

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		<i>Eucalyptus gunnii</i> - Cider 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 <i>Eucalyptus gunnii</i> 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. <i>E. gunnii</i> (also known as "Cider Gum") is mainly used as an ornamental shrub or amenity tree but there is interest in using this and related Eucalypt species as a short rotation pulp crop for biomass (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)	<i>Eucalyptus gunnii</i> Hook f. 1844, also known as "Cider Gum". Several subspecies are recognised which form part of a continuum between <i>Eucalyptus gunnii</i> and <i>Eucalyptus archeri</i> (Potts 1983). However, these can normally be distinguished by external features. <i>E. gunnii</i> has been shown to form hybrids relatively easily (Potts et al 1987), including with <i>E. nitens</i> (e.g. Tibbits 1989) and possibly <i>E. globulus</i> (Potts & Savva 1989). Recently, trials in France have produced 'Gundal' hybrids between <i>E. gunnii</i> and <i>E. dalrympleana</i> which are used grown clonally for the pulp industry.
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)	<i>E. gunnii</i> , alongside other Eucalypt species is listed on several databases as 'non-aboriginal' (Portugal) or naturalized and 'potentially invasive' (France, Bolivia) (FAO 2009, Yoshioka 2009) but there seems to be no evidence to show that this species is problematic. Abundant regeneration of <i>E. gunnii</i> has been noted at one arboretum in Scotland following windblow (Hardcastle 2006) but there is no indication that trees became transferred out of the area. At other sites there is some evidence to suggest that this species is unlikely to be a threat. For example: a considerable number of <i>E. gunnii</i> trees were planted in Brightlingsea, Essex in 1887 and though many mature trees still survive and have produced viable seed there is no evidence of any natural regeneration in the vicinity. (Purse 2005).
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)	<i>E. gunnii</i> seeds are small (404 - 1365 per g), unwinged and numerous (Boland et al 1980, Forestart 2009), and presumably liable to limited wind dispersal. In GB, dispersal has been intentional and there is no indication that natural regeneration is a significant problem. It can show rapid growth and is often continually coppiced to limit its size. It can presumably tolerate continued pruning over many years, but there is no indication that it would not be susceptible to standard herbicides if control was needed. It is known to produce both natural and artificial hybrids and is the subject of experimental trials due its relative high frost hardiness attributes, and the invasiveness risk of these is not known. <i>E. gunnii</i> is originally from Tasmania (George, A.S. ed. 1980), an area with similar climatic conditions to parts of GB. However, seed germination can be poor and seedlings can be vulnerable to frosts and shading, especially for the first few years (Lloyd 2009). Mature trees are more frost hardy (e.g. Sheppard & Cannell 1987) and are known to produce viable seed.
9	Does the organism occur outside effective containment in the Risk Assessment area?	NO (Go to 11)	All noted examples of self-seeding are on controlled trial plantings, nurseries or arboreta.
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	YES (Go to 12)	It appears that seed may germinate in abundance when ground is relatively bare and light levels are high, (e.g. following windblow or clearfelling at existing plantation sites or on burnt areas). (Hardcastle 2006, Paul Macpherson pers com 2009)
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	YES (Go to 13)	Most eucalypts require generalist pollinators (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 throughout 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 (Tasmania, Australia) and many other areas where it is grown (Ireland, USA, New Zealand, Denmark, France etc.) is somewhat comparable to parts of GB. It is also grown in S. Africa, Russia, Spain and Italy. (CABI 2005)
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. <i>E. gunnii</i> is known to produce viable seed in GB and there is evidence for limited self-seeding by pure <i>E. gunnii</i> at some trial plantations and nurseries (Hardcastle 2006, John Purse pers com), though these are not considered invasive. However, there is some evidence of complex hybrids of <i>E. gunnii</i> self-seeding more freely and hence potentially capable of natural regeneration in the wild. (Macpherson pers com 2009, John Purse 2005).
17	Can the organism spread rapidly by natural means or by human assistance?	NO (Go to 20)	Although there is evidence of intentional planting and also limited self-seeding, spread of pure <i>E. gunnii</i> is likely to be slow as site conditions are likely to be limiting and time to reproductive maturity is more than 5 years. 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	Intentional importation of seed by seed merchants, nurseries, garden centres, research organisations and individuals. Most imported seed is from Australia and USA, but also from tree breeding establishments in Europe (mainly France & Spain) and South Africa. Increasingly, market gardens are selling self-collected seed from their own mature trees (John Purse pers com).
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			Not required. Deliberate introduction.
1.9	What is the volume of movement along the pathway?	moderate - 2	MEDIUM -1	Small to moderate quantities of seed are likely to be imported each year as there are relatively few companies involved in re-selling seed, though more nurseries may be growing-on E gunnii than other Eucalypts. This may increase further 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 and USA 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 / USA. 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 gunnii 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	E. gunnii grows well in USDA climatic zones 7b through to 11 (average annual minimum temperature between -14.9 to 4.5 °C) and can tolerate up to 200 days of frost per year. (Randy Stewart Landscape designs 2011). The majority of GB apart from the high Pennines and Scottish uplands comes into the USDA plant hardiness categories 8a to 10a (e.g. Trebrow Nursery 31/03/2011), and provides the broad annual rainfall requirements and similar climatic conditions to those required for establishment. E. gunnii occurs naturally in the mountains of Tasmania at between 600-1100m asl. In these areas, the climate is cool to warm, humid to subhumid, (800-2400mm precipitation, with a dry season of between 0-2 months duration) with mild summers rarely having very high temperatures (max temp of hottest month 15-26°C and the mean minimum of the coldest month about -3°C to +3°C). Winter frosts are numerous with an absolute minimum of -14°C. E. gunnii is one of the most frost hardy of the fast-growing commercial Eucalyptus species and is also tolerant of very wet conditions, CABI 2005, Celyn Vale 2011, John Purse 2009), but has poor drought tolerance (Potts et al 2001). Established trees are hardy to approximately -14oC. (Booth & Pryor 1991). The current worldwide distribution of E. gunnii includes: mainland Australia, Tasmania, New Zealand, South Africa, USA and the Russian Federation. It is also increasingly grown in several countries in western Europe including France, Italy, Spain, Denmark, Great Britain and Ireland. Recommended germination temperature for E. gunnii is approximately 18-22°C (e.g. B&T World Seeds 2011, Barnes 2011). Some growers recommend that a pre-chilling stratification is beneficial, though possibly no stratification is needed (Hardcastle 2006). Growers recommend that seeds are germinated early in the year 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. However, natural regeneration from seed has been observed as far north in GB as Argyll, so seed survival may be possible in most milder areas, particularly in the west of GB. Establishment might be expected to be more difficult in droughty areas in the East / southeast GB.
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. gunnii appears to survive on a wide range of soil types and does not require fertile soils (Brooker & Evans 1983), and can grow on both dry and wet sites, although it grows better on richer, well drained soils (CABI 2005). There is some evidence that it is less wind-firm than other Eucalypt species (John Purse 2009), though this may not necessarily affect its long-term survival and seed production. Recruitment may be facilitated by fire-induced mass release of seed (Wellington & Noble 1985), and such wild-fires are currently relatively rare in GB.
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 natural habitat, E. gunnii occurs in mountain areas. 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 / forestry crops, or burnt areas) that are immediately adjacent to large numbers of parent trees could provide the most optimal conditions. In GB natural regeneration has been observed on a heavily disturbed forest site following severe windblow (Hardcastle 2006). If E. gunnii 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. Natural regeneration of this species has been observed at sites from Argyll in Scotland to sites in the south of England (Hardcastle 2006, Richard Jinks per com). However, the specific conditions necessary for survival and establishment within these habitat types (i.e. a fire-induced mass release of seed onto 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 in the risk assessment area?	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 (<2yrs old) (John Purse pers com) and where natural regeneration has been observed ground conditions may have been unusually disturbed (i.e. on clearfell or windthrow areas) (Hardcastle 2006). However, there is little information on the precise conditions that are most favourable.
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, Wellington & Noble 1985). Like other Eucalypts, mature E. gunnii may be vulnerable to psyllids, aphids, beetles and mildews but damage is likely to be merely cosmetic. E. gunnii is palatable to browsing animals (e.g. sheep, deer, rabbits) but trees are only likely to be vulnerable when young (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	There is some evidence that seed requires bare / disturbed ground to assist seedling survival. In its native home this might be provided by burning of leaf litter in bushfires (John Purse 2009). In GB, natural regeneration has been observed on disturbed ground following clear-felling or windthrow in plantations. Artificial burning or weed control in sites adjacent to mature <i>E gunnii</i> 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 has only occasionally been observed and self-seeding appears to have remained very localised at controlled sites.
1.24	How often has the organism been recorded in protected conditions, e.g. glasshouses, elsewhere?	frequent - 3	LOW - 0	<i>E. gunnii</i> has been grown in GB since 1846. Seed and saplings are now increasingly available from numerous nurseries mainly as an ornamental garden tree. It is the most common Eucalypt species grown in GB and has recently been planted at several trial sites for biomass (FCS 2009, 2010), so it may become much more abundant 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	<i>E. gunnii</i> can hybridise naturally (Potts et al 2001, Howard Lloyd pers com.) but the quality of seed from self-pollination (inbreeding) can be of poor quality (Potts et al 1987). It produces large quantities of fine seed from age 5 years onwards. Seed can potentially remain viable for several years on the tree, but may have a limited seedbank in the soil (DPI 2011).
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 if 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. It can naturally produce viable hybrids with other species e.g. <i>E globulus</i> (Potts & Savva 1989)
1.28	How likely is it that low genetic diversity in the founder population of the organism will not prevent establishment?	unlikely - 1	HIGH -2	There is little information on the amount of genetic diversity in natural stands of <i>E gunnii</i> , but in Australia there are concerns that as much diversity as possible is conserved, particularly within the threatened <i>E gunnii divaricata</i> subspecies (DPI 2011)
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 only occasionally been observed. However, there is little evidence available for other countries (e.g. France & Spain), and it may be more common elsewhere. The current worldwide distribution of <i>E gunnii</i> includes: mainland Australia, Tasmania, New Zealand, South Africa, USA and the Russian Federation. It is also increasingly grown in several countries in western Europe including France, Italy, Spain, Denmark, Great Britain and Ireland.
1.30	How likely is it that the organism could survive eradication campaigns in the Risk Assessment area?	very unlikely - 0	MEDIUM -1	Although <i>E. gunnii</i> does survive coppicing well, there is no evidence to suggest that it would not be vulnerable to standard herbicide treatments. Once coppiced, stumps of <i>E gunnii</i> may be vulnerable to shading by other trees.
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 <i>E gunnii</i> 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.

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	LOW - 0	Any spread of <i>E gunnii</i> from the parent trees is likely to be slow. Generally, seed dispersal is limited in the <i>Eucalyptus</i> genus (Potts & Reid 1988), the key agent being wind (Turnbull & Doran 1987). <i>E gunnii</i> seeds are small (404 - 1365 per g) and unwinged (Boland et al 1980, Forestart 2009). 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. Predation by birds or large animals is unlikely; whilst the capsules of some species of <i>Eucalypt</i> 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. Dispersal by insects (e.g. ants) might be possible as these are an important predator of <i>Eucalyptus</i> seed in Australia (Wellington & Noble 1985). <i>E gunnii</i> is considered one of the more palatable <i>Eucalypt</i> species for its leaves (DPI 2011, Purse, J 2009), 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 <i>Eucalyptus</i> seed viability falls rapidly in the soil after about 2 months and is very low after 12 months (e.g. Carey 2002), however, viable seed can be retained for years within the capsules on the tree (Wellington & Noble 1985).
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 are susceptible to herbicides, shading, grazing and fire.
2.4 Based on the answers to questions on the potential for establishment and spread define the area endangered by the organism.		HIGH -2	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 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, wetter 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 gunnii appear to be insignificant. No information available on natural regeneration outside GB.
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).	minor - 1	MEDIUM -1	Any negative economic impacts are likely to be very localised and small. Natural regeneration, is currently restricted to small numbers of individuals in areas adjacent to parent trees. Impacts of E gunnii establishing 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 gunnii occurs on farmland and established trees have to be removed. Commercial forestry may also suffer additional costs when plantations of E gunnii are to be replaced by other species. It is unlikely that significant cover of E. gunnii 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 gunnii control are not likely to be large. Spread by natural regeneration, is fairly slow and initially localised to areas adjacent to parent trees. Replacing other species on established E gunnii 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 gunnii, natural regeneration of E gunnii 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 gunnii 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, 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 gunnii has the potential for a high level of water loss through transpiration and cause a consequent lowering of the local water table, especially when grown in dense monoculture. It has been described as being not particularly wind-firm, (John Purse 2005) and so could introduce an obstructive, tangled habitat structure if large areas are affected. 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	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 effect 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. In at least once instance these have been controlled using introduced biological control (parasitic wasp). However, the damaging Psyllids may themselves be exclusive to Eucalypts and hence other species of commercially grown eucalypts might suffer most. (e.g. Celyn Vale Nurseries undated, Kerr 2007). Eucalypts are also affected by several leaf fungi (e.g. Phaeophleospora eucalypti in Australia) and Mildews affecting E gunnii could potentially affect other species. (MAF 2004)
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 gunnii. Areas of high conservation or social value which are adjacent to plantations of E gunnii may also be vulnerable. It is possible that warmer sites in the south and west of GB may favour survival of seedlings, and drier sites could suffer through increased fire risk and lowering of local water tables. The most vulnerable sites might be clearfell sites, prepared arable land, or recently burned areas, immediately adjacent to plantations of E gunni.

Summarise Entry	very likely - 4	LOW - 0	E gunnii seed and seedlings are currently imported for deliberate planting in GB. Due to increased interest in growing this species for short rotation forestry and cut foliage, imports and production of GB-produced seed may well increase, particularly if current 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. gunnii for greater frost-hardiness and these hybrids may ultimately be planted in large numbers.
Summarise Establishment	likely - 3	HIGH - 2	There is evidence of limited natural regeneration of E gunnii in GB, and most information is anecdotal from small-scale trial plantations. E gunnii is a widespread ornamental garden tree but there is no indication that significant self-seeding has been observed. It would appear that E gunnii has been allowed to establish at a small number of controlled sites where particular conditions have been favourable. More information is needed on what these conditions are. There is interest in developing this species for short-rotation forestry and in the future selected varieties or artificial hybrids involving E.gunnii 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 significant spread of E gunni and evidence of self-seeding in GB has come from within controlled sites. The potential for spread currently appears small.
Summarise Impacts	minor - 1	MEDIUM - 1	Potential impacts of E gunnii establishing 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 gunnii occurs on farmland adjacent to parent trees. Commercial forestry may also suffer additional costs when plantations of E gunnii are to be replaced by other species. The most important environmental impacts may be loss of biodiversity, increased fire risk and a reduced water table.
For pathway/policy risk assessment Assess the potential for establishment and economic/environmental/social impacts of another organism or stop			
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. gunnii is currently being grown in GB as an amenity tree and in trials as a potential short-rotation biomass/pulp crop. It does produce viable seed and there is evidence for natural regeneration under certain conditions, but there is no indication of any rapid spread by self-seeding. However, there is interest in producing hybrids of E. gunnii crossed with other Eucalypt species and the potential for invasiveness of these species is not yet known and should be monitored.
Conclusions on Uncertainty		MEDIUM - 1	Information on the natural regeneration of E. gunnii is limited as there are few sites where it has been observed. 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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