

# THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

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The Minister approved this conservation advice and included this species in the Vulnerable category, effective from 11/05/2021

## Conservation Advice

### *Trichosurus vulpecula arnhemensis*

Northern Brushtail Possum

#### **Taxonomy**

Generally accepted as *Trichosurus vulpecula arnhemensis* (Collet 1897). The Northern Brushtail Possum is a subspecies of *T. vulpecula*.

There has been contention as to whether the Northern Brushtail Possum is a separate species or a subspecies. Ride (1970) elevated it to species status as *T. arnhemensis*, which was subsequently recognised by some authors. However, a recent analysis of genetic variation in *Trichosurus* concluded that *Trichosurus vulpecula arnhemensis* should be recognised as a valid subspecies (Woinarski et al. 2014). The subspecies status is accepted by the Australian Faunal Directory and elsewhere (as detailed in Jackson & Groves 2015).

The number of subspecies of *T. vulpecula* is currently unresolved. Woinarski et al. (2014) recognises three subspecies, however Jackson & Groves (2015) and the Australian Faunal Directory recognise six.

#### **Summary of assessment**

##### **Conservation status**

The highest category for which *Trichosurus vulpecula arnhemensis* is eligible to be listed is Vulnerable.

*Trichosurus vulpecula arnhemensis* has been found to be eligible for listing under the following categories:

Criterion 1: A2, (a)(c)(e): Vulnerable

Species can be listed as threatened under state and territory legislation. For information on the listing status of this species under relevant state or territory legislation, see

<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

##### **Reason for conservation assessment by the Threatened Species Scientific Committee**

This advice follows assessment of new information provided to the Department as part of the process to systematically reviewing species that are inconsistently listed under the EPBC Act and relevant State or Territory legislation to list Northern Brushtail Possum.

##### **Public consultation**

Notice of the proposed amendment and a consultation document was made available for public comment for 30 business days between 2 December 2019 and 24 January 2020. Any comments received that were relevant to the survival of the species were considered by the Committee as part of the assessment process.

## **Species/sub-species information**

### **Description**

The Northern Brushtail Possum has a body length of approximately 35–55cm and a tail length of 25–40cm. The coat is typically grey in colour, however variations can include reddish brown, copper or chocolate brown. The fur is shorter and tail less hairy than *T. vulpecula* subspecies found in southern Australia (for example *T. v. fuliginosus*; Kerle 1991), and it has long, oval ears and a hairless underside. The subspecies is nocturnal, commonly nesting in tree hollows and forest canopy. Its diet consists mostly of leaves, flowers and fruits (Woinarski et al. 2014).

### **Distribution**

Noting there are some uncertainties defining historical distribution boundaries, the Northern Brushtail Possum occurs discontinuously from the Gulf of Carpentaria hinterland near Borroloola, Northern Territory (NT) (Woinarski et al. 2011b) westward to the Kimberley, Western Australia (WA) (McKenzie 1981; Kerle & How 2008; Morris et al. 2008). Most of the current population appears to be in the NT, with limited sightings recorded in WA.

The subspecies is known to occur on the following NT Islands: Bathurst (1645 km<sup>2</sup>), Cotton (197 km<sup>2</sup>), Croker (310 km<sup>2</sup>), Elcho (270 km<sup>2</sup>), Field (44 km<sup>2</sup>), Indian (28 km<sup>2</sup>), Melville (5730 km<sup>2</sup>) and North (18 km<sup>2</sup>) and South Peron (5 km<sup>2</sup>) Islands, and Groote Eylandt (2258 km<sup>2</sup>) (Abbott & Burbidge 1995; Woinarski et al. 1999; Woinarski 2004; Firth et al. 2006). It is not known to occur on any Kimberley islands (Gibson & McKenzie 2012). It formerly occurred on at least some of the Sir Edward Pellew Islands in the NT, but appears to have disappeared from the area sometime around the mid-20<sup>th</sup> century. Mammal surveys on the five main islands over 1966 to 2010 failed to detect the subspecies, which was previously recorded from the islands in ethno-biological accounts (Woinarski et al. 2011b).

Its extent of occurrence (EOO) and area of occupancy (AOO) have decreased (and continue to decrease) due to broad-scale losses of regional subpopulations across semi-arid north-western Australia (Kitchener 1978; Baynes & Jones 1993; Abbott 2012; Stobo-Wilson et al. 2019), and more recent reductions across extensive areas of its NT range (Woinarski 2004; Woinarski et al. 2011b; Gibson & McKenzie 2012; Ziembicki et al. 2013; Stobo-Wilson et al. 2019). Within its broad range, its distribution is patchy (Kitchener et al. 1981; Kerle & Burgman 1984).

### **Cultural significance**

Traditional Owners of the Tiwi Islands regularly hunt the Northern Brushtail Possum. The subspecies is an important and highly regarded food source (Puruntatameri 2001; C Kerinauia 2019. pers comm 24 July). Cooking and distributing food from possums follows traditional laws (Puruntatameri 2001).

### **Relevant biology/ecology**

The Northern Brushtail Possum is a nocturnal semi-arboreal marsupial. It occurs mainly in tall eucalypt open forests with large hollow-bearing trees, particularly where the understorey includes some shrubs that bear fleshy fruits (Kerle 1985; Friend & Taylor 1985). However, the subspecies also occurs in some mangrove communities (especially where these contain hollow-bearing trees) (Woinarski et al. 2011b), some rainforests (Menkhorst & Woinarski 1992; Firth et al. 2006) and some semi-urban areas (notably around Darwin). In the monsoonal tropics its diet mostly comprises fruits, flowers and foliage (for example mistletoe species such as *Lysiana spathulata* (Northern Mistletoe), *Amyema miquelii* and *Amyema bifurcate*, as well as *Erythrophleum chlorostachys* (Cooktown Ironwood) (Kerle 1985). In forests of northern Australia it shelters mostly in tree hollows (and in some cases, human infrastructure).

The subspecies is found in higher abundance where shrub density is high; these areas likely provide refuge from predation by feral cats (*Felis catus*) as well as important food resources (Stobo-Wilson et al. 2019). However, the persistence of the species (albeit a different subspecies, *T. v. vulpecula*) in the rugged desert uplands in the arid zone of the NT indicates

that the species is not strictly dependent on high shrub abundance where other forms of shelter from predation exist (Stobo-Wilson et al. 2019).

The Northern Brushtail Possum is smaller than other subspecies of *T. vulpecula* (for example *T. v. fuliginosus*; Kerle 1991; Wayne et al. 2005) and has no distinct breeding season (Kerle & Howe 1992; Short & Turner 1994). Sexual maturity is achieved at 12–15 months (Kerle & Howe 1992), and longevity (for the subspecies as a whole) is up to 10 years (Kerle & How 2008), so generation length is 5–6 years (Woinarski et al. 2014). Generation length, as calculated in Woinarski et al. (2014), is based on the sum of maximum longevity and age to reproductive maturity, divided by two.

## Threats

The Northern Brushtail Possum is mainly threatened by frequent, intense fires, predation by feral cats and habitat modification from invasive grasses (African gamba grass (*Andropogon gayanus*) and mission grass (*Pennisetum polystachion*)). These threats do not act in isolation, as each threat may exacerbate another. For example, a positive-feedback loop may occur between invasive grasses and fire (the grass-fire cycle), whereby invasive grasses increase fuel loads, leading to an increase in fire intensity, which reduces tree cover, which facilitates an increase in invasive grasses (Rossiter et al. 2003). Predation by feral cats may also increase in landscapes that are burnt frequently in extensive, intense fires, as cats are attracted to these burnt areas, and these fires can remove shelter sites for the possum, further increasing predation risk (McGregor et al. 2015, McGregor et al. 2016, Oakwood 2000). The threats to the subspecies are outlined in Table 1.

**Table 1** – Threats impacting the Northern Brushtail Possum in approximate order of severity of risk, based on available evidence.

| Threat factor                     | Threat type and status | Evidence base   |
|-----------------------------------|------------------------|---|
| <b>Fire</b>                       |                        |   |
| Frequent extensive, intense fires | Known current          | Small mammal (<2kg) numbers have declined dramatically in northern Australia in recent decades. Fire regimes characterised by frequent, extensive, late-season wildfires are implicated in this decline (Ziembicki et al. 2013). Altered fire regimes have been identified as a key driver of shrub loss in the mesic savannas of northern Australia (Russell-Smith et al. 2012; Vigilante & Bowman 2004), reducing food resources and habitat quality for species such as the Northern Brushtail Possum (Kerle 1985; Friend & Taylor 1985; Woinarski 2004). Fire frequency and intensity is likely to change with the changing climate, with extensive, intense fires more likely in some years. |
| <b>Invasive species</b>           |                        |   |
| Predation by feral cats           | Suspected current      | Predation by feral cats has been implicated in the ongoing decline of many terrestrial, non-volant, mammal species that fall within critical weight range (35g-3.5kg) (the Northern Brushtail Possum is < 2 kg) (Woinarski et al. 2014; Woinarski et al. 2015; Hardman et al. 2016; Davies et al. 2017; Radford et al. 2018; Woolley et al. 2019) . Radford et al (2018) noted the species was susceptible to introduced predators, that the susceptibility varied across its range, and was higher in northern Australia. Although arboreal, the Northern Brushtail Possum is frequently observed on the ground, exposing it to predation by ground-based predators (Stobo-Wilson et al. 2019).  |

|  |               |  |
|--|---------------|--|
|  |               | <p>Northern Brushtail Possum remains have been found in 12% of feral cat scats in Kakadu National Park (Stokeld et al. 2018).</p> <p>Population-level impacts of feral cats on the subspecies have been uncertain (Woinarski et al. 2014; Radford et al. 2018; Stobo-Wilson et al. 2019). However, recent research has shown that the Northern Brushtail Possum is less common in areas with higher cat abundance (Stobo-Wilson et al. 2020).</p> <p>Numbers of feral cats in some areas of Northern Australia may have increased in recent decades because of changes to fire regimes, intensification of grazing, and dingo (<i>Canis familiaris</i>) reduction in some areas (Johnson et al. 2007). Intense fire and grazing can amplify the impacts of predation by reducing understorey and ground cover (Oakwood 2000; Leahy et al. 2015); cat activity and hunting efficiency is known to increase in these areas (McGregor et al. 2014).</p> |
| Habitat degradation due to invasive grasses            | Known current | <p>Several invasive grasses – for example African Gamba Grass (<i>Andropogon gayanus</i>), Grader Grass (<i>Themeda quadrivalvis</i>) and Mission Grass (<i>Cenchrus</i> spp.) – are spreading through the subspecies’ preferred habitat, with high biomass fuelling higher intensity fires, and probably making ground movement more difficult in some parts of the species distribution (Woinarski 2004; Woinarski et al. 2014).</p> <p>African Gamba Grass is a serious threat to northern Australia’s savannas. Invasion by Gamba Grass has resulted in fuel loads up to seven times higher than those dominated by native grasses, and supported fires about eight times more intense than those recorded in native grass savannas at the same time of year (Rossiter et al. 2003).</p>   |
| Disease carried by black rats ( <i>Rattus rattus</i> ) | Potential     | <p>Disease is a potential threat to the subspecies (Abbott 2012). There has been an observed increase in the NT of the prevalence and abundance of exotic black rats, which are known vectors for some diseases that have caused mammal extinctions elsewhere (Wyatt et al. 2008). The subspecies has historical evidence of major population decline due to epizootic disease (Abbott 2012).</p> <p>While Reiss et al. (2015) found that there is no current evidence that a single pathogen is responsible for the decline of small mammals in the NT’s Top End (the northern component of the state, encompassing Darwin, Kakadu National Park, Arnhem Land and the Katherine area), this does not remove infectious diseases from the list of potentially significant factors that have driven population declines.</p>  |
| <b>Habitat loss and fragmentation</b>                  |               |  |

|                        |                   |  |
|------------------------|-------------------|--|
| Land clearing          | Known current     | The subspecies' preferred habitat is subject to continuing clearance for agriculture, forestry and mining, particularly on the Tiwi Islands and in more settled areas of the NT mainland (Woinarski 2004; Firth et al. 2006; Stobo-Wilson et al. 2019); and this subspecies shows significant habitat fragmentation responses (Rankmore & Price 2004). The clearing of large hollow-bearing trees is of particular concern, as the Northern Brushtail Possum is dependent on these for nesting (Kerle 1985; Friend & Taylor 1985). |
| Grazing                | Suspected current | The Northern Brushtail Possum preferentially inhabits areas with high shrub density (Stobo-Wilson et al. 2019). In northern Australia, overgrazing by livestock has been linked to a decline in shrub abundance (Legge et al. 2011) as well as increasing predation risk (described above).  |
| <b>Climate change</b>  |                   |  |
| Increased temperatures | Projected future  | The temperature across northern Australia is projected to rise under future climate change scenarios, resulting in a substantial increase in the number of days of extreme temperature and associated severe wildfire risk. Increased and more variable rainfall is also amplifying the frequency and intensity of fire events. (CSIRO & Bureau of Meteorology 2015). This is exacerbated by the spread of highly flammable exotic pasture grasses, such as Gamba grass (Rossiter et al. 2003).                                    |

**How judged by the Committee in relation to the EPBC Act criteria and regulations**

| <b>Criterion 1. Population size reduction (reduction in total numbers)</b>                            |   |  |   |
|---|---|--|---|
| Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4 |   |  |   |
|   | <b>Critically Endangered<br/>Very severe reduction</b>  | <b>Endangered<br/>Severe reduction</b>   | <b>Vulnerable<br/>Substantial reduction</b> |
| <b>A1</b>   | ≥ 90%   | ≥ 70%  | ≥ 50%                                       |
| <b>A2, A3, A4</b>   | ≥ 80%   | ≥ 50%  | ≥ 30%                                       |
| A1  | Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.   |  |   |
| A2  | Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.  |  |   |
| A3  | Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]   |  |   |
| A4  | An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible. |  |   |
|   |   | <i>based on any of the following:</i> <ul style="list-style-type: none"> <li>(a) direct observation [except A3]</li> <li>(b) an index of abundance appropriate to the taxon</li> <li>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</li> <li>(d) actual or potential levels of exploitation</li> <li>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</li> </ul> |   |

**Evidence:**

**Eligible under Criterion 1 A2 (a)(c)(e) for listing as Vulnerable**

The Northern Brushtail Possum has undergone broad-scale decline over the past few decades, and numbers continue to decrease across much of its formerly extensive range (Woinarski 2004). Assessment under this criterion considers population trends over the most recent three generation period (15–18 years).

Northern Territory

There are several data sources that suggest the Northern Brushtail Possum is declining in the Top End. Each data source is subject to interpretational constraints, but taken together, they all point towards substantial decline (Woinarski et al. 2001, Woinarski et al. 2010, unpublished NT Government data, Ziembicki et al. 2013, Stobo-Wilson et al. 2019).

A long-term monitoring program in Kakadu National Park, including trapping across 136 plots, was undertaken in 2001–04 and again in 2007 – 09 (Woinarski 2010). Over this period, the mean abundance per site of the Northern Brushtail Possum declined from 0.07 to 0.01, which equates to a greater than 80 percent decline (through direct observation) over the ten-year monitoring period (Woinarski 2010). Reasons for the decline are unclear, but the most plausible causes are too frequent fire and predation by feral cats (Woinarski 2010, Stobo-Wilson et al. 2019). The numbers of Northern Brushtail Possum captured during these surveys were very low, making it difficult to be confident about the decline. However these results follow on from reports of an earlier decline in trapping success in the late 1990s (Woinarski 2001).

Recent analyses by the Northern Territory government of long-term monitoring data in Kakadu, Litchfield and Nitmiluk National Parks examined the period from 1995-96 to 2016-2019. This analysis has found mean abundance to decline at these sites from 0.07 in 2001-05 to 0.03 in 2016-19, which equates to a greater than 50 percent decline over the 18 year monitoring period. The capture rates in these studies from the Top End are all low, with the Northern Brushtail

Possum recorded at very few sites, so changes between years should be interpreted cautiously. For example, in the 1995-1996 trapping period, no Northern Brushtail Possums were recorded.

Ziembicki et al. (2013) reviewed Indigenous knowledge of the abundance and distribution of the subspecies (and other mammals) across the Top End. In this study, information collected from a series of interviews with local Indigenous people indicated that Northern Brushtail Possum populations declined substantially over the 20 years leading up to 2013, and over the period from the 1950s to the 1980s (Ziembicki et al. 2013). These observations support the scale and timing of the declines suggested by trapping studies.

Using an occupancy model based on occurrence records, Stobo-Wilson et al. (2019) found that the modelled geographic range of *T. vulpecula* has declined by 72 percent, between the two periods 1840–1993 (historical distribution) and 1993–2017 (contemporary distribution), with a contraction in range away from the arid areas to the mesic areas. Although this study included records of both *T. vulpecula vulpecula* as well as *T. vulpecula arnhemensis*, and apply over a longer timeframe than the assessment period, the general conclusions – of distributional contraction in more arid parts of the range – accord with the reports of decline based on trapping studies and Traditional Ecological Knowledge.

Compared to other areas of northern Australia, subpopulations on the Tiwi Islands (comprised of Bathurst and Melville islands) are currently at a much greater density, with the mean density of individuals in eucalypt forest and savanna woodland recorded at 0.5 ha<sup>-1</sup> (Davies et al. 2018; Davies & Murphy 2019). Monitoring of small mammal species on Melville Island recorded the Northern Brushtail Possum at 29 percent more sites in 2015 than in 2001 to 2002, but recorded marked declines in *Conilurus penicillatus* (Brush-tailed Rabbit-rat) and *Mesembriomys gouldii* (Black-footed Tree-rat) (Davies et al. 2018). Davies et al (2018) speculates that the pattern of decline of small mammal species on Melville Island may mirror similar declines in Kakadu National Park from 2001 to 2009, where the Northern Brushtail Possum was one of the last species to show signs of decline. Given the widespread decline of the subspecies across mainland northern Australia, the current greater density of the Tiwi Islands subpopulations should therefore not be taken as evidence that these populations are safe from future decline (Davies et al. 2018; Davies & Murphy 2019).

Although the density of the species is high on the Tiwi Islands, the area is so small compared to the mainland (the EOO on Tiwi Islands is 1.5 percent of the total EOO), that declines on the mainland are still the main driver of overall population declines.

### Western Australia

The Northern Brushtail Possum has rarely been detected in WA in the past 20 years, with a handful of records spanning the northern Kimberley (Mitchell Plateau; in Woinarski 2014) to the central Kimberley (Mt Gladys in the King Leopolds, in Woinarski et al. 2014; Mornington Sanctuary, Glenroy Station, S. Legge 2020. pers comm 27 February) and southern Kimberley (Edgars Ranges in 2019, S. Legge 2020. pers comm 27 February). Earlier reports suggest the Northern Brushtail Possum was more abundant in the Kimberley in the past, but data are too fragmentary to pinpoint the timing and extent of these declines (Woinarski et al. 2014).

### Summary

Substantial declines have been reported from sites in the NT (of over 50 percent, and over 80 percent, in a 18 year period). Large distributional declines across the Top End have been observed by Traditional Owners and are also apparent from analysis of a long-term series of occurrence records. The subspecies occurs on several islands, but has disappeared from other islands and is rare on Groote Eylandt and Croker Island, indicating that island populations may not be secure. The subspecies is rare in Western Australia. Key threats to the Northern Brushtail Possum (especially introduced predators, interacting with changed fire regimes and land use, see Table 1) operate across its entire range, and it is likely that the population is continuing to decline due to these ongoing threats. Given declines of greater than 50 percent and greater than 80 percent at some mainland sites, it is likely that the total

population decline across the range of the taxon is at least 30 percent over a 15–18 year (i.e. three generation) period.

The Committee considers that the species has undergone a substantial reduction in numbers over three generation lengths, equivalent to at least 30 percent and the reduction has not ceased, the cause has not ceased and is not understood. Therefore, the species has met the relevant elements of Criterion 1 to make it eligible for listing as Vulnerable. The data presented above appear to demonstrate that the species is **eligible for listing as Vulnerable (A2a,c,e)** under this criterion.

| <b>Criterion 2. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy</b>  |  |                                  |                               |
|---|--|----------------------------------|-------------------------------|
|   | <b>Critically Endangered<br/>Very restricted</b> | <b>Endangered<br/>Restricted</b> | <b>Vulnerable<br/>Limited</b> |
| B1. Extent of occurrence (EOO)  | < 100 km <sup>2</sup>                            | < 5,000 km <sup>2</sup>          | < 20,000 km <sup>2</sup>      |
| B2. Area of occupancy (AOO)   | < 10 km <sup>2</sup>                             | < 500 km <sup>2</sup>            | < 2,000 km <sup>2</sup>       |
| AND at least 2 of the following 3 conditions:   |  |                                  |                               |
| (a) Severely fragmented OR Number of locations  | = 1  | ≤ 5                              | ≤ 10                          |
| (b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals |  |                                  |                               |
| (c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals  |  |                                  |                               |

#### **Evidence:**

#### **Not eligible**

The EOO is estimated to be 571 694 km<sup>2</sup>, and the AOO estimated to be 1392 km<sup>2</sup> (which meets the threshold for Vulnerable under B2). These figures are based on the mapping of point records from 1998 to 2018, obtained from state governments and museums. The EOO was calculated using a minimum convex hull, and the AOO calculated using a 2x2 km grid cell method, based on the IUCN Red List Guidelines 2019 (DoEE 2019). Noting that the EEO is large and given that survey effort is insufficient to capture its AOO across this area, the AOO is probably significantly greater than 1392 km<sup>2</sup>.

There has been a decline in habitat quality for the Northern Brushtail Possum, which satisfies subcriterion (b)(iii). Changing fire regimes have led to a reduction in the subspecies' habitat quality across much of northern Australia, with too frequent fires depleting the woody understorey that formerly provided fleshy fruit resources, and reducing the abundance of large trees and tree hollows (Woinarski et al. 2011a). African Gamba Grass, Grader Grass and Mission Grass are also spreading through northern Australia, increasing biomass for fire fuel and probably making movement for the subspecies more difficult (Woinarski 2004). These invasive grasses provide a fuel load which is up to five times greater than native species (Dyer et al. 2001). Vegetation change in the subspecies' range has also been driven by cattle (*Bos taurus* and *Bos indicus*) grazing and grazing by other introduced herbivores (for example donkeys, horses (*Equus* spp.) and feral buffalo (*Bubalus bubalis*)). This broad-scale decline in habitat quality is likely occurring across much of the subspecies' extent, including conservation reserves (Woinarski 2004). The number of mature individuals is also declining (see Criterion 1), which satisfies subcriterion (b)(v).

The Northern Brushtail Possum occurs on ten islands and the mainland, and therefore occurs in more than 10 locations. There is no evidence to indicate that the distribution is severely fragmented, or that the subspecies undergoes extreme fluctuations. Therefore, only one of the three conditions indicating distribution is precarious for survival have been met.

Following assessment of the data the Committee has determined that the geographic distribution may be limited, however there is no evidence to indicate that there are threats operating that would make the species' geographic distribution precarious for its survival. Therefore, the species has not met this required element of this criterion.

| <b>Criterion 3. Population size and decline</b>   |  |   |  |
|---|--|---|--|
|   | <b>Critically Endangered<br/>Very low</b>  | <b>Endangered<br/>Low</b>   | <b>Vulnerable<br/>Limited</b>  |
| Estimated number of mature individuals  | <b>&lt; 250</b>  | <b>&lt; 2,500</b>   | <b>&lt; 10,000</b>   |
| AND either (C1) or (C2) is true   |  |   |  |
| C1 An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future)   | <b>Very high rate<br/>25% in 3 years or 1 generation<br/>(whichever is longer)</b> | <b>High rate<br/>20% in 5 years or 2 generation<br/>(whichever is longer)</b> | <b>Substantial rate<br/>10% in 10 years or 3 generations<br/>(whichever is longer)</b> |
| C2 An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions: |  |   |  |
| (a) (i) Number of mature individuals in each subpopulation  | <b>≤ 50</b>  | <b>≤ 250</b>  | <b>≤ 1,000</b>   |
| (a) (ii) % of mature individuals in one subpopulation =   | <b>90 – 100%</b>   | <b>95 – 100%</b>  | <b>100%</b>  |
| (b) Extreme fluctuations in the number of mature individuals  |  |   |  |

**Evidence:**

**Not eligible**

There is currently no reliable estimate of population size for the Northern Brushtail Possum. Woinarski et al. (2014) considers the number of mature individuals to be approximately 20 000. Given the broad distribution of the subspecies (EOO 228 770 km<sup>2</sup>) and the high density of at least one subpopulation (Tiwi Islands), the number of mature individuals is probably greater than 10 000.

The Committee considers that the subspecies does not meet a required element of this criterion.

| <b>Criterion 4. Number of mature individuals</b> |  |                                |                           |
|--|--|--------------------------------|---------------------------|
|  | <b>Critically Endangered<br/>Extremely low</b> | <b>Endangered<br/>Very Low</b> | <b>Vulnerable<br/>Low</b> |
| Number of mature individuals                     | <b>&lt; 50</b>                                 | <b>&lt; 250</b>                | <b>&lt; 1,000</b>         |

**Evidence:**

**Not eligible**

There has been no reliable estimate of the population size of this subspecies. However, given the broad distribution of the subspecies (EOO 228 770 km<sup>2</sup>) and the high density of at least one subpopulation (Tiwi Islands), it is very likely that the number of mature individuals is greater than 1000. The total number of mature individuals is greater than 1000 which is not considered low. Therefore, the subspecies has not met the required element of this criterion.

| <b>Criterion 5. Quantitative Analysis</b>                   |   |   |  |
|---|---|---|--|
|   | <b>Critically Endangered<br/>Immediate future</b>                               | <b>Endangered<br/>Near future</b>   | <b>Vulnerable<br/>Medium-term future</b> |
| Indicating the probability of extinction in the wild to be: | <b>≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)</b> | <b>≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)</b> | <b>≥ 10% in 100 years</b>                |

## **Evidence:**

### **Insufficient information**

Population viability analysis for the Northern Brushtail Possum has not been undertaken. There are insufficient data to demonstrate if the subspecies is eligible for listing under this criterion.

### **Conservation actions**

#### **Recovery plan**

A Recovery Plan is not required; an approved Conservation Advice for the subspecies provides sufficient direction to implement priority actions, mitigate against key threats and enable recovery.

#### **Primary conservation actions**

1. Identify and protect important habitat for the Northern Brushtail Possum from habitat loss, degradation and fragmentation.
2. Minimise levels of feral cat predation by managing habitat to reduce cat impacts (through fire management, the removal of feral introduced herbivores, and not killing dingoes).
3. Manage fire to promote resources important to the species, as well as reduce risk from predation.
4. Undertake long-term monitoring to assess changes in population status, evaluate the success of management actions, and inform adaptive management.

#### **Conservation and management priorities**

##### **Fire**

- Implement strategic, fine-scaled prescribed burning at landscape scales, to decrease the likelihood of extensive, intense fires, reduce fire frequency and increase the extent of long-unburnt vegetation. The intent of this fire management is to promote food resources important to the subspecies (e.g. flesh-fruited shrubs), promote shelter resources used by the subspecies (hollows in logs, trees), and reduce the impacts of feral cats on the subspecies.

##### **Invasive Species**

- Manage habitat to reduce the risk of predation by cats:
  - In high value sites for Northern Brushtail Possum, intensive cat control (for example shooting).
  - Reduce fire frequency and intensity.
  - Remove feral herbivores.
  - Exclude stock from riparian forests.
  - Stop killing of dingoes.
- Undertake ongoing control and containment of invasive grasses; guidance on how to manage weeds such as African Gamba Grass, Grader Grass and Mission Grass can be found on state/territory government websites.

- Develop or enhance biosecurity plans and management for all islands where the subspecies is present, with particular focus on preventing the introduction of feral cats.

#### Habitat loss disturbance and modifications

- Protect areas of high habitat value from land clearance (particularly on the Tiwi Islands).

#### Impacts of domestic species

- If livestock grazing occurs in the area, support and encourage landowners/managers to use an appropriate grazing regime and stocking density that enables the recruitment of native shrubs, and ensure stock are kept off riparian forests.

### Stakeholder Engagement

- Engage and involve Traditional Owners in conservation actions, including the implementation of Indigenous fire management and other survey, monitoring and management actions, including the removal of feral herbivores.
- Liaise with the local community and NT and WA Government agencies to ensure that up-to-date population data for the subspecies inform the implementation of conservation actions.
- Raise awareness amongst community that despite possums generally being seen as a pest in homeowners roofs in urban and peri-urban areas, their numbers are declining across their range.
- Develop voluntary conservation covenants on private lands with high value for the subspecies.

### Survey and Monitoring priorities

- Undertake surveys to define fine-scale distribution patterns of the subspecies across its range, and the number of individuals (or relative abundance) in subpopulations.
- Design and implement an integrated monitoring program for the subspecies, in order to better estimate population trends across its distribution and enable an assessment of the effectiveness of management actions. The monitoring program should gather information on distribution and density in the Kimberley and the Top End, and include subpopulations with the greatest contributions to representation, viability or function. Monitoring should preferably be designed such that the method can easily be employed by ranger groups (e.g. spotlighting).
- Monitor and record the incidence of fire, and vegetation responses, at key subpopulations, including any changes in response to fire management.
- Monitor and record the abundance of feral cats at key subpopulations, including whether this varies with vegetation type/density and any changes in response to management.

### Information and Research priorities

- Identify an optimal fire regime for the subspecies, by assessing population-level responses to a range of fire regimes, and modelling population viability across all fire scenarios.
- Assess the efficacy and impacts of management options to reduce fire frequency and increase the extent of long-unburnt vegetation.
- Determine the abundance of feral cats in the range of the subspecies, and the impact of predation on population viability of the Northern Brushtail Possum.
- Continue efforts to develop broad-scale, targeted feral cat control technology.
- Identify subpopulations have the greatest contributions to representation, viability or function, and ensure that landscape planning and development cater appropriately for such subpopulations.
- Resolve taxonomic uncertainties and the validity of subspecies using molecular tools.

### Recommendations

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the Vulnerable category:

*Trichosurus vulpecula arnhemensis* (Northern Brushtail Possum) Conservation Advice

*Trichosurus vulpecula arnhemensis*

- (ii) The Committee recommends that there not be a recovery plan for this species.

Threatened Species Scientific Committee

03/09/2020

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