spread rapidly by natural means or by human assistance?	NO (Go to 20)	Natural seed spread from parent trees is likely to be slow and conditions for natural regeneration limited. However, intentional planting in commercial plantations could increase rapidly.
18	Could the organism as such, or acting as a vector, cause economic, environmental or social harm in the Risk Assessment area?		There are some indications that rapid water loss may cause a lowering of local water tables, and a build up of leaf litter could increase fire risk. Potentially, biodiversity could be reduced where large volumes are planted in monocultures.
19	This organism could present a risk to the Risk Assessment area and a detailed risk assessment is appropriate.		
20	This organism is not likely to be a harmful non-native organism in the Risk Assessment area and the assessment can stop.	Detailed Risk Assessment Not Appropriate - STOP	A full risk assessment has been requested by the GB Programme Board and so Section B is also completed.

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?	few - 1	LOW - 0	This species has already entered GB and is widely established as an ornamental garden tree and in trial plantations. Entry pathway is by intentional importation of seed by seed merchants, nurseries, garden centres, research organisations and individuals. Most imported seed is from Australia or USA, though small amounts of seed for sale is becoming available from trees grown in GB. (e.g. Jungle Seeds). Some cell-grown planting stock is also imported from within the EU (mainly Holland, Spain & Portugal (Purse, J. 2009).
1.2	Choose one pathway from the list of pathways selected in 1.1 to begin the pathway assessments.			Importation of seed through horticultural trade channels and direct online sales.
1.3	How likely is the organism to be associated with the pathway at origin?			Not required. Deliberate introduction.
1.4	Is the concentration of the organism on the pathway at origin likely to be high?			Not required. Deliberate introduction.
1.5	How likely is the organism to survive existing cultivation or commercial practices?			Not required. Deliberate introduction.
1.6	How likely is the organism to survive or remain undetected by existing measures?			Not required. Deliberate introduction.
1.7	How likely is the organism to survive during transport /storage?			Not required. Deliberate introduction.
1.8	How likely is the organism to multiply/increase in prevalence during transport /storage?			Not required. Deliberate introduction.
1.9	What is the volume of movement along the pathway?	minor - 1	MEDIUM -1	Small quantities of seed are likely to be imported each year as few companies appear to be involved in re-selling seed or growing-on. This may change in the future if there is commercial interest in establishing short-rotation forestry plantations with this species..
1.10	How frequent is movement along the pathway?	occasionally - 2	HIGH -2	Probably imports are fairly regular, but no precise information is available. Online purchase of seed from Australia seems to be available throughout the year.
1.11	How widely could the organism be distributed throughout the Risk Assessment area?	very widely - 4	LOW - 0	Companies importing and re-selling seed are rather few, but well distributed across GB. Most seed is probably purchased on-line either from these companies or directly from Australia. Seed is usually delivered by post and purchasers will be widely distributed across GB.
1.12	How likely is the organism to arrive during the months of the year most appropriate for establishment ?			Not required. Deliberate introduction.
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?			Not required. Deliberate introduction.
1.14	How likely is the organism to be able to transfer from the pathway to a suitable habitat?	unlikely - 1	MEDIUM -1	It is unlikely that E glaucescens will spread rapidly from the intended planting areas. Seed is normally sold in small quantities to be grown under managed conditions in commercial or private nursery areas, usually indoors. Seed germination is erratic (Jungleseeds 2009) and particular conditions suitable for germination are needed (full sunlight, moisture, bare soil, protection from predators and possibly a period of cold stratification) (Krugman & Whitesell 1974, John Purse 2009). Seedlings are delicate and do not tolerate droughting, frosts or competition with other vegetation (Krugman & Whitesell 1974, Bell & Williams 1997, Meskimen & Francis 1990). Mature trees can produce viable seed quite early (from 4-5 years, Celyn Vale 2011) and can produce large quantities of seed, but dispersal away from the parent is likely to be slow (Cremer 1977).

	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?	similar - 3	LOW - 0	The majority of GB apart from the high Pennines and Scottish uplands comes into the USDA plant hardiness categories 8a to 10a (e.g. Trebrown Nursery 31/03/2011), and provides the broad annual rainfall requirements and similar climatic conditions to those required for establishment. E. glaucescens grows well in USDA climatic zones 8a through to 11 (average annual minimum temperature between -12.2 to >4.5 degrees Celsius) (DG informational website 31/03/2011). Some sources indicate that the suitable climatic range may be wider, perhaps down to USDA zone 7 tolerating as low as -15 C, requiring 20 to 60 inches of average yearly rainfall. "This species enjoys Mediterranean climates but also thrives in the Pacific Northwest and England" (Randy Stewart Landscape designs 2011). Eucalyptus glaucescens is amongst the most cold hardy species of the genus. Its distribution lies in the cool to cold humid climatic zone, with icy winter conditions and heavy snowfalls. It occurs naturally in the high mountain country of the Great Dividing Range in south-eastern New South Wales and in eastern Victoria, Australia. This region receives 500-2000mm of precipitation, a dry season lasting between 0-3 months mean maximum temperature of 19-22 deg C, mean minimum temp of -3 to -5 deg C and an absolute minimum of -12 to -7 deg C. (CABI 2005). This is also reflected in the current worldwide distribution of E. glaucescens in temperate regions including: SE Australia, New Zealand, South Africa, the Pacific Northwest of America, western Europe including parts of the mediterranean, Great Britain and Ireland. Some seed suppliers suggest ideal germination conditions of 18 to 20 degrees Celsius. Krugman & Whitesell (1974) state that a pre-germination cold stratification is required, though Doran & Gunn (1978), suggest that no cold stratification is necessary. Growers recommend that seeds are germinated so that seedlings are well-grown enough to deal with the following winters cold conditions. This might mean that warmer areas with a longer growing season (i.e. the south and west of GB) may favour establishment from seed, though this may remain theoretically possible elsewhere.
1.16	How similar are other abiotic factors that would affect establishment in the Risk Assessment area and in the area of present distribution?	similar - 3	LOW - 0	E glaucescens will tolerate most soil types, prefers moist but well-drained conditions (but will tolerate poor drainage) and acid to neutral pH. (Paul MacPherson, Macfoliage). It can also tolerate thin soils (CABI 2005). As such, large areas in GB could provide these conditions.
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.	moderate number - 2	MEDIUM -1	In its native environment in Australia, E glaucescens is found in small fragmented stands growing on sites that are frequently subjected to strong, cold winds, at altitudes above 1000m asl (Kirkpatrick 1976). However, the complete range of suitable habitats where it *might* survive in different circumstances has not been described. In GB it is likely that the majority of habitats that might support the growth of woodland or scrub could be suitable. However, due to the small size of the seed, the seedlings have very small reserves and so are unable to tolerate shade or weedy competition. In order to germinate and establish, Eucalyptus seed need contact with bare mineral soil and sunlight to develop, and the seedlings are delicate and cannot suffer competition with other plants (Krugman & Whitesell 1974, Bell & Williams 1997, Meskimen & Francis 1990). Hence, areas of bare soil where weeds are suppressed (e.g land prepared for agricultural crops, or burnt areas) that are immediately adjacent to large numbers of parent trees could provide the most optimal conditions. In GB these conditions may be relatively uncommon. If E glaucescens is similar to other Eucalypts, then only generalist pollinators are required, of which there are numerous species throughout GB.
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?	frequent - 3	MEDIUM -1	Suitable habitats (potential woodland / scrub) and species vital for multiplication (generalist pollinators) are very widespread in the Risk Assessment area. However, the specific conditions necessary for survival and development within these habitat types (i.e. bare ground with little competition from other vegetation) may be relatively uncommon.
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	very likely - 4	LOW - 0	If like other Eucalypts, then probably only generalist pollinators are required, and these should easily come into contact with this species.
1.20	How likely is it that establishment will not be prevented by competition from existing species in the Risk Assessment area?	moderately likely - 2	MEDIUM -1	Seedlings are vulnerable to shading at the early seedling stage and both germinating seeds and mature trees prefer full sun (Krugman & Whitesell 1974, John Purse 2009).
1.21	How likely is it that establishment will not be prevented by natural enemies already present in the Risk Assessment area?	moderately likely - 2	MEDIUM -1	Seeds may be vulnerable to predation from rodents, birds and insects (Krugman & Whitesell 1974). Like other Eucalypts, mature E. glaucescens may be vulnerable to psyllids, aphids, beetles and mildews but damage is likely to be merely cosmetic. Mature E glaucescens is considered relatively unpalatable to browsing animals. (John Purse 2009)
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)	moderately likely - 2	MEDIUM -1	Outside its native range, E glaucescens is grown either as an ornamental garden tree, in small plantations for foliage, or in experimental trials as a short-rotation biomass crop. In all these situations trees are initially grown from seed in carefully managed conditions (greenhouse or nursery) before being transplanted as a seedling in prepared ground, and with little or no competition with other plants. Herbicides may be used to control weeds around seedlings / saplings in such plantations so there may be potential for unintended growth of E glaucescens on these sites. Artificial burning or weed control in sites adjacent to mature E glaucescens could aid establishment.

1.23	How likely is it that existing control or husbandry measures will fail to prevent establishment of the organism?	unlikely - 1	MEDIUM -1	Natural regeneration of pure E. glaucescens has not been recorded in GB. It is likely that any natural regeneration occurring on recent trial plantation sites would be controlled.
1.24	How often has the organism been recorded in protected conditions, e.g. glasshouses, elsewhere?	frequent - 3	LOW - 0	E glaucescens saplings are available from numerous nurseries (mainly in S England) where it is initially grown under glass. It is still an uncommon garden plant. It is grown in a small number of plantations for its foliage and has recently been planted at several trial sites for biomass, so may become more popular in the future.
1.25	How likely is the reproductive strategy of the organism and duration of its life cycle to aid establishment?	unlikely - 1	MEDIUM -1	There is little information on how easily E. glaucescens hybridises naturally. It can produce seed from age 4-5 years onwards but may not flower heavily and produce quantities of seed until older. When mature, large quantities of fine seed are produced, high numbers of which could germinate when conditions are suitable.
1.26	How likely is it that the organism's capacity to spread will aid establishment?	unlikely - 1	LOW - 0	Current spread is probably mainly through deliberate planting of small numbers of trees in gardens though there is increasing interest in larger scale plantations. Natural spread from these loci is likely to be slow.
1.27	How adaptable is the organism?	moderately adaptable - 2	HIGH -2	If similar to other Eucalypts, then genetic variation is likely to be fairly high, but there is little specific information on the number of geographic races or the ease of natural hybridisation. It will hybridise artificially with E nitens (Tibbits 2000)
1.28	How likely is it that low genetic diversity in the founder population of the organism will not prevent establishment?	moderately likely - 2	HIGH -2	Little information on the extent of genetic variation in its native population.
1.29	How often has the organism entered and established in new areas outside its original range as a result of man's activities?	moderate number - 2	MEDIUM -1	Natural regeneration in GB has not been recorded for E. glaucescens. There appears to be no evidence of natural regeneration in other countries outside Australia. The current worldwide distribution of E. glaucescens through cultivation includes: SE Australia, New Zealand, South Africa, the Pacific Northwest of America, western Europe including Great Britain and Ireland. (Barclay 2004, Krugman & Whitesell 1974, FCS 2009)
1.30	How likely is it that the organism could survive eradication campaigns in the Risk Assessment area?	very unlikely - 0	MEDIUM -1	E glaucescens tolerates coppicing well and is grown to provide a sustainable crop of juvenile foliage. However, there is no evidence to suggest that it would not be vulnerable to standard herbicide treatments.
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)?	likely - 3	LOW - 0	The population of E glaucescens in GB is increasing. At least 12 trial sites researching the usefulness of this species in short rotation forestry have recently been set up in Scotland by Forest Commission Scotland & in England for the Department of Energy & Climate Change (DECC) (FCS 2010). If these trials prove successful it is likely that larger scale deliberate planting and possibly more experimental trials will follow, thereby maintaining populations in GB. As hardier varieties are established sales of seed and small saplings may also increase for use as ornamental garden plants.

	Spread	RESPONSE	UNCERTAINTY	COMMENT
2.1	How rapidly is the organism liable to spread in the Risk Assessment area by natural means?	very slow - 0	MEDIUM -1	Any spread of E glaucescens from the parent trees is likely to be slow. Generally, seed dispersal is limited in the Eucalyptus genus (Potts & Reid 1988), the key agent being wind (Turnbull & Doran 1987). E glaucescens seeds are small (210 - 260 per g) and unwinged (National Herbarium of NSW, Royston Petrie Seeds, Forestart, UK). The seeds would be expected to fall close (less than twice the tree height) to the parent i.e. within <80m (Cremer 1977). Greater drift of seeds might be possible in storm conditions. It is possible that seed could be transported by water either by falling into streams, or in surface water especially in storm events. Dispersal by birds or animals is unlikely: whilst the capsules of some species of Eucalypt have been observed to be eaten by birds, (probably parrots), it is not common and seed is unlikely to survive passage through the gut. (O'Sullivan 2011). The capsules and seed are smooth and are unlikely to be transported accidentally by animals by adhering to hair or skin. This species is considered unpalatable to browsing animals and not damaged by squirrels (Purse, J), though there is no specific information available on the palatability of the seeds or capsules to animals in GB. The seed is fine and unlikely to be cached underground by rodents. Under natural conditions Eucalyptus seed viability falls rapidly after about 2 months and is very low after 12 months (Carey 2002), so even if seed were transported, high volumes are unlikely to build up.
2.2	How rapidly is the organism liable to spread in the Risk Assessment area by human assistance?	intermediate - 2	MEDIUM -1	Recently there has been much interest in using this species for biomass production in 'short rotation forestry' plantations. At present there are at least 6 trial plots in Scotland (Caithness, Aberdeen, Perth, Fife, Lanark & Mull) & 6 in England (Cumbria, South Yorkshire, Lincs, Oxon, Sussex & Devon) (FCS 2010). Should these prove successful, then it is very likely that much larger areas will be planted as commercial crops. However, spread from these sites to unintended areas is likely to be slow.
2.3	How difficult would it be to contain the organism within the Risk Assessment area?	easily - 1	LOW - 0	Trees are easily recognised even when small, and if similar to other Eucalypt species, should be susceptible to herbicides (e.g. Little & Eccles 2000)
2.4	Based on the answers to questions on the potential for establishment and spread define the area endangered by the organism.		MEDIUM -1	Endangered areas are most likely to be unmanaged habitats adjacent to plantations, gardens or nurseries. The seedlings do not thrive well in shade or in competition to other vegetation. Hence, areas of bare soil where weeds are suppressed (e.g prepared areas for forestry and agricultural crops, or possibly recently burnt areas) that are immediately adjacent to large numbers of parent trees could provide the most optimal conditions. Ideal germination conditions may suggest that warmer areas with a longer growing season in the south and west could favour establishment from seed.

	Impacts	RESPONSE	UNCERTAINTY	COMMENT
2.5	How important is economic loss caused by the organism within its existing geographic range?	minimal - 0	MEDIUM -1	Currently, economic losses due to E glaucescens appear to be insignificant.
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?	minor - 1	MEDIUM -1	Any negative economic impacts are likely to be very localised and small. Natural regeneration, should it occur, is likely to be restricted small numbers of individuals in areas adjacent to parent trees. Potential impacts should E glaucescens acquire the ability to establish naturally are likely to be greatest at sites of high conservation or social value should it need to be eradicated. Commercial agriculture may suffer if natural regeneration of E glaucescens occurs on farmland and established trees have to be removed. Commercial forestry may also suffer additional costs when plantations of E glaucescens are to be replaced by other species. It is unlikely that significant cover of E. glaucescens would occur before control would be initiated.
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	MEDIUM -1	Costs of E glaucescens control are not likely to be large. Spread by natural regeneration, should it occur, is likely to be very slow and initially localised to areas adjacent to parent trees. Re-planting on established E glaucescens plantation sites may be difficult and costly, but possibly no more than on other short rotation coppice sites.
2.8	How great a reduction in consumer demand is the organism likely to cause in the Risk Assessment area?	minimal - 0	LOW - 0	Consumer demand is potentially for the woody biomass of E glaucescens, natural regeneration of E glaucescens growing outside commercial plantations is unlikely to have any significant effect.
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	Natural regeneration of E glaucescens unlikely to affect any losses in exports.
2.10	How important would other economic costs resulting from introduction be? (specify)	minimal - 0	MEDIUM -1	Spread by natural regeneration, should it occur, is not expected to create large additional economic costs.
2.11	How important is environmental harm caused by the organism within its existing geographic range?	minor - 1	MEDIUM -1	There is no indication that this species causes environmental harm within its current range. However, large scale planting is relatively new, so little data is so far available.
2.12	How important is environmental harm likely to be in the Risk Assessment area?	minor - 1	MEDIUM -1	In common with other Eucalypt species E glaucescens has the potential for a high level of water loss though transpiration and cause a consequent lowering of the local water table, especially when grown in dense monoculture. Its growth form ('whipstick mallee', Kirkpatrick (1976) i.e. rather undefined coppice-stool branching) could introduce an obstructive tangled habitat structure. Shedding of oil-rich leaves and bark which may not break down immediately could increase fire-risk. Information from trial plantations should help clarify potential issues in the next few years.
2.13	How important is social and other harm caused by the organism within its existing geographic range?	minimal - 0	HIGH -2	No information available on social & other harm outside GB.
2.14	How important is the social harm likely to be in the Risk Assessment area?	minimal - 0	MEDIUM -1	Within GB social & other harm is unlikely to be significant.
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	There are no native Eucalypts in GB.
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?	very likely - 4	MEDIUM -1	No significant natural enemies have been identified in GB.
2.17	How easily can the organism be controlled?	easily - 1	MEDIUM -1	Little information available, but probable that standard herbicides would provide effective control.
2.18	How likely are control measures to disrupt existing biological or integrated systems for control of other organisms?	very unlikely - 0	MEDIUM -1	Herbicide application and /or prolonged severe coppicing of selected individual trees would be involved.
2.19	How likely is the organism to act as food, a host, a symbiont or a vector for other damaging organisms?	moderately likely - 2	HIGH -2	There is some evidence that Eucalypts in general provide a host for certain psyllids and aphids. (e.g. Celyn Vale Nurseries undated, Kerr 2007). Leaf fungi (e.g. Phaeophleospora eucalypti in Australia) and Mildews affecting E glaucescens could potentially affect other species. (MAF 2004). There are also growing examples of host-specific pathogens native to areas where eucalypts have been planted as non-natives, which have undergone sometimes surprising host jumps (Wingfield et al 2008).
2.20	Highlight those parts of the endangered area where economic, environmental and social impacts are most likely to occur		HIGH -2	Should natural regeneration occur in the future, the greatest impact would possibly be on existing plantation sites after removal of mature E glaucescens. Areas of high conservation or social value which are adjacent to plantations of E glaucescens may also be vulnerable. It is possible that warmer sites in the south of GB may favour survival of seedlings, and could suffer through increased fire risk and lowering of local water tables. The most vulnerable sites might be arable, or recently burned areas, immediately adjacent to plantations of E glaucescens.

Summarise Entry	very likely - 4	LOW - 0	E glaucescens seed is currently imported for deliberate planting in GB. Due to increased interest in growing this species for short rotation forestry and cut foliage, imports may well increase. If trials are successful, it is likely that established trees in GB will be used to produce more planting stock. There is also increasing interest in developing hybrids of E. glaucescens for greater frost-hardiness and these hybrids may ultimately be planted in large numbers.
Summarise Establishment	unlikely - 1	HIGH -2	There appears to be no evidence of natural regeneration of E. glaucescens in GB. It is a widespread ornamental garden tree but there is no indication that significant self-seeding has been observed. However, there is interest in developing this species for short-rotation forestry and in the future selected varieties or artificial hybrids involving E.glaucescens may show a greater ability for natural regeneration, so the situation needs to be monitored. Recent forestry trials should provide more data on this.
Summarise Spread	very slow - 0	MEDIUM -1	There is no evidence of any spread of E glaucescens. The potential for spread currently appears small.
Summarise Impacts	minor - 1	MEDIUM -1	Potential impacts should E glaucescens acquire the ability to establish naturally are likely to be greatest at sites of high conservation or social value should it need to be eradicated. Commercial agriculture may suffer if natural regeneration of E glaucescens occurs on farmland adjacent to parent trees. Commercial forestry may also suffer additional costs when plantations of E glaucescens are to be replaced by other species. The most important environmental impacts may loss of biodiversity, increased fire risk and a reduced water table.
Conclusion of the risk assessment	LOW - 0	HIGH -2	This species is probably in the upper level of the 'Low Risk' category, but given the potential for rapid developments in both the volumes that may be grown, and new varieties which could quickly be developed, the situation should be closely monitored. Pure E. glaucescens is currently being grown in GB as an amenity shrub, for cut foliage and as a potential plantation species for short rotation biomass trials. It can produce viable seed but there is little evidence for significant natural regeneration or rapid spread from areas where it is being grown. However, there is interest in identifying frost-tolerant varieties and hybrids of *E. glaucescens* crossed with other Eucalypt species. The potential for invasiveness of these is not yet known and will need to be monitored.
Conclusions on Uncertainty		MEDIUM -1	Information on the natural regeneration of *E. glaucescens* is limited as there are few sites where it has been grown for a long time. Eucalypts in general tend to be highly genetically variable and it is possible that new provenances or hybrids will be rapidly developed and the invasiveness risk of these may need to be assessed.

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