PEST RISK ASSESSMENT

Carpet Python

Morelia spilota

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

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.

1. Summary

The Carpet Python (*Morelia spilota*) is the most widespread Australian python and is found in areas of all States and Territories of mainland Australia and some offshore islands. The species occupies a broad range of habitats and is found in lowland forest, shrubland, grassland and rocky areas of various altitudes and temperature ranges. Carpet Pythons are also common to highly altered environments such as agricultural and urban areas, and show significant variation in colour and markings, particularly between sub-species.

Carpet Pythons have not established feral populations outside their natural range and are not noted for causing environmental impacts. In suburban areas, Carpet Pythons are noted as a minor pest and may consume aviary birds and their eggs and some domestic pets (eg. cats). Climate modelling suggests that Tasmania's climate is moderately similar to the native range of this species.

The Carpet Python is listed as 'least concern' on the IUCN Red List of Threatened Species and is commonly traded as a commercial pet internationally and in Australia. This species is listed under Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Under the *Environment Protection and Biodiversity Conservation Act 1999*, Carpet Pythons are listed as 'specimens taken to be suitable for live import' and require a permit to import into Australia issued under this Act.

In Tasmania, Carpet Pythons are controlled animals under the *Nature Conservation Act 2002*.

This risk assessment concludes that Carpet Pythons are a serious threat to Tasmania and proposes that imports be restricted to those licence holders approved for keeping serious threat species.

2. Introduction

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2.1 NAME AND TAXONOMY

Kingdom: Animalia

Phylum: Chordata

Class: Reptilia

Order: Squamata

Family: Pythonidae

Genus: *Morelia*

Species: *M. spilota.*

Sub-species or variety (if applicable): Eight sub-species are noted: *M.s.cheynei*, *M.s.harrisoni*, *M.s.imbricata*, *M.s.macrospila*, *M.s.mcdowelli*, *M.s.metcalfei*, *M.s.spilota* and *M.s.variegata* (Shine and Allison 2010).

Common names (including any industry or trade names): Carpet Python, Diamond Python, Western Australian Carpet Python, Carpet Snake, Jungle Python, Darwin Carpet Python. The taxonomy of this species is currently debated and may affect the common name of this species.

Known hybrids: Multiple cases of hybridisation between the sub-species have been recorded, although successful hybridisation between Carpet Pythons and other species has not been noted. Male Carpet Pythons reportedly bred with female Scrub Pythons (*Morelia amethistina*) and Water Pythons (*Liasis fuscus*) in captivity in the late 1970s, although offspring were not viable (Hoser 1988).

Close relatives: Other members of the genus *Morelia* include *M. amethistina* (Amethyst Python; Scrub Python), *M. carinata* (Rough-scaled Python), *M. oenpelliensis* (Oenpelli Rock Python), *M. viridis* (Green Python) (Wilson and Swan 2010).

2.2 DESCRIPTION

Carpet Pythons can reach 2.5m in length and show significant variation in colour and markings, particularly between sub-species (Wilson and Swan 2010). Carpet Pythons are generally patterned with blotched markings or stripes of contrasting colours, and colours vary from black, grey, orange-red, brown, olive green to yellow. Refer to Wilson and Swan (2010) for identification of the sub-species.

Carpet Pythons have a row of deep pits along the lower jaw and have small fragmented head scales which can help distinguish this species (Wilson and Swan 2010; Queensland Museum 2011).

2.3 CONSERVATION AND LEGAL STATUS

CONSERVATION STATUS

The Carpet Python is listed as 'least concern' on the IUCN Red List of Threatened Species. The species has a large distribution and is tolerant of a broad range of habitats, including urban areas. Some localised declines have been noted.

Carpet Pythons are commonly traded as commercial pets internationally and in Australia, although collection from the wild is considered minimal (Shine and Allison 2010).

LEGAL STATUS

This species is listed under Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Shine and Allison 2010). The international trade of this species is controlled under this convention.

Under the *Environment Protection and Biodiversity Conservation Act 1999*, Carpet Pythons are listed as 'specimens taken to be suitable for live import' and require a permit to import into Australia issued under this Act. Eligible imports are for non-commercial purposes only (i.e. zoos) and exclude household pets.

In Tasmania, Carpet Pythons are controlled animals under the *Nature Conservation Act 2002*.

3. Biology and Ecology

3.1 LIFE HISTORY

Mating in Carpet Pythons in Australia occurs between June and January. Following mating, a clutch of about 15-25 (max. 52) eggs is laid which are incubated for approximately 52-75 days (Greer 1995; Wilson and Swan 2010). Carpet Pythons exhibit maternal care and females coil around their eggs and guard them until they hatch. Eggs are concealed in sheltered sites, such as beneath building materials, between hay bales, in a hollow stump or in a depression in the ground (Queensland Museum 2011). Females leave the eggs to bask, and heat obtained from basking is transferred to the clutch so that the eggs are kept at about 30°C. Females may also raise the temperature of the eggs by shivering. Maternal care ceases once the eggs hatch and the young disperse. At hatching, Carpet Pythons are about 40cm in length and weigh between 22-26g (Wilson and Swan 2010; Lourdais *et al.* 2007, Neil *et al.* 1985).

Anecdotal reports suggest breeding is dependent on body size, and breeding typically commences at three years of age in females and two years of age in males. Sperm storage is not noted in this species.

3.2 HABITAT REQUIREMENTS AND PREFERENCES

Carpet Pythons have broad habitat tolerance (Wilson and Swan 2010). Generally, the species can be found in dense moist lowland forest, shrubland, grassland and rocky areas of various altitudes and temperature ranges. This species is also common to highly altered environments, such as agricultural and urban areas, and is noted for using tree hollows (Shine and Allison 2010; Gibbons and Lindenmayer 2002).

3.3 NATURAL GEOGRAPHIC RANGE

Carpet Pythons are the most widespread Australian python species (Torr 2000 cited in Shine and Allison 2010). As shown in Figure 1, Carpet Pythons can be found in areas of all States and Territories of mainland Australia, and the species is also present on offshore islands in Western Australia, South Australia and the Torres Strait. Populations may be present in New Guinea (Wilson and Swan 2010).
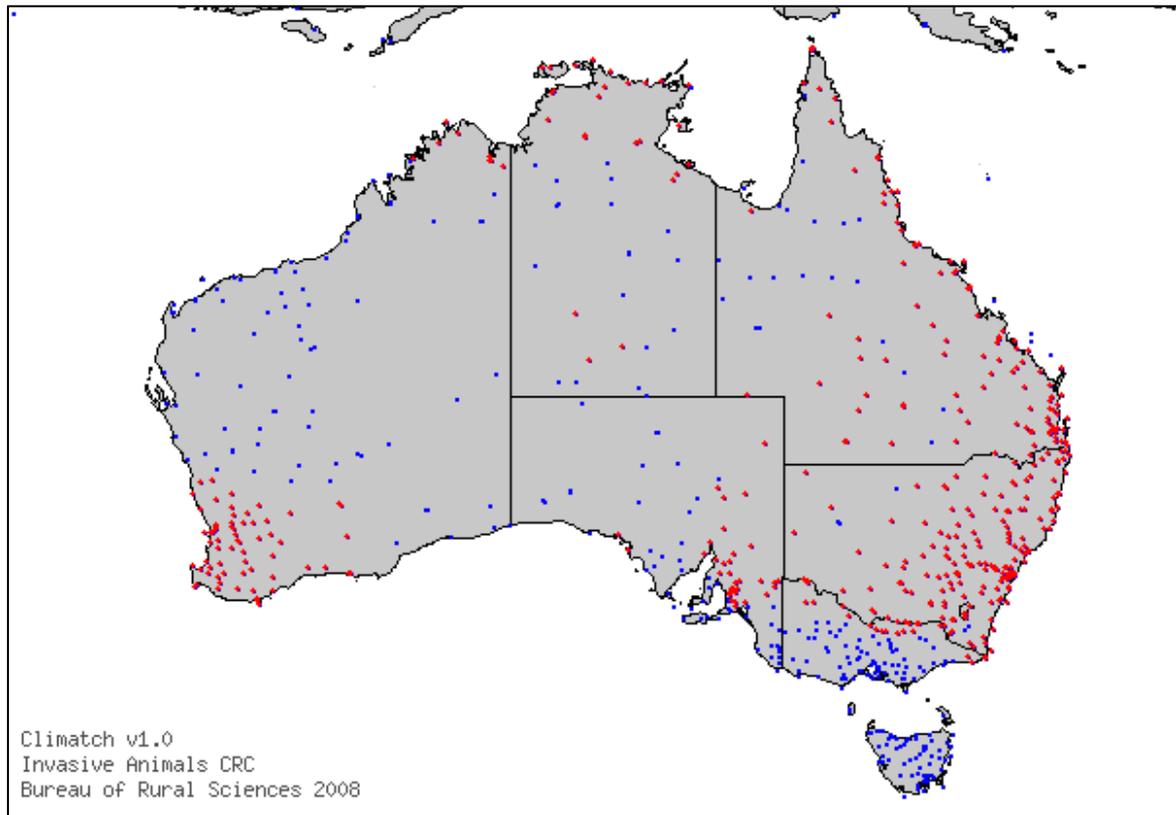
Figure 1. Natural range of Carpet Pythons, shown in red (distribution from Wilson and Swan 2010).

3.4 INTRODUCED GEOGRAPHIC RANGE

This species is not noted for establishing feral populations outside its natural range and is not listed on the Global Invasive Species Database list of the world's worst 100 invasive species (GISP 2005).

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's climate is moderately similar, with some areas of highly similar climate.
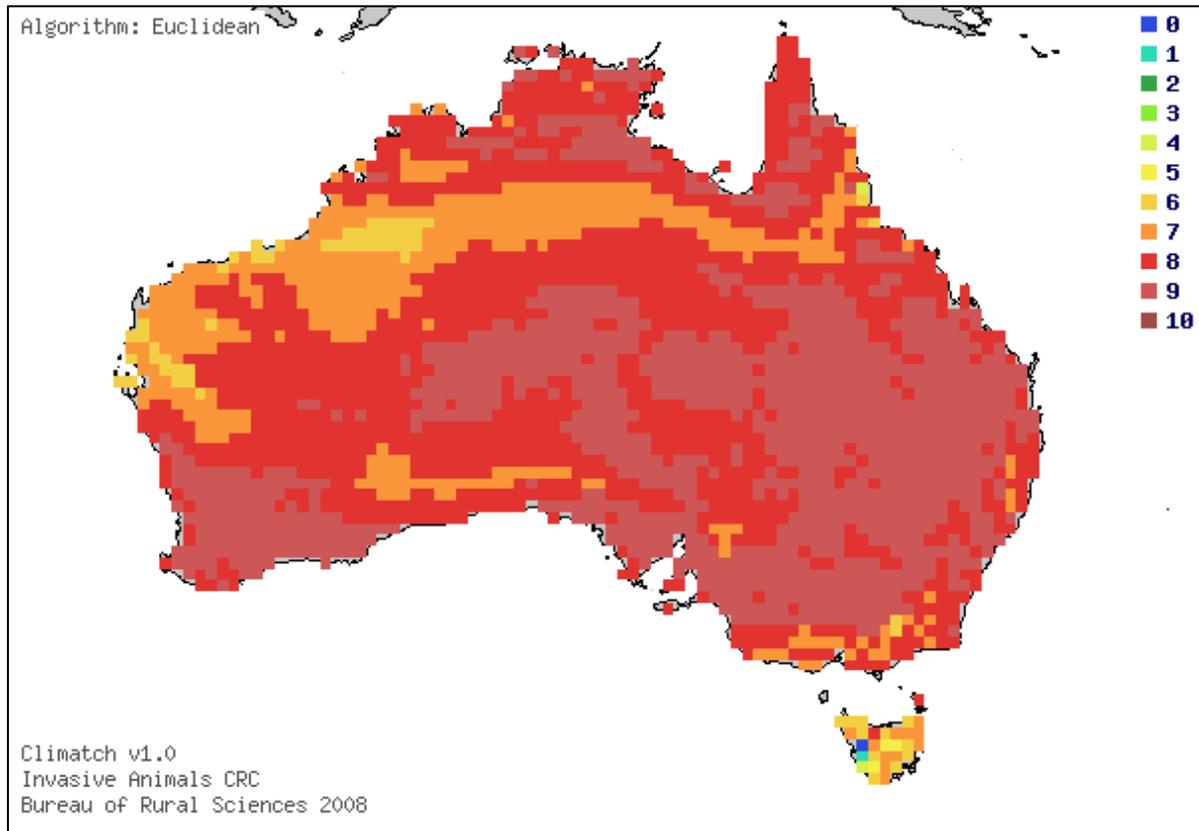
Figure 2. Climate comparison between the historical range of Carpet Pythons and the whole of Australia, where 10 is a 'perfect' match and 0 is having a very dissimilar climate. Tasmania shows a moderate match (highest score: 8) (Distribution source: Wilson and Swan 2010).

3.6 DIET AND FEEDING BEHAVIOUR

Carpet Pythons are ambush predators. Pythons are able to locate prey from chemical cues using their forked tongue, and heat sensitive pits on the head are also used to detect warm blooded animals. Pythons are non-venomous and kill prey via constriction, enveloping and suffocating prey in tight coils (Wilson and Swan 2010).

Mammals are a primary food source for Carpet Pythons. Typically, small mammals are consumed, such as rats, mice, possums, sugar gliders, bandicoots and rabbits, although larger individuals may consume bigger prey such as wallabies. Carpet Pythons also eat insects, frogs, birds and bird eggs, lizards and other snakes (Slip and Shine 1988).

Carpet Pythons persist in urban and suburban environments and may prey on Black Rats, Swamp Rats, House Mice, pigeons, Brushtail Possums and fruit bats. Domestic pets may also be consumed, including aviary birds, chickens, ducks, turkeys and guinea pigs. Larger pythons may also take cats; one notable record is of a Carpet Python lying in ambush on a cat's bed (Fearn *et al.* 2001).

3.7 SOCIAL BEHAVIOUR AND GROUPINGS

Behaviour varies significantly between the sub-species, which is quite unusual between races of one species (Wilson and Swan 2010). Male Eastern Carpet Pythons (*M. s. mcdowelli*) have been observed fighting in spring, while male Diamond Pythons (*M. s. spilota*) will aggregate near a receptive female and are highly tolerant of each other (Wilson and Swan 2010).

Temperament also varies between individuals. Some may allow themselves to be handled, while others may hiss loudly and strike with an open mouth when approached (Wilson and Swan 2010).

3.8 NATURAL PREDATORS AND DISEASE

Carpet Pythons are likely to have a range of predators, particularly as juveniles, including birds of prey, foxes, large monitors, cats and dingoes. In Tasmania, potential predators include Tiger Snakes (*Notechis scutatus*), Spotted-tailed Quolls (*Dasyurus maculatus*), birds of prey such as eagles and hawks, feral cats and, should it become established, the introduced European Red Fox (*Vulpes vulpes*).

Limited literature is available detailing diseases specific to this species. Carpet Pythons are commonly infested with parasites such as ticks and tapeworms although the impact of parasites on this species is largely unknown (Krefft 1869 cited in Hoser 1982). Inclusion body disease has been noted in captive specimens of two sub-species of Carpet Python, *M. spilota variegata* and *M. s. spilota* (Carlisle *et al.* 1988). This disease is caused by a retrovirus and is found worldwide, although it is mainly a disease of boas and pythons. The disease has been diagnosed in captive pythons throughout Australia, although there is no evidence that the disease is present in wild populations of Australian snakes (AWHN 2009).

3.9 THREAT TO HUMAN SAFETY

There is potential for this species to cause human injury. Anecdotal reports suggest the temperament of individuals varies significantly; individuals may lunge and can inflict a painful bite with the potential for moderate injury. Attacks can be unprovoked and may require medical attention or cause severe discomfort.

A health risk commonly associated with reptiles is salmonellosis; a diseased caused by *Salmonella* bacteria (AWHN 2010). This disease is spread in the animal's faeces, but can be prevented by simple hygiene measures. Salmonellosis is a notifiable disease under the Tasmanian *Animal Health Act 1995*.

3.10 HISTORY AS A PEST

There is no noted evidence of Carpet Pythons being introduced or forming populations outside their natural range. No damage to the environment has been noted. Carpet Pythons are commonly found in agricultural areas, although impacts to agriculture have not been noted. Carpet Pythons

are noted as a minor pest in suburban environments and may consume aviary birds and their eggs, and domestic pets (Fearn *et al.* 2001).

3.11 POTENTIAL IMPACT IN TASMANIA

Carpet Pythons are not noted for causing environmental impacts. Climate modelling suggests that Tasmania's climate is moderately suitable for this species, with some areas of a highly similar climate. Should a population establish in Tasmania, Carpet Pythons have the potential to prey upon a wide variety of native and threatened fauna, including the New Holland Mouse (*Pseudomys novaehollandiae*) which is a listed species under the Tasmanian *Threatened Species Protection Act 1995*.

4. Risk Assessment

4.1 PREVIOUS RISK ASSESSMENTS

No formal risk assessments have been noted for this species.

4.2 RISK ASSESSMENT

The following risk assessment determines the risk of the Carpet Python (*Morelia spilota*) to Tasmania using the Bomford model (2008) and proposes assigned threat categories and import classifications for this species.

Species:	Carpet Python (*Morelia spilota*)	
Date of Assessment:	January 2012	
Literature search type and date:	See references	
Factor	**Score**	
A1. Risk posed from individual escapees (0-2)	1	*The animal can make unprovoked attacks causing moderate injury (requiring medical attention) or severe discomfort but is highly unlikely (few if any records) to cause serious injury (requiring hospitalisation) if unprovoked.* *Temperament varies between individuals. Carpet Pythons can make unprovoked attacks and may inflict a painful bite.*
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 = 1	**Public Safety Risk Ranking** A ≥ 2, Highly Dangerous A = 1, Moderately Dangerous A = 0, Not Dangerous = Moderately Dangerous
B1. Family random effect value	-0.08	*Pythonidae.*
B2. Proportion of introduction events that led to species establishment (Prop.species value)	0.066	*There are no records of this species, or the genus, being introduced into new areas. At the family level, 4 out of 61 attempts by related species were successful.*
B3. S(Climate 6 value)	1.52	*Climate 6 Score: 0.8.*

Stage B. Likelihood of establishment (risk that a particular species will establish a wild population in Tasmania)	Establishment Risk Score = $1/(1 + \exp(0.80 - 2.90$ (Prop. species) $- S($Climate6$) -$ Family Random Effect$))$ =1/(1+EXP(0.8-2.9*(0.066)-(1.52)-(-0.08))) = 0.696	Establishment Risk Ranking B = ≥0.86, Extreme B = 0.40-0.85, High B = 0.17-0.39, Moderate B = ≤ 0.16, Low = High
C1. Taxonomic group (0-4)	0	*Other group.*
C2. Overseas range size (0-2)	0	*Range <10 million km².*
C3. Diet and feeding (0-3)	0	*Not a mammal.*
C4. Competition for native fauna for tree hollows (0-2)	2	*Can nest or shelter in tree hollows.*
C5. Overseas environmental pest status (0-3)	0	*Never reported as an environmental pest in any country or region.*
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 that are listed as threatened under Tasmanian legislation occurs within the mapped areas of the six highest climate match classes.* *The entire Tasmanian range of the New Holland Mouse occurs within the highest six climate match classes. The range of many other threatened species would also be included.*
C7. Overseas primary production (0-3)	0	*No reports of damage to crops or primary production in any country or region.*
C8. Climate match to susceptible primary production (0-5)	1	*Total Commodity Damage Score (TCDS): 6.*
C9. Spread disease (1-2)	1	*Reptile.*
C10. Harm to property (0-3)	0	*<$100,000 per year.*
C11. Harm to people (0-5)	2	*Injuries or harm or annoyance likely to be minor and few people exposed.*
Stage C. Quantitative Consequence Assessment	Consequence Risk Score = sum of C1 to C11 = 11	Consequence Risk Ranking C > 19, Extreme C = 15-19, High C = 9-14, Moderate C < 9, Low = Moderate

Adverse impacts	In suburban environments, Carpet Pythons are noted as a minor pest and may consume aviary birds and their eggs, and some domestic pets (e.g. cats).
Close relatives with similar behavioural and ecological strategies that have had adverse impacts elsewhere	No immediate relatives in Australia known to cause adverse impacts. Other python species (e.g. Burmese Python) are known to have a significant adverse impact.
Dietary generalists	This species is carnivorous.
Stir up sediments to increase turbidity in aquatic habitats	Aquatic habitats are not the preferred habitat type for this species.
Occur in high densities in their native or introduced range	This species occurs in low densities in its native range.
Have the potential to cause poisoning and/or physical injury	This species is not poisonous but has the potential to cause moderate human injury requiring medical attention by inflicting painful bites. Serious injury (requiring hospitalisation) is highly unlikely.
Harbour or transmit diseases or parasites that are present in Australia	This species may harbour salmonella bacteria and parasites such as ticks and tapeworms.
Have close relatives among Australia's endemic reptiles and amphibians	This species is endemic to Australia and is closely related to *M. amethistina* (Amethyst Python; Scrub Python), *M. carinata* (Rough-scaled Python), *M. oenpelliensis* (Oenpelli Rock Python), *M. viridis* (Green Python). There are no close relatives in Tasmania.
Are known to have spread rapidly following their release into new environments	This species is not noted for establishing feral populations outside its natural range.
Stage C. Qualitative Consequence Assessment	Based on the qualitative consequence assessment, the estimated consequence of Carpet Python establishing in Tasmania is MODERATE.
Stage C. Consequence of Establishment (risk that an established population would cause harm)	Quantitative Consequence: Serious Qualitative Consequence: Moderate **Highest Consequence Assessment: Serious**
ASSIGNED THREAT CATEGORY:	**SERIOUS**
PROPOSED IMPORT CLASSIFICATION:	**IMPORT RESTRICTED TO THOSE LICENCE HOLDERS APPROVED FOR HANDLING SERIOUS THREAT SPECIES**

5. Risk Management

This risk assessment concludes that Carpet Pythons (*Morelia spilota*) are a serious threat to Tasmania and that imports be restricted to those licence holders approved for keeping serious threat species. On the basis of this risk assessment, it is recommended that this species 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 there is a clear public benefit and 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.

6. References

Australian Wildlife Health Network (2010). *Salmonellosis in reptiles in Australia – Fact Sheet.* <http://www.wildlifehealth.org.au> (Accessed 21 November 2011).

Australian Wildlife Health Network (2009). *Inclusion Body Disease in Australian Snakes – Fact Sheet.* <http://www.wildlifehealth.org.au> (Accessed 25 January 2012).

Carlisle-Nowak, M.S., Sullivan, N., Carrigan, M., Knight, C., Ryan, C. and Jacobson, E.R. (1988). Inclusion body disease in two captive Australian pythons (*Morelia spilota variegata* and Morelia spilota spilota). *Australian Veterinary Journal* 76: 98-100.

Charles, N., Field, R. and Shine, R. (1985). Notes on the reproductive biology of Australian pythons, Genera *Aspidites*, *Liasis* and *Morelia*. *Herpetological Review* 16(2): 45-48.

Fearn, S. Robinson, B., Sambono, J. and Shine, R. (2001). Pythons in the pergola: the ecology of 'nuisance' carpet pythons (*Morelia spilota*) from suburban habitats in south-eastern Queensland. *Wildlife Research* 28: 573-579.

Gibbons, P. and Lindenmayer, D. (2002). *Tree hollows and wildlife in Australia.* CSIRO Publishing, Australia.

GISP (2005) Global Invasive Species Database. <http://www.issg.org/database> (Accessed 8 December 2011).

Greer, A. (1997). *The Biology and Evolution of Australian Snakes*. Surrey Beatty & Sons, Chipping Norton, N.S.W.

Hoser, R.T. (1988). Problems of hybrid pythons and python classification. *Litteratura Serpentium* (Journal of the Dutch Snake Society) 8 (3): 134-139.

Hoser, R.T. (1982). Australian Pythons (part 4), Genus *Morelia* and *Python carinatus*, followed by discussions on the taxonomy and evolution of Australasian Pythons. *Herptile* 7 (2): 2-17.

Queensland Museum (2011). Carpet Snake or Carpet Python – Morelia spilota. <http://www.qm.qld.gov.au> (Accessed 17 January 2012).

Shine, R.A. and Allison, A. (2010). *Morelia spilota*. In: IUCN 2010. *IUCN Red List of Threatened Species*. Version 2011.2. <www.iucnredlist.org>. (Accessed 8 December 2011).

Slip, D.J. and Shine, R. (1988). Habitat use, movements and activity patterns of free-ranging Diamond Pythons, *Morelia spilota spilota* (Serpentes: Boidae): a radiotelemetric study. *Australian Wildlife Research* 15: 515-531.

Wilson, S. and Swan, G. (2010). *A complete guide to reptiles of Australia* (Third Ed.). Reed New Holland Publishers, Australia.

7. 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	1	4	6
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)				6

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		