

# PEST RISK ASSESSMENT

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## Water Buffalo

*Bubalus bubalis*



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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.

**For more information about this Pest Risk Assessment, please contact:**

Wildlife Management Branch

Department of Primary Industries, Parks, Water and Environment

Address: GPO Box 44, Hobart, TAS. 7001, Australia.

Phone: 1300 386 550

Email: [wildlife.reception@dpiuwe.tas.gov.au](mailto:wildlife.reception@dpiuwe.tas.gov.au)

Visit: [www.dpiuwe.tas.gov.au](http://www.dpiuwe.tas.gov.au)

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# I. Summary

The Water Buffalo (*Bubalus bubalis*) is a large bovid that has been domesticated for thousands of years. Feral populations are known to exist well outside the species' natural range of tropical and sub-tropical south and south-east Asia.

Until recently all water buffalo were considered to be the one species. Recent taxonomic revision has defined *B. bubalis* as the domestic Water Buffalo, and *B. arnee* as the Wild Water Buffalo. *B. arnee* has a fragmented distribution in parts of Asia and is listed as an “endangered” species under the IUCN Red List.

This risk assessment considers only the domestic Water Buffalo (*B. bubalis*), and the term ‘Water Buffalo’ refers to this species unless otherwise specified.

Domesticated Water Buffalo occur in all Australian states, where they are used for meat, hide and dairy production. In northern Australia, Water Buffalo are feral pests. The species is noted for causing extensive environmental damage to tropical wetlands and grasslands in Australia and is subject to an ongoing eradication program.

Water Buffalo's impact on Tasmanian biodiversity and agriculture is likely to be significantly limited by climate.

Water Buffalo are considered a ‘serious’ threat under the Vertebrate Pest Committee's threat categorisation and are a ‘controlled animal’ under the Tasmanian *Nature Conservation Act 2002*. This risk assessment concludes that Water Buffalo are a ‘serious’ threat to Tasmania and proposes that imports be restricted to those licence holders approved for keeping serious threat species.

## 2. Introduction

### 2.1 NAME AND TAXONOMY

<b>Kingdom:</b>	Animalia
<b>Phylum:</b>	Chordata
<b>Class:</b>	Mammalia
<b>Order:</b>	Artiodactyla
<b>Family:</b>	Bovidae
<b>Genus:</b>	<i>Bubalus</i>
<b>Species:</b>	<i>B. bubalis</i> (Linnaeus, 1758)



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**Sub-species:** *B. bubalis* has two subspecies, the River Buffalo (*B. bubalis bubalis*) of South Asia, and the Carabao or Swamp Buffalo (*B. bubalis carabanesis*) of the Philippines and Southeast Asia.

**Common names (including industry or trade names):** Water Buffalo, Asian Water Buffalo, Asian Buffalo, Asiatic Buffalo, River Buffalo, Carabao or Swamp Buffalo.

**Known hybrids:** The subspecies of *B. bubalis* may successfully interbreed. *B. bubalis* may also hybridise with the Wild Water Buffalo (*B. arnee*).

**Close relatives:** *B. bubalis* is closely related to the Wild Water Buffalo, *B. arnee*. This species has a fragmented distribution in parts of Asia and is listed as an “endangered” species under the IUCN Red List. Other members of the *Bubalus* genus include Lowland Anoa (*B. depressicornis*), Tamaraw (*B. mindorensis*) and Mountain Anoa (*B. quarlesi*).

### 2.2 DESCRIPTION

Water Buffalo are large bovids, standing 1.5–1.9 metres at the shoulder (Long 2003). Head and body length ranges from 2.4 - 3.6 metres and tail length is approximately 0.6-1.0m (Roth 2004, cited in Jesser *et al.* 2008; Long 2003). Males are usually larger than females and can weigh 1200 kilograms, while females can weigh 800 kilograms (Roth 2004, cited in Jesser *et al.* 2008). Domestic Water Buffalo are often smaller than free-living animals and vary in size between regions. Typical weights for domestic animals range from 250 kilograms for some small animals in China, to 300 kilograms for animals in Burma and 500–600 kilograms for animals in Laos (Ligda 1998, cited in Jesser *et al.* 2008).

Adult buffalo are almost hairless. They are sparsely covered with ash-gray or black hair and their skin varies from black to ash-gray or reddish in colour (Ligda 1998, in Jesser *et al.* 2008). The tail is bushy at the tip. Animals are often covered with mud which can make it difficult to determine skin colour. A black and white variety of Water Buffalo exists in Indonesia (Ligda 1998, cited in Jesser *et al.* 2008). Calves are born fully haired and have a reddish coat that darkens with age (Long 2003).

Both male and females possess horns, although the female's horns are usually smaller. Horns are ribbed, heavy-set at the base, and triangular in cross-section (Roth 2004, cited in Jesser *et al.* 2008).

The horns help distinguish the two subspecies of Water Buffalo: *B. bubalis bubalis* from Western Asia has curled horns while *B. bubalis carabanesis* from Eastern Asia has swept-back horns (DSEWPC 2011). Australia has a mix of both subspecies (although *B. bubalis carabanesis* dominates) and both interbreed despite having a different number of chromosomes (Jesser *et al.* 2008).

## 2.3 CONSERVATION AND LEGAL STATUS

### CONSERVATION STATUS

The IUCN considers *B. bubalis* to be a domestic animal (Hedges *et al.* 2008). The species has an extensive history of domestication and are thought to be one of the earliest domesticated animals in Asia, with evidence of their existence dating from around 4000 BC (Diamond 1997, cited in Jesser *et al.* 2008). Domestic Water Buffalo were introduced to northern Africa around 600 AD, prior to being introduced to Europe in the Middle Ages. Remnant herds of introduced Water Buffalo exist in Italy and Bulgaria (Ligda 1998, cited in Jesser *et al.* 2008).

Australia has approximately 15,000–20,000 head of domestic Water Buffalo (Australian Buffalo Industry Council 2008, cited in Jesser *et al.* 2008). Small numbers of Water Buffalo are farmed for meat and hides in all states, and farming for buffalo milk is an increasing trend.

### LEGAL STATUS

Under the *Environment Protection and Biodiversity Conservation Act 1999*, Water Buffalo are listed as animals suitable for live import and require a permit to import issued under this Act.

The species is classed as a 'serious' threat under the Vertebrate Pests Committee's list of exotic animals (Vertebrate Pests Committee 2007).

Feral Water Buffalo are declared pests in Western Australia under the *Agriculture and Related Resources Protection Act 1976*. North of the 20th parallel, their entry is prohibited, they are subject to eradication, and keeping these animals is prohibited. Elsewhere in the state, animals are to be controlled and possession of Water Buffalo is regulated by a permit system (Jesser *et al.* 2008).

No specific legislation manages Water Buffalo in the Northern Territory, although powers to control the species may be exercised under the *Territory Parks and Wildlife Conservation Act 2005*, the *Stock Diseases Act 2004* and the *Soil Conservation and Land Utilization Act 2001*.

Water Buffalo are listed as 'prohibited fauna' under the *Queensland Nature Conservation Act 1992* and can only be kept under permit.

The species is a 'controlled animal' under the *Tasmanian Nature Conservation Act 2002*.

## 3. Biology and Ecology

### 3.1 LIFE HISTORY

Water Buffalo may breed throughout the year, and most mating occurs in the wet season between October and April. Gestation typically lasts 300-334 days and results in a single young per year; twinning is rare. Calves are weaned at six months of age and reach sexual maturity by two to four years (Long 2003). Individuals have a life span of approximately 25 years in the wild and 29 years in captivity (Roth 2004, cited in Jesser *et al.* 2008). Females can reproduce for 15–18 years, while bulls decline in fertility after 6–7 years (Ingawale & Dhoble 2004; Soysal *et al.* 2005; cited in Jesser *et al.* 2008).

Research in Australia indicates that weaning can be carried out as late as 12 months of age without any effect on the mother's conception times (Ligda 2004, cited in Jesser *et al.* 2008). This suggests that Water Buffalo may have high reproduction rates when nutrition levels are high and predation is low (Roth 2004, cited in Jesser *et al.* 2008).

Sperm storage is not noted in this species. Water Buffalo may successfully hybridise with the Wild Water Buffalo (*B. arnee*), and both subspecies of *B. bubalis* may interbreed.

### 3.2 HABITAT REQUIREMENTS AND PREFERENCES

Water Buffalo are found in wet tropical and subtropical forests, marshes and grasslands and may reach densities of 34 animals per square kilometre (DSEWPC 2011).

The species is heavily dependent on water and wallows in rivers or mud holes. Water Buffalo are more heat-sensitive than other bovids as they have fewer sweat glands, and wallowing in mud helps keep Water Buffalo cool. Mud also helps to protect the animal from biting insects (DSEWPC 2011). When water is scarce, Water Buffalo may be restricted to permanent water sources or may die (Roth 2004, cited in Jesser *et al.* 2008).

The range of Water Buffalo can extend from tropical and subtropical environments provided adequate shelter is available. With suitable protection, farmed Water Buffalo have been able to tolerate most conditions in southern Australia and can be found at elevations of up to 2800 metres in Nepal (Lemke 1994, Roth 2004; cited in Jesser *et al.* 2008).

### 3.3 NATURAL GEOGRAPHIC RANGE

The widespread and long-term domestication of Water Buffalo makes it difficult to determine the natural and historic range of this species and many free-ranging populations may have established from domestic stock. The original range of Water Buffalo is thought to include Southern Asia, India and Sri Lanka. Wild populations have been reported in Nepal, Bengal and Assam, but these are possibly feral animals (Long 2003).

### 3.4 INTRODUCED GEOGRAPHIC RANGE

The species is farmed in many tropical regions where animals would be intentionally fed or sheltered, making it difficult to determine free-living feral populations. Introduced free-ranging populations are noted in Australia, Sri Lanka, Papua New Guinea, Indonesia, Andaman Islands, Tunisia, north-eastern Argentina and Brazil (Long 2003; Jesser *et al.* 2008); further populations are likely to be present in areas where domestic stock have been introduced.

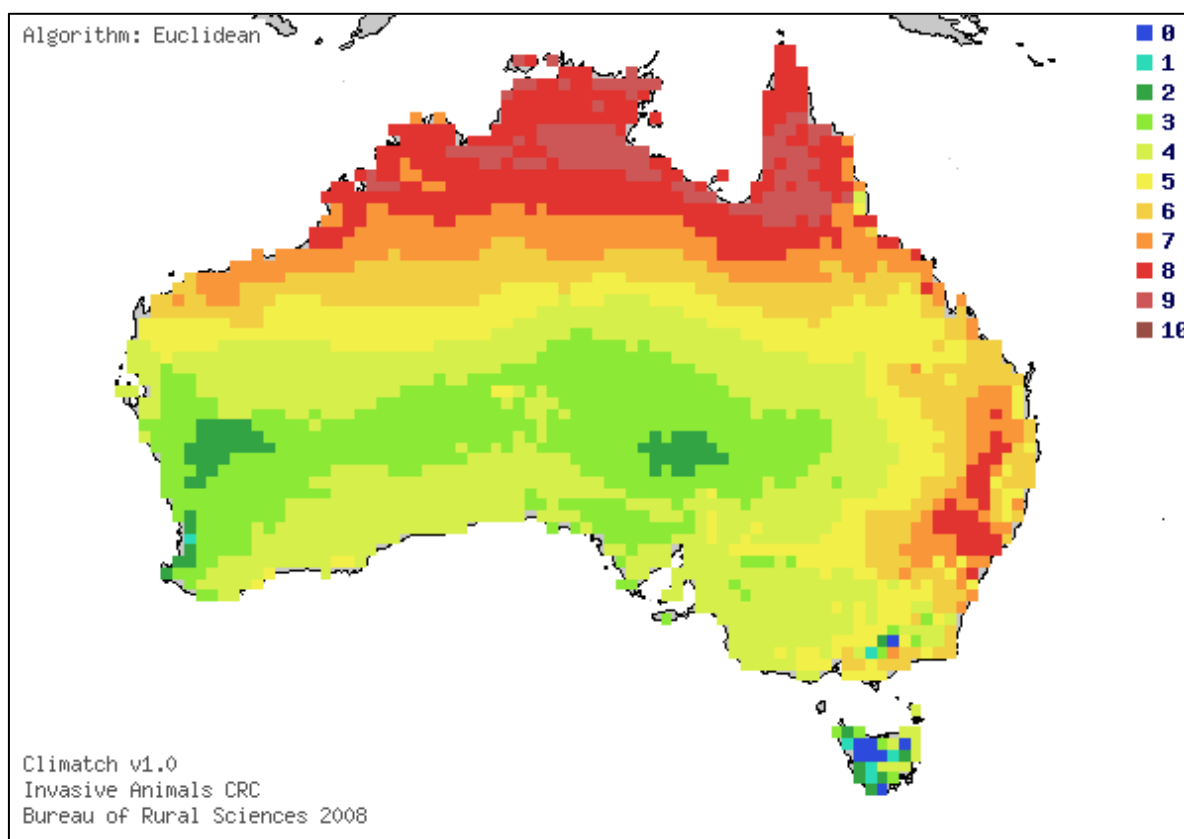
In Australia, feral populations occur in the northern regions of Western Australia, the Northern Territory and Queensland. Water Buffalo were originally introduced to Australia from Timor in the 1820s, with subsequent introductions in the 1840s and 1860s. Large herds of Water Buffalo were established by the mid 1870s (Long 2003).



**Figure 1.** Distribution of feral Water Buffalo in Australia (DEW 2004, cited in Jesser *et al.* 2008).

### 3.5 POTENTIAL DISTRIBUTION IN TASMANIA

Using modelling applications by the Australian Bureau of Agricultural and Resource Economics and Sciences (DAFF), a climate comparison between the species' current distribution and potential Australian distribution is shown in Figure 2. Modelling indicates that Northern and Eastern Australia has areas of similar climate that may support the establishment of introduced Water Buffalo populations. Tasmania's climate is unsuitable (highest climate match score: 4).



**Figure 2.** Climate comparison between the natural range of *B. bubalis* and Australia, where 10 is a 'perfect' climate match and 0 is having a very dissimilar climate. Tasmania shows a match of 0 – 4 (Source: Long 2003; DEH 2004, cited in Jesser *et al.* 2008).

### 3.6 DIET AND FEEDING BEHAVIOUR

Water Buffalo are able to eat a wider range of vegetation than cattle, and are physiologically adapted to eat poor quality feed (Lemke 1994, cited in Jesser *et al.* 2008). The species grazes on a range of grasses and other plants but may also chew bark from trees to obtain minerals (DEH 2004, cited in Jesser *et al.* 2008). Aquatic grasses and grass-like wetland plants are grazed in the wet season while a broader range of food is consumed in the dry season, including grasses, herbs and the leaves of plants like pandanus (DSEWPC 2011). Males may consume up to 30 kilograms of dry matter each day (DSEWPC 2011).

In the wet season, Water Buffalo graze flood plains at dawn and dusk; moving to water around mid-morning to drink and wallow before returning to graze from mid-afternoon until dark. During the dry season, Water Buffalo graze at night, spending most of the day in wallows (DSEWPC 2011).

### 3.7 SOCIAL BEHAVIOUR AND GROUPINGS

Males and females form separate herds during most of the Australian dry season (May–October). Mothers, daughters and calves form clans of about 30 individuals and occupy forested plains that provide food and shade. A clan may have a home range of 170–1000 hectares which may overlap with the range of other clans. At night, clans may come together to rest in a herd of up to 500 animals (Roth 2004, cited in Jesser *et al.* 2008).

Males leave the female herds at the age of three and often form bachelor herds of about 10 individuals. Male herds tend to have slightly greater ranges which overlap those of female clans. Males show a preference for more open plains or areas with drier vegetation. Older males are often solitary, but may occur in female herds year-round. Males ejected from the herds may wander thousands of kilometres in search of new territories (Roth 2004, cited in Jesser *et al.* 2008).

### 3.8 NATURAL PREDATORS AND DISEASE

In Northern Australia, dingoes and crocodiles may prey on young Water Buffalo (DSEWPC 2011). Tasmania has no natural predators capable of preying on Water Buffalo. Wild dogs may opportunistically prey on young calves, but are unlikely to present significant predation pressure in Tasmania.

Water Buffalo are vulnerable to many of the diseases found in cattle (Geering *et al.* 1995, cited in Jesser *et al.* 2008). The species can be a reservoir for bovine tuberculosis, bovine brucellosis and foot-and-mouth disease (Long 2003; Jesser *et al.* 2008). These diseases are not currently found in Australia and are 'Notifiable Diseases' under the Tasmanian *Animal Health Act 1995*. Under this Act, any suspicion of either disease must be reported immediately and the owner must isolate the suspect animal immediately, pending further investigation.

The species is thought to have contributed to the introduction of buffalo fly and cattle tick into Australia (Ford and Tulloch 1982, cited in Long, 2003).

### 3.9 THREAT TO HUMAN SAFETY

Water Buffalo are large bovids that may threaten human safety. Water Buffalo are unlikely to make unprovoked attacks, although individuals may charge and trample humans or inflict damage with their horns. Injuries are likely to be serious and may potentially result in death.

Water Buffalo are unlikely to present a significant disease threat to human safety. The species is vulnerable to many diseases found in cattle, and Tasmania's stringent biosecurity protocols for cattle apply to this species.

### 3.10 HISTORY AS A PEST

Water Buffalo have a significant environmental impact. Water Buffalo are noted for trampling flood plain environments; causing extensive damage to freshwater swamps; eating out native grasses; compacting soil; and changing the structure of monsoon forest (Calder 1981, Considine 1985, Braithwaite *et al.* 1984; cited in Long 2003). Water Buffalo may also spread exotic weeds and change the floristic composition, vegetation structure and micro-topography of floodplains and adjacent communities (Long 2003). Feral populations pose a threat to important wetlands in the Amazon Basin in Brazil (Bambaradeniya *et al.* 2005, cited in Jesser *et al.* 2008).

Water Buffalo may damage the habitat of threatened species. Water Buffalo are noted for trampling the nesting grounds of the rare Pig-nosed Turtle (*Carettochelys insculpta*) on the shores of billabongs and rivers (Georges and Kennett 1990, cited in Long 2003).

Water Buffalo also cause damage to agriculture by overgrazing and trampling pasture, damaging farm trails and contributing to soil erosion and salinity problems (Long 2003). In Sri Lanka, Water Buffalo damage various agricultural crops, mainly in the dry zone (Thornback 1983, Kane 1989; cited in Jesser *et al.* 2008).

### 3.11 POTENTIAL IMPACT IN TASMANIA

Climate modelling suggests that Tasmania is unsuitable for Water Buffalo populations, however should a population establish in Tasmania, extensive damage to agriculture and the environment could occur. A feral population could be expected to trample and graze agricultural pasture and cause damage to agricultural infrastructure, and contribute to the decline of threatened species and vegetation communities through grazing, trampling and soil compaction. Wetlands, riverine and grassland environments in the northeast of the State are likely to be at risk.

## 4. Risk Assessment

### 4.1 PREVIOUS RISK ASSESSMENTS

The species has been previously assessed by the Queensland Department of Primary Industries and Fisheries (refer Jesser *et al.* 2008). Water Buffalo have been assessed by the Vertebrate Pest Committee and classed as a 'serious' threat (Vertebrate Pests Committee 2007).

### 4.2 RISK ASSESSMENT

The following risk assessment determines the risk of Water Buffalo to Tasmania using the Bomford model (2008) and proposes assigned threat categories and import classifications for the species.

Species:	Water Buffalo ( <i>Bubalus bubalis</i> )	
Date of Assessment:	October 2011	
Literature search type and date:	See references	
Factor	Score	
A1. Risk posed from individual escapees (0-2)	2	<i>Animal that is capable of causing serious injury (requiring hospitalisation) or fatality.</i>
A2. Risk to public safety from individual captive animals (0-2)	0	<i>Nil or low risk (highly unlikely or not possible).</i> The risk to public safety from irresponsible use of products obtained from Water Buffalo is low.
<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 = 2	<b>Public Safety Risk Rank</b> A ≥ 2, Highly Dangerous A = 1, Moderately Dangerous A = 0, Not Dangerous = Highly Dangerous
B1. Climate match score (1-6)	0	<i>Low climate match score.</i> Sum of squares for classes 10 to 6: 0 (Very Low).
B2. Exotic population established overseas score (0-4)	4	<i>Exotic populations established on a continent.</i> Free-ranging populations noted in Australia, Sri Lanka, Papua New Guinea, Indonesia, Andaman Islands, Tunisia, north-eastern Argentina and Brazil.
B3. Overseas range size score (0-2)	1	<i>Overseas range class of 1-70 million km, (includes current and past 1000 years, natural and introduced range.</i> Range is estimated to be >5 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	<b>Establishment Risk Rank</b> B = 11-13, Extreme B = 9-10, Serious

	= 6	B = 6-8, Moderate B ≤ 5, Low = Moderate
C1. Taxonomic group (0-4)	4	Mammal of the Artiodactyla order and Bovidae family.
C2. Overseas range size (0-2)	0	Overseas geographic range class <10 million km <sup>2</sup> ..
C3. Diet and feeding (0-3)	3	Mammal that is primarily a grazer.
C4. Competition for native fauna for tree hollows (0-2)	0	Does not use tree hollows.
C5. Overseas environmental pest status (0-3)	3	Major environmental pest in any country or region. Water Buffalo can cause significant environmental impact by trampling flood plain environments; causing extensive damage to freshwater swamps; eating out native grasses; compacting soil; and changing the structure of monsoon forest and wetlands.
C6. Climate match to areas with susceptible native species or communities (0-5)	0	No grid squares within the highest six climate match classes.
C7. Overseas primary production (0-5)	1	Minor pest of primary production in any country or region. Water Buffalo are commonly used in farming but can be a pest to agriculture by overgrazing and trampling pasture and contributing to soil erosion and salinity problems.
C8. Climate match to susceptible primary production (0-5)	1	Climate match to susceptible primary production: 1.
C9. Spread disease (1-2)	2	Mammal.
C10. Harm to property (0-3)	0	Total annual dollar value of damage if the exotic species established throughout the area which it has a climate match within the highest six classes (classes 10 to 5): \$0.
C11. Harm to people (0-5)	4	Injuries or harm severe or fatal but few people at risk. Water Buffalo are unlikely to make unprovoked attacks, although may charge and trample humans or inflict damage with their horns. Injuries are likely to be serious and may potentially result in death.
<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 = 18	<b>Consequence Risk Ranking</b> C > 19, Extreme C = 15-19, High C = 9-14, Moderate C < 9, Low = High
<b>ASSIGNED THREAT CATEGORY:</b>	<b>SERIOUS</b>	
<b>PROPOSED IMPORT CLASSIFICATION:</b>	<b>IMPORT RESTRICTED TO THOSE COLLECTIONS APPROVED FOR KEEPING SERIOUS THREAT SPECIES</b>	

## 5. Risk Management

This risk assessment concludes that Water Buffalo (*Bubalus bubalis*) are a serious threat to Tasmania and that imports be restricted to those license holders approved for keeping serious threat species. On the basis of this risk assessment, it is recommended that Water Buffalo be placed on the list of imports permitted with conditions.

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 conditions may be required.

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.
13. Bonds, insurance or cost recovery systems.
14. Import of serious threat species will generally be prohibited unless sufficient measures exist for the secure housing and on-going management of the species. Species kept solely for:
  - Public display and education purposes approved by DPIPWE and/or
  - Genuine scientific research approved by DPIPWE and/or
  - Domestic farming for the purposes of dairy or meat production approved by DPIPWE.

Specific requirements for fencing will apply to the import and keeping of this species. Animals must be housed within fencing that must consist of a minimum of 1 solid post sunk to a depth of 60 cm every 6 meters with a minimum of 5 droppers between posts. Wire must consist of either 3 strands of standard wire and 3 strands of wire electrified with a minimum of 4,000 volts or 6 strands of six strand barbed wire.

## 6. References

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## 7. 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	1	1	11
<b>Timber (includes native and plantation forests)</b>	10	N/A		
<b>Aquaculture</b>	6	N/A		
<b>Sheep (includes wool and meat)</b>	5	1	1	5
<b>Vegetables</b>	5	N/A		
<b>Fruit (includes wine grapes)</b>	5	N/A		
<b>Poultry (including eggs)</b>	1.5	NA		
<b>Cereal grain (includes wheat, barley, sorghum etc)</b>	1	N/A		
<b>Other crops and horticulture (includes nuts and flowers)</b>	1	2	1	2
<b>Pigs</b>	1	N/A		
<b>Bees (includes honey, beeswax, and pollination)</b>	0.5	N/A		
<b>Oilseeds (includes canola, sunflower etc)</b>	0.5	N/A		
<b>Grain legumes (includes soybeans)</b>	0.3	N/A		
<b>Other livestock (includes goats and deer)</b>	0.3	1	1	0.3
<b>Total Commodity Damage Score (TCDS)</b>				18.3

## 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	Serious		
Highly, Moderately or Not Dangerous	Extreme	Moderate		
Highly, Moderately or Not Dangerous	Extreme	Low		
Highly, Moderately or Not Dangerous	Serious	Extreme		
Highly, Moderately or Not Dangerous	Serious	Serious		
Highly, Moderately or Not Dangerous	Moderate	Extreme		
Highly, Moderately or Not Dangerous	Serious	Moderate	Serious	Import restricted to those collections approved for keeping serious threat species
Highly, Moderately or Not Dangerous	Serious	Low		
Highly, Moderately or Not Dangerous	Moderate	Serious		
Highly Dangerous	Moderate	Moderate		
Highly Dangerous	Moderate	Low		
Highly, Moderately or Not Dangerous	Low	Extreme		
Highly, Moderately or Not Dangerous	Low	Serious		
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		



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Department of Primary Industries, Parks,  
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GPO Box 44, Hobart 7001

Ph: 1300 368 550

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Visit: [www.dpiuwe.tas.gov.au](http://www.dpiuwe.tas.gov.au)