

# PEST RISK ASSESSMENT

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## Koala

*Phascolarctos cinereus*



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**About this Pest Risk Assessment**

This pest risk assessment is developed in accordance with the *Policy and Procedures for the Import, Movement and Keeping of Vertebrate Wildlife in Tasmania* (DPIPWE 2011). The policy and procedures set out conditions and restrictions for the importation of controlled animals pursuant to s32 of the *Nature Conservation Act 2002*. This pest risk assessment is prepared by DPIPWE for the use within the Department.

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# I. Summary

The koala (*Phascolarctos cinereus*) is a marsupial endemic to the eastern seaboard of mainland Australia where it occurs in a patchy distribution from approximately Adelaide in South Australia to Cairns in Queensland. It has become established outside its natural range as a consequence of deliberate translocations and escapes. Translocated populations are predominantly on islands in Victoria and South Australia.

Where populations have established in new areas there have been ongoing management issues as a consequence of over-population. Management of these populations has been difficult and of limited success.

In Tasmania, the koala is a 'controlled animal' under the *Nature Conservation Act 2002*.

This risk assessment estimates that there is a high risk of koalas establishing in Tasmania, with potential for extreme consequences. The assessment concludes that koalas represent an extreme threat to Tasmania. Based on the outcome of the risk assessment it is recommended that koalas are not permitted entry into Tasmania.

## 2. Introduction

### 2.1 NAME AND TAXONOMY

<b>Kingdom:</b>	Animalia
<b>Phylum:</b>	Chordata
<b>Class:</b>	Mammalia
<b>Sub Class:</b>	Marsupialia
<b>Order:</b>	Diprotodontia
<b>Family:</b>	Phascolarctidae
<b>Genus:</b>	<i>Phascolarctos</i>
<b>Species:</b>	<i>P. cinereus</i> (Goldfuss, 1817)
<b>Common names:</b>	Koala, koala bear, native bear
<b>Known hybrids:</b>	None
<b>Close relatives:</b>	None



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### 2.2 DESCRIPTION

The koala (*Phascolarctos cinereus*) is the sole member of the family Phascolarctidae. It is an arboreal marsupial with large furry ears and a vestigial tail. Its fur colour varies from pale grey in the northern parts of its range to grey-brown in the south (NRMMINCO 2009). The koala also varies in size across its latitudinal range, with animals larger in Victoria than in Queensland: males range from an average 6.5 kilograms in Queensland to 12 kilograms in Victoria, while females range from an average of 5 kilograms in Queensland to 8 kilograms in Victoria (Lee and Martin 1988).

Koalas have powerful fore-limbs and long sharp claws enabling them to easily climb large trees. Males have a large prominent scent gland on the chest that develops with maturity and stains the surrounding fur brown. Koalas have poor eyesight, but excellent smell and hearing. Due to their low-energy folivorous diet, they are relatively slow-moving, although they can move quickly when necessary (Strahan 1995).

All koalas are now classed as a single species, *P. cinereus*, however several sub-species have been described in the past (Lee and Martin 1988).

### 2.3 CONSERVATION AND LEGAL STATUS

The legal status of the koala varies across Australia from 'secure' to 'vulnerable', with different states affording the species different levels of significance and protection (Table 1).

## **National**

The koala is not currently listed under the Australian Government's national environment law—the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act). The most recent completed assessment by the Australian Government Threatened Species Scientific Committee in 2006 found that, while the species was subject to a variety of threats and that some regional populations had declined significantly, the koala did not meet the criteria for listing under the EPBC Act (NRMMinCo 2009). However, the conservation status of the koala under the EPBC Act is currently under review, with a reassessment undertaken in late 2010. This process has not yet been completed (as at 21/2/11).

## **Queensland**

In Queensland, the koala is listed as vulnerable wildlife throughout the south-east Queensland bioregion, and least concern wildlife elsewhere in the state under the *Nature Conservation Act 1992*. The koala is a protected species in Queensland and cannot be taken, used or kept without a permit.

## **New South Wales**

In New South Wales the koala is listed as vulnerable under the *Threatened Species Conservation Act 1995*. The koala is a protected species in New South Wales under the *National Parks and Wildlife Act 1974* and cannot be harmed or possessed without authority. Controls for the protection of koala habitat are also in place under the *Native Vegetation Act 2003* and the *Environment Planning and Assessment Act 1979*, including the subordinate planning instrument *State Environmental Planning Policy No. 44—Koala Habitat Protection*.

## **Victoria**

In Victoria, the koala is listed as 'other protected wildlife' under the *Wildlife Act 1975* which controls the possession of, trade in, and research into native fauna through licensing and permits. The koala is not listed under the Victorian *Flora and Fauna Guarantee Act 1988*, which provides schedules of threatened species, communities and potentially threatening processes and has the conservation of Victoria's native flora and fauna as its main objective.

## **South Australia**

In South Australia, the koala is protected under the *National Parks and Wildlife Act 1972*, which allows for the protection of habitat and wildlife and provides for the use of wildlife through a system of permits allowing certain actions (that is, keeping, selling, trading, harvesting, farming, hunting and the destruction of native species). The koala was listed as rare, but was de-listed in 2008.

## **International**

The koala is listed as 'of least concern' on the 2008 IUCN Red List of Threatened Species (IUCN 2008). The United States Fish and Wildlife Service listed the koala as 'threatened' on the United States *Endangered Species Act* in May 2000. The listing requires that United States federal agencies consider the impact of their actions on the koala and prohibits commercial activity or trade in koalas by the United States, except under a threatened species permit. The listing of the koala in the United States does not influence the legislative responsibilities of the Australian, state or

territory governments with respect to koala management and conservation. However, it does demonstrate the international interest in, and concern for, the koala.

**Table 1: Legal status of the koala throughout its range in Australia (NRMMINCO 2009)**

State/territory	Legislation	Status of koala
Australia	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Not listed (currently under review)
Queensland	<i>Nature Conservation Act 1992</i>	Vulnerable in South-East Queensland Bioregion  Least concern (common) elsewhere
New South Wales	<i>Threatened Species Conservation Act 1995</i>  <i>National Parks and Wildlife Act 1974</i>	Vulnerable; two populations listed as endangered  Protected
Australian Capital Territory	<i>Nature Conservation Act 1980</i>	Not listed
Victoria	<i>Wildlife Act 1975</i>  <i>Flora and Fauna Guarantee Act 1988</i>	Protected wildlife  Not listed
South Australia	<i>National Parks and Wildlife Act 1972</i>	Protected  Not listed as threatened

# 3. Biology and Ecology

## 3.1 LIFE HISTORY

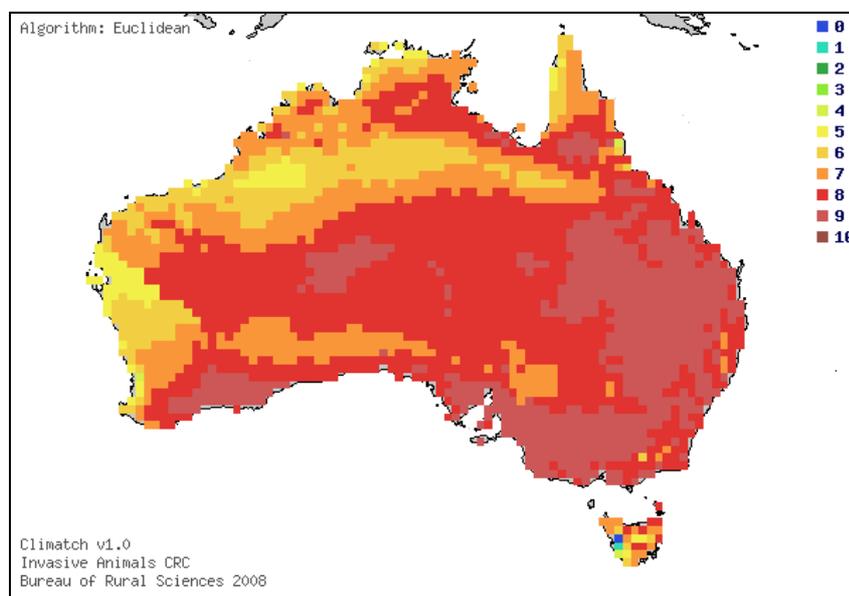
Female koalas are normally sexually mature by two years of age and healthy animals are able to produce one young per year until at least 14 years of age and occasionally up to 18 years. Twins are rare (Strahan 1995). Koalas can have a population doubling time of 2.8 years and there are numerous examples of populations rapidly expanding from a small number of introduced or escaped animals within a relatively short time (e.g. Martin and Handasyde 1999).

Females do not store sperm and there is no record of koalas hybridising with other species.

## 3.2 HABITAT REQUIREMENTS AND PREFERENCES

Koalas are obligate folivorous marsupials, feeding almost entirely on leaves from trees of the *Eucalyptus* genus. They are notoriously fussy feeders, however koalas will feed on a number of the eucalypt species within their range and preferences may differ, often with availability, between populations (Martin and Handasyde 1999). Koalas occupy eucalypt woodland with suitable food trees at elevations from sea level to above 700m. Reflecting their status as obligate folivores, koalas are arboreal, but come to ground regularly to move between food trees.

The geographic range of koalas, which extends along most of the eastern seaboard of Australia, demonstrates the ability of the koala to exist in a wide range of climates. Climate modelling using Climatch (BRS 2008) further supports this, suggesting a much broader range for the species if it was not limited by other factors (Figure 1).



**Figure 1** Climate comparison between the natural and introduced range of *P. cinereus* and other areas of Australia, where 10 is a 'perfect' climate match and 0 is a very dissimilar climate.

### 3.3 NATURAL GEOGRAPHIC RANGE

An Australian endemic, koalas naturally occur in eucalypt woodland along Australia's eastern seaboard, from southeast South Australia, through Victoria, New South Wales, the ACT and Queensland (Figure 2). Koalas are not found in the wild in Tasmania. Koala habitat in mainland Australia is highly fragmented and the majority of populations are now isolated and disjunct (Strahan 1995).

Southern koala populations are at much higher densities, up to 13 per ha in some areas. Koalas in Queensland and New South Wales are at much lower densities however these low densities are thought to be natural in outback Queensland due to the scattered nature of suitable habitat (Martin and Handasyde 1999).

### 3.4 INTRODUCED GEOGRAPHIC RANGE

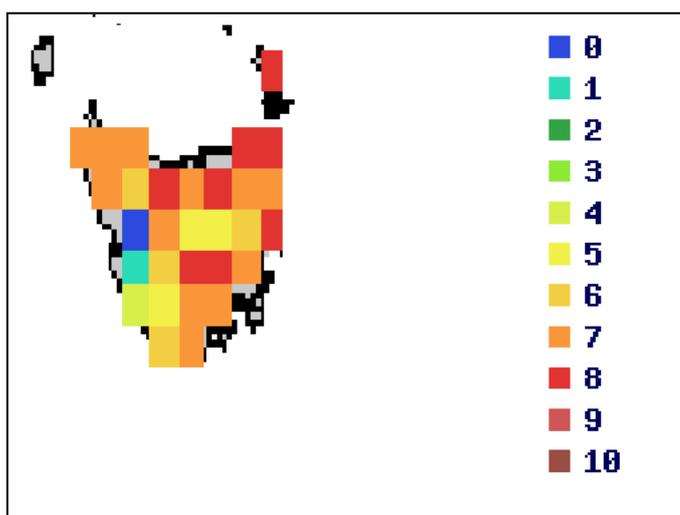
Following major population declines across its range in the late 1800's/early 1900's due to hunting pressure, habitat destruction, fire and disease (koalas were extinct in South Australia by the 1930's), a major translocation program took place which led to animals being introduced to a range of islands and locations for conservation purposes (Martin and Handasyde 1999). Successful translocations occurred at French, Raymond, Snake and Phillip Islands in Victoria and Kangaroo Island in South Australia. These populations rapidly expanded and have caused extensive damage to trees in these new habitats. Past and current management has involved translocation from these overabundant populations to other areas of suitable habitat on other islands and the Australian mainland. Consequently, koalas are now found in all suitable areas within their historical range (Martin and Handasyde 1999). The total area of the introduced range is less than 4,000km<sup>2</sup>.



**Figure 2:** Natural and introduced geographic distribution of the koala (*Phascolarctos cinereus*). Source: National Koala Conservation and Management Strategy 2010.

### 3.5 POTENTIAL DISTRIBUTION IN TASMANIA

Using climate data from the koala’s natural and established range as a reference for Climatch modelling (see Figure 3) it appears that the climate in Tasmania is well suited for the establishment of the species. In addition, five species of *Eucalyptus*, which are known to be preferred feed tree species of koala, occur in Tasmania (*Eucalyptus globulus*, *E. viminalis*, *E. obliqua*, *E. ovata*, *E. radiata*), and provide one or more potential food sources across most of the state (Forestry Tasmania 1996).



**Figure 3** Climatch modelling result comparing the climate of the natural and established distribution of the koala with Tasmania showing a climate match of 0-8 in Tasmania.

### 3.6 DIET AND FEEDING BEHAVIOUR

#### *Diet*

The koala is an obligate folivore, its diet consisting almost entirely of foliage of species from the genus *Eucalyptus* (Strahan 1995) although buds, fruit and even bark from these trees are occasionally eaten (Lee and Martin 1988). There are, however, marked local and regional preferences in terms of the species consumed. In the south of the range, the preferred species are manna gum (*E. viminalis*), swamp gum (*E. ovata*), and blue gum (*E. globulus*), while the red gums (*E. camaldulensis* and *E. tereticornis*), tallowwood (*E. microcorys*) and grey gum (*E. punctata*) are important in the north (Strahan 1995).

#### *Feeding behaviour*

While some individual koalas will eat at any time of the day or night, most feeding occurs during the first half of the night, usually between 1700 and 2400 hours. Animals do not feed continuously through this period but tend to feed in a series of six to ten bouts lasting, on average, for twenty minutes. Koalas often sleep in the tree in which they have been feeding. They may move to another tree between bouts of feeding, although typically they only do this about once per day (Martin and Handasyde 1999). Koalas are inactive for approximately 20 hours per day; of the time spent active one to three hours may be spent feeding (Lee and Martin 1988).

#### *Pest potential*

Given the species' status as an obligate folivore that feeds almost exclusively on eucalypts, the potential for the koala to cause economic damage is limited to forestry plantations consisting of suitable (eucalypt) feed trees. The actual risk of this occurring is unclear. Koalas are not considered a threat to forestry in their natural range due to their generally low density. However, koalas have

a demonstrated ability to have a major impact on the health of eucalypt forests in areas where they have been introduced and occur in high densities. It is therefore clear that koalas do have major pest potential in areas where they have been introduced (Martin and Handasyde 1999), and it may be assumed that the impact of koalas in Tasmania could potentially be significant.

### 3.7 SOCIAL BEHAVIOUR AND GROUPINGS

Koalas exhibit a range of behaviours that are a consequence of a consistently low quality diet. Foremost among these are energy saving behaviours such as being inactive for approximately 20 hours per day and largely sedentary even when they are active (Strahan 1995). After a day of resting in the lower branches of a tree, koalas climb into the canopy around dusk to commence feeding.

Dominant males move the most frequently, ranging over the largest area and consequently have the most frequent interactions with other individuals. Home ranges have been found to be relatively stable but not exclusive, with the home range of males and females overlapping considerably indicating an absence of territoriality. Apart from the associations between a female and its young, koalas are solitary animals with limited social interaction (Martin and Handasyde 1999). Aggressive intra-specific behaviour occurs between koalas, particularly related to breeding however aggression towards other species, including humans, is not reported.

### 3.8 NATURAL PREDATORS AND DISEASE

#### *Predation*

Historically, the principal predators of koalas were Aboriginals and dingos. European colonisation led to changes in koala predation as harvest of koalas for fur became a major source of mortality for the species (Martin and Handasyde 1999). Currently the major threats to koalas, particularly in semi-urban areas, are domestic dogs and vehicles. In bushland areas, away from roads and domestic dogs, the species now has few predators. Feral dogs may cause mortality; the wedge-tailed eagle (*Aquila audax fleayi*) has been reported to take koalas, though it has not been documented; and powerful owl (*Ninox strenua*) occasionally take young koalas (Martin and Handasyde 1999).

In Tasmania, potential predators are limited to wedge-tailed eagles, dogs, and vehicles.

#### *Parasites*

Koalas generally have relatively few internal and external parasites, although ticks can be a problem in coastal areas of the koala's range. The paralysis tick *Ixodes holocyclus* can be particularly problematic and cause mortality in koalas. There are two external parasites which can be a significant issue for koalas, mange (*Sarcoptes scabiei*) and a bacterium *Mycobacterium ulcerans* which is related to the organism that causes leprosy in humans.

## Diseases

The only significant disease which commonly afflicts koalas is Chlamydia, of which there are multiple strains that may cause infertility, respiratory disease or eye disease (Martin and Handasyde 1999).

### 3.9 THREAT TO HUMAN SAFETY

Koalas are not likely to pose a significant threat to human safety. While it is possible that a koala may cause injury to humans, particularly smaller children, the injuries caused are likely to be limited to bites and scratches. An interaction between a person and a koala leading to injury is unlikely to occur unless a koala is provoked.

There is limited potential for koalas to carry and transmit disease or parasites that may affect human health and there are no reports of this occurring.

### 3.10 HISTORY AS A PEST

In many cases where koalas have been introduced to islands, fragmented habitat, or outside their natural range, they have subsequently reached high densities. This has led to over-browsing, defoliation and death of their food trees, in some cases over quite extensive areas. Severe reductions in available food resources can in turn lead to starvation, suffering and death, and this has been recorded at a number of locations in Victoria and South Australia (Martin and Handasyde 1999). Unsustainable over-browsing can also lead to ecosystem damage and jeopardise vegetation conservation.

The impacts of over-browsing have been an important issue at some Victorian sites for more than 85 years and continue to be an ongoing problem in parts of Victoria and South Australia (NRMMINCO 2009). As there are no longer any predators of koalas, the density of populations has to be artificially reduced to avoid defoliation and death of food trees (Strahan 1995). The manner in which this population reduction is achieved provides an on-going source of complexity and cost for managers, particularly given the national and international profile of the species.

### 3.11 POTENTIAL IMPACT IN TASMANIA

Based on the experience of other parts of Australia where koalas have been introduced, it is likely that koalas would establish in Tasmania and have the potential to impact on areas of suitable habitat. There are currently a number of threatened native vegetation communities listed under Schedule 3A of the *Tasmanian Nature Conservation Act 2002* that include *eucalyptus* species known to be preferred feed trees for koalas. These communities include:

- *Eucalyptus globulus* dry forest and woodland;
- *Eucalyptus globulus* King Island forest;

- *Eucalyptus ovata* forest and woodland;
- *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland;
- *Eucalyptus viminalis* Furneaux forest and woodland; and
- *Eucalyptus viminalis* wet forest.

In addition to the impact on communities of conservation significance, a number of the species preferred by koalas are important for forestry production in Tasmania. Consequently there is potential for koalas to impact directly on forestry activities by browsing on trees being grown for harvest. In addition, the presence of koalas could cause an increase in forestry management costs by requiring koala management actions in timber production areas.

## 4. Risk Assessment

### 4.1 PREVIOUS RISK ASSESSMENTS

Koalas have not been assessed by other jurisdictions within Australia at a state or national level.

### 4.2 RISK ASSESSMENT

The following risk assessment determines the risk of koala to Tasmania using the Bomford model (2008) and proposes assigned threat categories and import classifications for the species. The assessment then assigns the species into a threat category. The category used to score each factor is shown in column three in italics and where necessary the rationale for each assessment is also provided.

<b>Species:</b>	<b>Koala (<i>Phascolarctos cinereus</i>)</b>	
Date of Assessment:	March 2011	
Literature search type and date:	See references	
<b>Factor</b>	<b>Score</b>	
A1. Risk posed from individual escapees (0-2)	1	<i>Animal that is unlikely to make an unprovoked attack but can cause serious injury (requiring hospitalisation) or fatality if cornered or handled</i> Koala may potentially cause injury by biting and scratching
A2. Risk to public safety from individual captive animals (0-2)	0	<i>Nil or low risk (highly unlikely or not possible)</i> Risk arising from irresponsible use of products from koalas is negligible.
<b>Stage A. Risk posed by individual animals (risk that a captive or escape animal would harm people)</b>	<b>Public Safety Risk Score</b> = A1 + A2 = 1	<b>Public Safety Risk Ranking</b> A ≥ 2, Highly Dangerous A = 1, Moderately Dangerous A = 0, Not Dangerous Moderately Dangerous
B1. Climate match score (1-6)	5	<i>Very High Climatch Score</i> Sum of squares for match classes 10 to 6: 24 (Very High).
B2. Exotic population established overseas score (0-4)	2	<i>Exotic populations have only established on small islands (&lt;50 000 km<sup>2</sup>)</i>
B3. Overseas range size score (0-2)	1	<i>Overseas size range: 1-70million.</i> The historical range is estimated at approximately 2 million km <sup>2</sup>
B4. Taxonomic class score (0-1)	1	<i>Mammal</i>
<b>Stage B. Likelihood of establishment (risk that a particular species will establish a wild population in Tasmania)</b>	<b>Establishment Risk Score</b> = B1 + B2 + B3 + B4 =9	<b>Establishment Risk Ranking</b> B = 11-13, Extreme B = 9-10, High B = 6-8, Moderate B ≤ 5, Low = High

C1. Taxonomic group (0-4)	2	<i>Mammal of the order Marsupialia</i>
C2. Overseas range size (0-2)	0	<i>Species range &lt;10 million km<sup>2</sup></i>
C3. Diet and feeding (0-3)	3	<i>Mammal that is primarily a browser</i>
C4. Competition for native fauna for tree hollows (0-2)	0	<i>Does not use tree hollows</i>
C5. Overseas environmental pest status (0-3)	3	<i>Major environmental pest in any region or country. South Australia and Victoria</i>
C6. Climate match to areas with susceptible native species or communities (0-5)	5	<i>75% of the geographic range of one or more susceptible native species or ecological communities that are listed as threatened lies within the mapped area of the six climate matches (10, 9, 8, 7, 6, and 5). Multiple species and communities</i>
C7. Overseas primary production (0-3)	2	<i>Moderate forestry impacts</i> Koalas are known to seriously impact on forests in areas where they have been introduced. Feed tree species are important in forestry in Tasmania.
C8. Climate match to susceptible primary production (0-5)	3	<i>Moderate to serious</i> Koalas could have moderate impacts on forestry (PCIS = 2, CMCS = 4, CDS = 80).
C9. Spread disease (1-2)	2	<i>Mammal, unknown effect</i>
C10. Harm to property (0-3)	0	<i>&lt;\$100,000/year</i> May be need for exclusion fences
C11. Harm to people (0-5)	1	<i>Low risk of harm to people</i> Small potential for biting and scratching injuries if animals are cornered and provoked.
<b>Stage C. Consequence of Establishment (risk that an established population would cause harm)</b>	<b>Consequence Risk Score</b> = sum of C1 to C11 =21	<b>Consequence Risk Ranking</b> C > 19, Extreme C = 15-19, High C = 9-14, Moderate C < 9, Low =Extreme
<b>ASSIGNED THREAT CATEGORY:</b>	<b>EXTREME</b>	
<b>PROPOSED IMPORT CLASSIFICATION:</b>	<b>PROHIBITED</b>	

## 5. Risk Management

This risk assessment concludes that koalas (*Phascolarctos cinereus*) are an extreme threat to Tasmania and recommends that imports should be prohibited.

## 6. References

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# Appendices

## APPENDIX A: CALCULATING TOTAL COMMODITY DAMAGE SCORE

Column 1	Column 2	Column 3	Column 4	Column 5
<b>Industry</b>	<b>Commodity Value Index (CVI)</b>	<b>Potential Commodity Impact Score (PCIS, 0-3)</b>	<b>Climate Match to Commodity Score (CMCS, 0-5)</b>	<b>Commodity Damage Score (CDS columns 2 x 3 x 4)</b>
<b>Cattle (includes dairy and beef)</b>	11			
<b>Timber (includes native and plantation forests)</b>	10	2	4	80
<b>Aquaculture</b>	6			
<b>Sheep (includes wool and meat)</b>	5			
<b>Vegetables</b>	5			
<b>Fruit (includes wine grapes)</b>	5			
<b>Poultry (including eggs)</b>	1.5			
<b>Cereal grain (includes wheat, barley, sorghum etc)</b>	1			
<b>Other crops and horticulture (includes nuts and flowers)</b>	1			
<b>Pigs</b>	1			
<b>Bees (includes honey, beeswax, and pollination)</b>	0.5			
<b>Oilseeds (includes canola, sunflower etc)</b>	0.5			
<b>Grain legumes (includes soybeans)</b>	0.3			
<b>Other livestock (includes goats and deer)</b>	0.3			
<b>Total Commodity Damage Score (TCDS)</b>				80

## APPENDIX B: ASSIGNING SPECIES TO THREAT CATEGORIES

<b>A: Danger posed by individual animals</b> (risk a captive or escaped individual would harm people)	<b>B: Likelihood of establishment</b> (risk that a particular species will establish a wild population in Tasmania)	<b>C: Consequence of establishment</b> (risk that an established population would cause harm)	<b>Threat category</b>	<b>Implications for any proposed import into Tasmania</b>
Highly, Moderately or Not Dangerous	Extreme	Extreme	Extreme	Prohibited
Highly, Moderately or Not Dangerous	Extreme	High		
Highly, Moderately or Not Dangerous	Extreme	Moderate		
Highly, Moderately or Not Dangerous	Extreme	Low		
Highly, Moderately or Not Dangerous	High	Extreme		
Highly, Moderately or Not Dangerous	High	High		
Highly, Moderately or Not Dangerous	Moderate	Extreme		
Highly, Moderately or Not Dangerous	High	Moderate	Serious	Import restricted to those license holders approved for keeping serious threat species
Highly, Moderately or Not Dangerous	High	Low		
Highly, Moderately or Not Dangerous	Moderate	High		
Highly Dangerous	Moderate	Moderate		
Highly Dangerous	Moderate	Low		
Highly, Moderately or Not Dangerous	Low	Extreme		
Highly, Moderately or Not Dangerous	Low	High		
Highly Dangerous	Low	Moderate		
Highly Dangerous	Low	Low		
Moderately or Not Dangerous	Moderate	Moderate		
Moderately or Not Dangerous	Moderate	Low		
Moderately or Not Dangerous	Low	Moderate		
Moderately Dangerous	Low	Low		
Not Dangerous	Low	Low	Low	Import Permitted
Unknown	Any value	Any value	Extreme until proven otherwise	Prohibited
Any Value	Unknown	Any value		
Any Value	Any value	Unknown		
Unassessed	Unassessed	Unassessed		



Tasmania

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