PEST RISK ASSESSMENT

Bush Stone-curlew

Burhinus grallarius

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Department of Primary Industries, Parks, Water and Environment
Resource Management and Conservation Division

Tasmania
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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 use within the Department.

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1. Summary

The Bush Stone-curlew (*Burhinus grallarius*) is a medium-sized, long-legged Australian bush bird. It is found throughout grassland and open woodland areas, including off-shore islands, and is absent only from deserts, forest and higher altitudes.

Bush Stone-curlews are listed as near threatened on the IUCN Red List of Threatened Species. In New South Wales, the Bush Stone-curlew is listed as endangered under the *Threatened Species Conservation Act 1995*; in Victoria it is listed as threatened under the *Flora and Fauna Guarantee Act 1988*; and in South Australia it is listed as rare under the *National Parks and Wildlife Act 1972*. In Tasmania the Bush Stone-curlew is a 'controlled animal' under the Tasmanian *Nature Conservation Act 2002* and is a protected species under the *Wildlife (General) Regulations 2010*.

Burhinus grallarius is not considered a pest species. It has not established feral populations outside its native range and there is no evidence of the species causing any major impacts on the environment or agriculture.

There is a moderate likelihood that this species could establish in Tasmania. The most significant impacts are likely to be predation because Bush Stone-curlews have a broad diet of small mammals, birds, reptiles, amphibians and carrion. The consequence of this species establishing in Tasmania is low.

This risk assessment categorises Bush Stone-curlews as a moderate threat to Tasmania and proposes that imports be restricted to those licence holders approved for keeping moderate threat species.

2. Introduction

2.1 NAME AND TAXONOMY

Kingdom: Animalia

Phylum: Chordata

Class: Aves

Order: Charadriiformes

Family: Burhinidae

Genus: *Burhinus*

Species: *B. grallarius*

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Sub-species or variety (if applicable): None now recognised (three sub-species have been previously described) (Marchant and Higgins 1993).

Common names (including any industry or trade names): Bush thick-knee, Southern Stone-curlew, Southern Stone Plover, Weeloo, Willaroo (Pizzey and Knight 2003).

Known hybrids: None known.

Close relatives: Beach Stone-curlew (*Esacus magnirostris*).

2.2 DESCRIPTION

The Bush Stone-curlew is a large, long-legged, ground dwelling bird. It has a hunched appearance, large pale eyes, a dark bill and long-legs; it flies with the neck stretched forward and legs trailing beyond the tail tip (Marchant and Higgins 1993).

The Bush Stone-curlew stands 540-590mm tall with a wingspan of 820-1050mm. Adult males weigh an average of 670g, with females slightly smaller at 625g.

The species is polymorphic, with the rufous morph dominating the species range in northern Australia and intergrading with the grey morph irregularly on the east and west coasts of Australia.

The grey morph is predominately covered with light grey-brown plumage with black streaks throughout. A prominent dark stripe runs from the eye to the back. The face, chin, ear coverts, under wing and lower belly are white with black tips along the edges of the under wing. The rufous morph has rufous-brown plumage, streaked black, around the eye and on the forehead, neck, breast and upper-belly. In flight, the Bush Stone-curlew reveals a broad pale panel across the centre of the wing and a flash of white near the wing tips (Marchant and Higgins 1993). Juvenile plumage for both morphs is paler.

The Bush Stone-curlew is broadly similar to its closest relative in Australia, the Beach Stone-curlew (*Esacus magnirostris*); neither species occurs in Tasmania.

2.3 CONSERVATION AND LEGAL STATUS

The IUCN Red List categorises the Bush Stone-curlew as near threatened (Birdlife International 2011).

The Bush Stone-curlew is not listed under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999*.

In New South Wales, the Bush Stone-curlew is listed as endangered under the *Threatened Species Conservation Act 1995*; in Victoria it is listed as threatened under the *Flora and Fauna Guarantee Act 1988*, and in South Australia it is listed as rare under the *National Parks and Wildlife Act 1972*.

In Tasmania the Bush Stone-curlew is a protected species under the *Wildlife (General) Regulations 2010*.

3. Biology and Ecology

3.1 LIFE HISTORY

Bush Stone-curlews live for approximately 30 years (McGilp 1947, cited in DEC 2006) and are believed to hold long-term pair-bonds (Flavell 1992, cited in DEC 2006). Breeding probably begins at 2-3 years of age (Marchant and Higgins 1993) although birds in captivity may begin earlier (Mrs J. Lubke pers. comm., cited in DEC 2006).

Eggs are laid directly on bare ground, with grass and leaves scraped away The nest site is typically in or near the edge of open grassy woodland or within a cleared paddock where there is good visibility across the surrounding land. Nest sites are sometimes abandoned if the grass around the nest becomes taller than about 15cm (Johnson and Baker-Gabb 1994, cited in DEC 2006). The same nesting areas may be used in successive years and some have been reported to have been used for almost 30 years (DEC 2006).

A breeding pair will have between one and three clutches within a breeding season (most frequently one or two), with each clutch usually containing two eggs (Andrews 1997, Johnson and Baker-Gabb 1993, cited in DEC 2006).

The incubation period is between 22 and 30 days, with both parents participating in the incubation and care of the young (Andrews 1997). The chicks leave the nest site within an hour or two of hatching, and often remain with the parents until the next breeding attempt. The length of time that the young remain with the parents can vary from three to nine months depending on whether they are from the first or second brood of the season (Marchant and Higgins 1993). The young from the first clutch is chased away from the nesting area by the parents 1 to 2 weeks before the second clutch is laid (Marchant and Higgins 1993). Both parents feed the chick until it is approximately 4 weeks of age (Andrews 1997, cited in DEC 2006) and it is approximately 8 to 10 weeks before a chick can fly (Price 2004, cited in DEC 2006). The chick is extremely vulnerable to predation during this time and instinctively lies flat to the ground in an attempt to remain camouflaged if it senses danger. The adults vigorously defend their young, and their territory, from intruders and potential predators during the breeding season.

A study in Victoria found that about half of breeding pairs manage to raise one young to independence each year (Johnson and Baker-Gabb 1994, cited in DEC 2006).

Sperm storage is not known for this species. There are no records of hybridisation.

3.2 HABITAT REQUIREMENTS AND PREFERENCES

The Bush Stone-curlew is found throughout mainland Australia in most vegetation types other than the most arid environments and thick forest. Its broad distribution indicates tolerance for a wide range of temperature and other climatic conditions.

Bush Stone-curlew habitat is described by broad ground and understorey structural features and is not necessarily associated with any particular vegetation communities. In general, habitat occurs in

open woodlands with few, if any, shrubs, and short, sparse grasses of less than 15cm in height, with scattered fallen timber, leaf litter and bare ground present. In coastal areas, structurally similar elements of tidal and estuarine communities provide suitable habitat (DEC 2006).

Bush Stone-curlews appear to be associated with lower elevations in fairly flat or rolling country (Johnson and Baker-Gabb 1994, cited in DEC 2006). A study of 167 sites in northern Victoria found that virtually all sites were below 300m elevation, and that 59% were below 150m (Johnson and Baker-Gabb 1994, cited in DEC 2006).

Specific habitat requirements for nesting, foraging and roosting appear to be different and the proximity of suitable areas for each activity is likely to influence abundance and distribution of Bush Stone-curlews (Gates 2001, I. Davidson pers. comm., cited in DEC 2006).

By day, birds roost on the ground amongst fallen tree debris where their mottled plumage provides excellent camouflage and the open terrain provides good visibility (Marchant and Higgins 1993). These daytime roosts are typically found in woodland patches that are less than 1km from other patches of similar habitat and less than 250m from water (Johnson and Baker-Gabb 1994, cited in DEC 2006).

Bush Stone-curlews are almost entirely terrestrial and do not occupy trees or tree hollows for either roosting or nesting.

3.3 NATURAL GEOGRAPHIC RANGE

The Bush Stone-curlew occurs across northern and south-western Western Australia, the Northern Territory and Queensland, throughout coastal and inland New South Wales, central and north-western Victoria, south-eastern South Australia, numerous offshore islands and southern coastal Papua New Guinea (Figure 1).

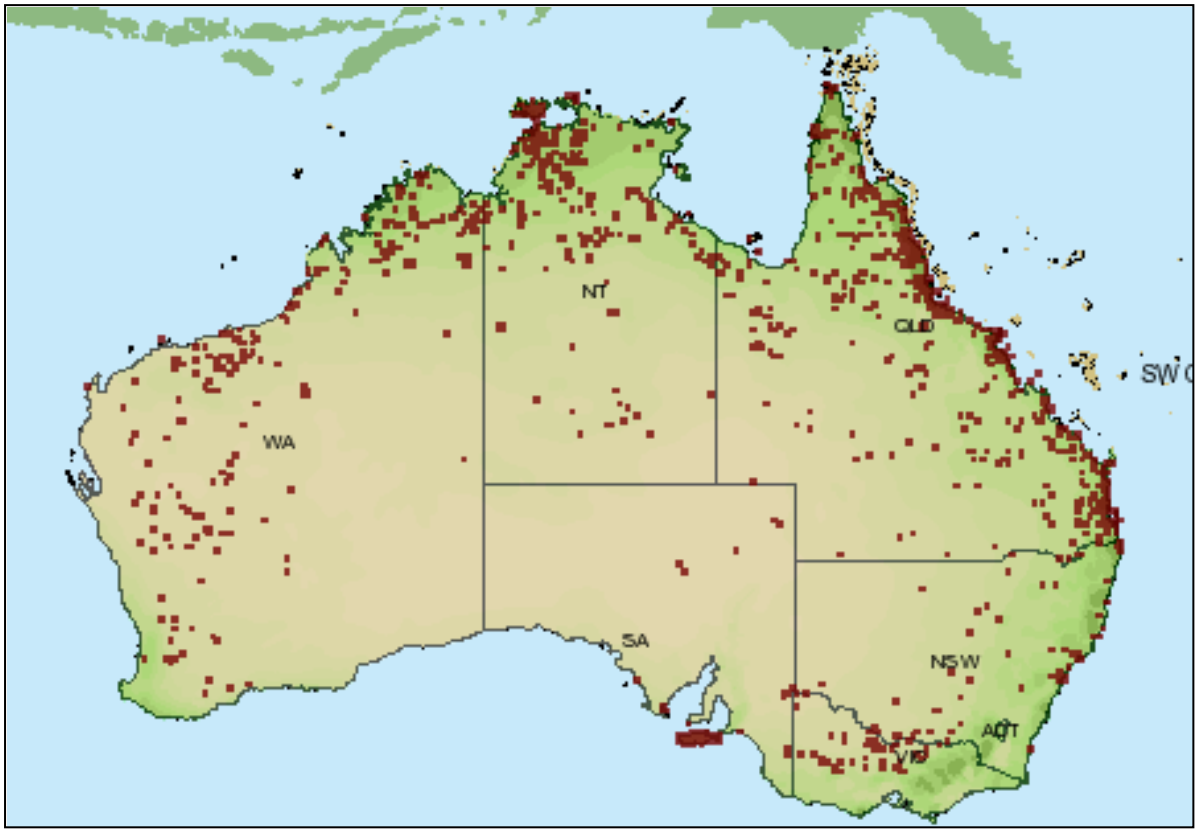

Figure 1: Australian Distribution of Bush Stone-curlew (Birds Australia, 2007).

The species has suffered severe declines in abundance throughout its range in southern, eastern and western Australia which appear to correlate with the distribution of the fox and extent of habitat modification (Marchant and Higgins 1993). It is now rare to absent south and east of the Great Dividing Range between Brisbane, Queensland and Port Fairy, Victoria (Garnett and Crowley 2000, cited in DEC 2006).

The total range size is estimated at 2,570,000 km2 (BirdLife International, 2011).

3.4 INTRODUCED GEOGRAPHIC RANGE

There are no records of this species having been introduced outside its native range.

3.5 POTENTIAL DISTRIBUTION IN TASMANIA

Using modelling applications by the Australian Bureau of Agricultural and Resource Economics and Sciences (DAFF), climate is compared between the species' natural and historical distribution and potential distribution throughout Australia (shown in Figure 2). Modelling indicates that Tasmania has a highly similar climate that may support the establishment of this species (highest score of 8).

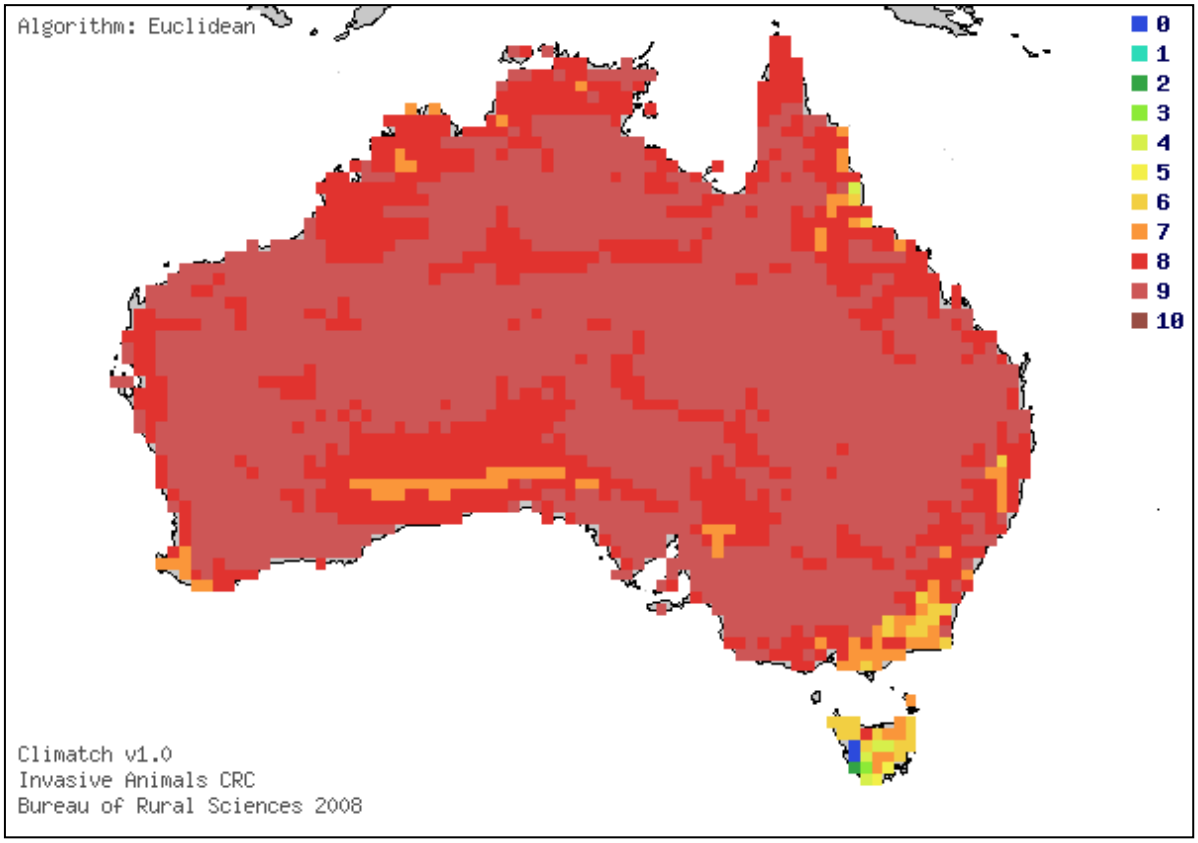

Figure 2: Climate comparison between the historical range of *B. grallarius* and the whole of Australia, where 10 is a perfect match and 0 is having a very dissimilar climate. Tasmania shows a match between 0 and 8 (Distribution source Birds Australia 2007).

3.6 DIET AND FEEDING BEHAVIOUR

Bush Stone-curlews have a generalist diet, foraging on a wide variety of flying and ground-dwelling invertebrates (including locusts and grasshoppers), seeds, small fruit, crustaceans, molluscs, frogs, lizards, snakes and mice (Marchant and Higgins 1993).

Foraging can occur over a wide area, including irrigated paddocks, grasslands, woodlands, domestic gardens, saltmarsh, mangroves, and fields. Birds adopt a heron-like stalking posture when foraging and stab quickly at the ground to catch their prey in soft soil and mud, amongst fallen timber, rotting wood, pebbles and debris (Marchant and Higgins 1993).

3.7 SOCIAL BEHAVIOUR AND GROUPINGS

The Bush Stone-curlew is nocturnal and tends to lie or stand motionless in woodlands during the day.

One of the most detailed studies of Bush Stone-curlew social behaviour determined that home range and movement characteristics differed between resident breeding birds, mobile breeding birds, non-breeding birds and resident first year juveniles (Gates 2001, cited in DEC 2006).

Resident breeding birds remained with their partner and in their home range year round, and had home ranges of 26-64 hectares. Mobile breeding Bush Stone-curlews exhibited different behaviour to resident breeding birds during the non-breeding season. During this time, this group flew long foraging distances, used communal roost sites and had large home ranges of up to 337 hectares. During the breeding season, their home range contracted to approximately 39 hectares (Gates 2001, cited in DEC 2006). It has been suggested that these birds could be first time breeders searching for a suitable breeding territory or that young birds breeding for the first time may not immediately establish year round territories or that suitable habitat was limited.

Non-breeding Bush Stone-curlews are thought to have larger, loosely defined home ranges. They have been recorded roosting communally.

Home range sizes are likely to vary depending on the availability and proximity of roosting, foraging and breeding habitat. In northern Victoria it was estimated that a pair of Bush Stone-curlews may have day roost sites across an area up to 250 hectares, but up to 600 hectares could be used for nocturnal foraging (Johnson and Baker-Gabb 1994, cited in DEC 2006).

3.8 NATURAL PREDATORS AND DISEASE

The most likely predators of Bush Stone-curlews in Tasmania are larger raptors, such as the Wedge-tailed Eagle (*Aquila audax fleayii*). Chicks are likely to be susceptible to predation from the majority of raptors present in Tasmania.

On the Australian mainland the introduced Red Fox (*Vulpes vulpes*) preys on adult and young Bush Stone-curlews and is thought to be a major cause of its decline (Gates 2001, cited in DEC 2006). Other predators include feral and domestic cats and dogs, feral pigs and rats may eat eggs and chicks, with feral pigs also likely to trample on nests (DEC, 2006).

Bush Stone-curlews are prone to many diseases and conditions, with pneumonia a common problem with captive animals. They are also prone to broken legs and bumblefoot[1] (Andrews 2000).

Burhinus species in captivity overseas have been found to suffer a range of diseases. These include avipoxvirus (Lierz *et al.* 1999). Members of this complex of viruses are present in Australia. Captive

[1] Weakness, inflammation, and degradation of the feet in captive bird species

Stone-curlews overseas have also been found to suffer from Cryptosporidiosis, a disease caused by several protozoa; some of these are capable of causing illness in humans.

Mycoplasmosis has been recorded in Stone-curlews overseas, and is known in Australian poultry. However, the specific pathogen identified overseas has not been recorded in Australia. Captive *Burhinus* have also been particularly prone to the fungal infection candidiasis (Andrews 2000).

3.9 THREAT TO HUMAN SAFETY

There are no records of the Bush Stone-curlew causing injury. Like most bird species, Bush Stone-curlews can carry a range of diseases, some with zoonotic potential. Of these, the most serious is cryptosporidiosis. However, this potential has only been demonstrated in species of the same Family overseas; there have been no reported cases in Australia involving the Bush Stone-curlew.

3.10 HISTORY AS A PEST

There is no history of the Bush Stone-curlew as either an agricultural or environmental pest.

3.11 POTENTIAL IMPACT IN TASMANIA

The broad diet of the Bush Stone-curlew suggests that a wide range of invertebrates and small vertebrates could potentially be impacted. These include listed species, such as the Ptunarra Brown Butterfly (*Oreixenica ptunarra*), Tussock skink (*Pseudemoia pagenstecheri*), and Glossy Grass Skink (*Pseudemoia rawlinsoni*). Climate modelling suggests that the Bush Stone-curlew could potentially occupy areas where these species are present.

4. Risk Assessment

4.1 PREVIOUS RISK ASSESSMENTS

No risk assessments for the Bush Stone-curlew have previously been undertaken.

4.2 RISK ASSESSMENT

The following risk assessment determines the risk of the Bush Stone-curlew (*Burhinus gallarius*) to Tasmania using the Bomford model (2008) and proposes assigned threat categories and import classifications for the species.

Species:	**Bush Stone-curlew (*Burhinus gallarius*)**	
Date of Assessment:	December 2011	
Literature search type and date:	See references	
Factor	**Score**	
A1. Risk posed from individual escapees (0-2)	0	*Animal posing a low risk of harm to people (animal that will not make unprovoked attacks causing injury requiring medical attention, and which, even when cornered or handled, is unlikely to cause injury requiring hospitalisation).* Does not make unprovoked attacks and does not cause serious injury.
A2. Risk to public safety from individual captive animals (0-2)	0	*Nil or low risk (highly unlikely or not possible).* Risk arising from irresponsible use of product is low.
Stage A. Risk posed by individual animals (risk that a captive or escape animal would harm people)	**Public Safety Risk Score** = A1 + A2 = 0	**Public Safety Risk Ranking** A ≥ 2, Highly Dangerous A = 1, Moderately Dangerous A = 0, Not Dangerous = Not Dangerous
B1. Climate match score (1-6)	5	Number of squares in Tasmania that are in the top five climate match classes: 20.
B2. Exotic population established overseas score (0-4)	0	None
B3. Overseas range size score (0-2)	1	*1-70 million km²* Range estimated at 2.57 million km²
B4. Taxonomic class score (0-1)	0	Bird
Stage B. Likelihood of establishment (risk that a particular species will establish a wild	**Establishment Risk Score**	**Establishment Risk Ranking** B = 11-13, Extreme

population in Tasmania)	= B1 + B2 + B3 + B4 = 6	B = 9-10, High B = 6-8, Moderate B ≤ 5, Low =MODERATE
C1. Taxonomic group (0-4)	0	Species of a Family with no known pest history or close relatives in Tasmania with which hybridisation could occur.
C2. Overseas range size (0-2)	0	Range of 2.5 million km in Australia and southern PNG.
C3. Diet and feeding (0-3)	0	*Bird.*
C4. Competition for native fauna for tree hollows (0-2)	0	*Does not use tree hollows.*
C5. Overseas environmental pest status (0-3)	0	Never reported as an environmental pest.
C6. Climate match to areas with susceptible native species or communities (0-5)	5	*75% of the geographic range of one or more susceptible native species or ecological communities that are listed as threatened under Tasmanian legislation lies within the mapped area of the six climate match classes (10, 9, 8, 7, 6, and 5).* Ptunarra Brown Butterfly (*Oreixenica ptunarra*), Tussock skink (*Pseudemoia pagenstecheri*), and Glossy Grass Skink (*Pseudemoia rawlinsoni*) could potentially be impacted.
C7. Overseas primary production (0-3)	0	No recorded impact
C8. Climate match to susceptible primary production (0-5)	0	None
C9. Spread disease (1-2)	2	Bird
C10. Harm to property (0-3)	0	No recorded harm to property
C11. Harm to people (0-5)	0	Negligible risk to people
Stage C. Consequence of Establishment (risk that an established population would cause harm)	**Consequence Risk Score** = sum of C1 to C11 =7	**Consequence Risk Ranking** C > 19, Extreme C = 15-19, High C = 9-14, Moderate C < 9, Low = LOW
ASSIGNED THREAT CATEGORY:	**MODERATE**	
PROPOSED IMPORT CLASSIFICATION:	**IMPORT RESTRICTED TO THOSE LICENCE HOLDERS APPROVED FOR KEEPING MODERATE THREAT SPECIES**	

5. Risk Management

This risk assessment concludes that Bush Stone-curlews (*Burhinus grallarius*) are a moderate threat to Tasmania and that imports should be restricted to those licence holders approved for keeping moderate threat species.

As defined under the *Policy and Procedures for the Import, Movement and Keeping of Vertebrate Wildlife in Tasmania* (DPIPWE 2011), the following mandatory conditions will apply to the import and keeping of this species. Additional licences requirements will be implemented.

1. The animal must not be released, or be allowed to escape from effective control.
2. Specimens seized or forfeited as a result of illegal or accidental introductions, where rehousing is not available, will be humanely euthanized.
3. Animal welfare requirements under the *Animal Welfare Act 1993* and any approved Code of Practice or Management Plan must be met.
4. Import only permitted by holders approved to keep the species under licence.
5. Individuals to be micro-chipped or otherwise identified, or treated to allow identification.
6. Facility must meet minimum standards for welfare and security.
7. Facility must be available for inspection at any reasonable time.
8. Audits of facilities and collections.
9. The maximum number of individuals of a species held at the facility to be stipulated on the licence, taking into account relevant factors. Gender may also be stipulated.
10. Written approval prior to movement of animals between facilities and trade of species under licence.
11. Record keeping and reporting to DPIPWE as required by DPIPWE.
12. Collections containing species subject to approval by DPIPWE as meeting best practice for keeping the species concerned.

6. References

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Appendices

APPENDIX A: CALCULATING TOTAL COMMODITY DAMAGE SCORE

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

APPENDIX B: ASSIGNING SPECIES TO THREAT CATEGORIES

A: Danger posed by individual animals (risk a captive or escaped individual would harm people)	**B: Likelihood of establishment** (risk that a particular species will establish a wild population in Tasmania)	**C: Consequence of establishment** (risk that an established population would cause harm)	**Threat category**	**Implications for any proposed import into Tasmania**
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 licence 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	Moderate	Import restricted to those licence holders approved for keeping moderate threat species
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		

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