

# NSW Threatened Species Scientific Committee

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Exhibition period: 30/11/18 – 25/01/19

Proposed Listing date: 30/11/18

## Notice of and reasons for the Final Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list habitat degradation and loss by Feral Horses (brumbies, wild horses), *Equus caballus* Linnaeus 1758, as a Key Threatening Process in Schedule 4 of the Act. Listing of Key Threatening Processes is provided for by Part 4 of the Act.

The Scientific Committee has found that:

1. Horses, *Equus caballus* Linnaeus 1758, arrived in Australia with the First Fleet in 1788 and were first recorded as escaping into the wild, or being abandoned, in 1804 (Csurhes *et al.* 2009). Feral horses (brumbies, wild horses) became established in significant numbers and variable sized populations now occur across about half of Australia (Berman 2008). The largest populations of feral horses in the world are found in Australia with an estimate of more than 400,000 individuals, mostly in central Australia (Dobbie *et al.* 2006; Dawson *et al.* 2006).
2. Feral horse populations in Australia have been founded from a variety of domestic breeds including draught horses, Arabian and Thoroughbred stock (Berman 2008). This, in addition to geographical isolation, natural selection and culling by land managers, has resulted in a variety of physical types ranging from the light 'racehorse' types to heavy 'clumper' types, and other small horses with short necks and large heads (Berman 2008).
3. In New South Wales (NSW), estimates in the year 2000 suggested there were up to 8,000 feral horses in the North Coast, Northern Tablelands, Hunter, Blue Mountains, Far South Coast and Snowy Mountains Regions (English 2002). More recent data indicates that 10,000 feral horses is a more likely estimate across NSW. Feral horses are well established and most abundant in the NSW (and contiguous Victorian) high country where they arrived in the 1820s with the first European explorers and settlers. They now occupy over 3,000 km<sup>2</sup> of the Australian Alps National Parks of NSW and Victoria and their range is expanding (Dawson and Hone 2012). In 2014 detailed aerial surveys in the Australian Alps estimated horse numbers to be approximately 7,150 in NSW (6,150 individuals in Kosciuszko National Park, and another 1,000 individuals in Bago and Maragle State Forests) and 2,350 in the adjacent Victorian high country (Cairns and Robertson 2015). Feral horses are also present in at least another nine reserves in NSW. These reserves include: Oxley Wild Rivers National Park which is estimated to contain 800–1,000 horses (OEH 2012a; OEH *in litt.* 27 April 2017), an increase from the estimate of 200 horses in 2000 (English 2002); Blue Mountains National Park with an estimate of 60–70 horses in 2016 (OEH *in litt.* 27 April 2017); Guy Fawkes National Park estimated to contain over 1,000 horses (OEH 2012b, OEH *in litt.* 27 April 2017); and Barrington Tops National Park with an estimate of 100 horses (OEH *in litt.* 27 April 2017). Smaller populations are recorded from Barakee National Park, Yuraygir National Park and surrounding state forests and private lands, Myall Lakes National Park, Yerranderie State Conservation Area, Wadbilliga NP, the Pilliga region (50–100 horses) and the River Red Gum forests and riverine plains of the Murray River including the Murray Valley National Park (Berman 2008; OEH 2012c; OEH *in litt.* 27 April 2017). The highest recorded feral horse density of 2.74 per square kilometre is in the northern sections of Kosciuszko National Park (Cairns and Robertson 2015). Feral horses also occur in high densities in other areas such as Dead Horse Gap to Tin Mines in the Pilot wilderness

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section of the Kosciusko National Park (Worboys and Pulsford 2013). As a consequence of the herd behaviour of feral horses, they are not evenly distributed across their range.

4. Feral horses are large bodied mobile grazers with few natural predators or diseases and have a range of flexible physiological, behavioural and morphological attributes that have enabled them to thrive under a wide range of ecological conditions (Beever 2003, cited in Lenehan 2010). Horses are gregarious social animals with group size generally varying between five and twenty individuals, but which can also be found in herds of more than 100 animals (consisting of multiple social groups) at watering and feeding points (Berman 2008; OEH 2016). Harems usually move independently of other groups and typically consist of a dominant male, one to three mares and their offspring (Berman 2008). Young males (~2 years old) form bachelor groups before establishing a harem (Berman 2008).
5. Populations of feral horses have the potential for rapid growth. Feral horse mares give birth in the summer months when food is most available. They can reproduce from 3 years of age (or 2 years at low densities with high food availability) and continue to breed until 15–18 years (Dawson and Hone 2012). They have a high reproductive potential with a maximum finite rate of increase of between 1.21 and 1.36 (Dawson and Hone 2012). In one study of stable to slightly increasing populations in the Australian Alps, annual fecundity ranged from 0.21 to 0.31 young per adult female, juvenile survival from 0.83 to 0.90 per annum and annual adult survival averaged 0.91 per annum (Dawson and Hone 2012). In the Victorian East Alps the annual population increase between 2003 and 2009 was estimated to be 22% (NERP 2014).
6. Feral horses generally prefer flat open grassy areas but will also move through steeper rocky terrain (Dobbie *et al.* 1993; OEH 2016). In NSW they prefer grassy river flat, forest and woodland habitats but in the Australian Alps they occupy a broader range of habitats (NSW NPWS 2001; DEC 2005; NSW NPWS 2006; DECC 2009; Lenehan 2010). Horses principally feed on fibrous grasses and sedges but also consume bark and roots and browse on buds, fruit and leaves. There have been no studies to specifically determine the diet of feral horses (Menkhorst 1995). They preferentially graze high-quality low fibre plants on floodplains and riparian habitats and concentrate around watering points, especially during drought. Emergent and sub-emergent plants in swampy areas are targeted as a food source (Menkhorst 1995, James *et al.* 1999; Wild and Poll 2012, cited in Robertson *et al.* 2015). Horses need regular access to water and will dig in stream beds to access water causing erosion and disturbing stream beds (Menkhorst and Knight 2001).
7. Feral horses negatively impact ecosystems, ecological communities and native species. Habitat damage in streams, wetlands and adjacent riparian systems occurs through selective grazing, trampling, track creation, pugging (soil compaction), wallowing and dust bathing leading to stream bank slumping and destruction, stream course disturbance and incision and sphagnum bog and wetland destruction (Berman 2008; Hunter *et al.* 2009; Prober and Thiele 2007, cited in Robertson *et al.* 2015; Tolsma 2009; Warboys and Pulsford 2013; Robertson *et al.* 2015; OEH 2016). The impacts of feral horses on wetlands, watercourses and riparian systems are most severe in the alpine and sub-alpine regions of NSW where feral horses are most abundant but are also evident in other areas. Observations from the alpine and sub-alpine regions indicate that this damage has become increasingly evident as horse numbers have increased over the last twenty years (D. Darlington *in litt.* 1 June 2018; Worboys and Pulsford 2013). The effect of this damage is significant at two scales. At the local scale the impacts include the degradation of ecological communities and reductions in biodiversity. At the landscape scale the impacts of

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feral horses alter ecosystem processes governing water quality and supply including at the sources of the Snowy, Murray and Murrumbidgee Rivers. These rivers are significant inland river ecosystems as well as supply significant volumes of water to the Murray Darling basin and the Cotter River catchment which is the primary source of potable water for the Canberra region (ACT Parks Management and Lands 2007). Removal of feral horses from catchment areas in Namadgi National Park increased the quality of water downstream (ACT Parks Management and Lands 2007).

8. Feral horses also alter the structure and composition of vegetation by ringbarking trees and overgrazing native pasture, spreading of weeds and pathogens, browsing terminal buds and trampling and rubbing plants, removing and changing the infiltration and nutrient cycling capacity of soil through soil compaction, disturbance and erosion (Schott 2005; Lenehan 2010). Increased inputs of soil phosphorus and nitrogen from concentrated urine and faeces (dung heaps) also changes soil nutrient composition in heavily used habitats. In combination, these activities lead to reductions in vegetation cover, richness and structural complexity (Green and Osborne 2003; NSW NPWS 2006; NSW NPWS 2007; Ansong and Pickering 2013; Doherty *et al.* 2015; OEH 2016; Robertson *et al.* 2015; D. Driscoll *in litt.* 11 May 2018).
9. Alpine and sub-alpine parts of the feral horse's range in NSW are characterised by native plant species that are slow growing, recover slowly from disturbance due in part to the short growing season (Montague-Drake 2005 cited in OEH 2016) and often occur in restricted geographic areas. Soil structure in alpine and sub-alpine areas is fragile and disturbance caused by horses is novel to the Australian environment given no native analogues occur. Given the densities of feral horses across the alpine and sub-alpine zones, negative impacts on a range of alpine plant species such as the anemone buttercup *Ranunculus anemoneus* are expected (Doherty *et al.* 2015). Sphagnum bogs are very slow growing and the associated peat soils are susceptible to permanent damage by hard hooved animals. The sphagnum bogs of the Ginini Flats (habitat for the endangered Northern Corroboree Frog *Pseudophryne pengilleyi*) have an estimated growth rate of 2.3–3.5cm/100 years and are extremely sensitive to disturbance and trampling which leads to channelization and then drainage of bogs (Macdonald 2009; Hope *et al.* 2012). Fauna species sensitive to disturbance, decreased water quality or availability, habitat loss or degradation are also likely to be impacted by horses. These species include the Stocky Galaxis *Galaxis tantangara*, Alpine Spiny Crayfish *Euastacus crassus*, Alpine She-oak Skink *Cyclodomorphus praealtus*, Alpine Water Skink *Eulamprus kosciuskoi*, Southern Corroboree Frog *Pseudophryne corroboree*, Northern Corroboree Frog *Pseudophryne pengilleyi* (Hunter *et al.* 2009) and Alpine Tree Frog *Litoria verreauxii alpina* (Robertson *et al.* 2015).
10. Grazing by horses reduces overall plant biomass and leads to a more open vegetation structure with higher exotic plant species richness and a reduction in the abundance of some native species, causing degradation of habitat for native fauna (Lenehan 2010; K. Green *in litt.* 3 September 2015). Alpine adapted animals, such as the Broad-toothed Rat *Mastacomys fuscus* and Mountain Pygmy-Possum *Burramys parvus*, require subnivean spaces (cavities under the snow formed by buried shrub canopies, branches, rocks and other objects) as winter foraging and refuge sites (Fleming 1985; K Green *in litt.* 3 September 2015). Grazing of tussocks and trampling causes expansion of inter-tussock spaces, reduces plant biomass (reducing food and shelter availability for Broad-toothed Rat), changes the size, shape and availability of subnivean spaces, increases predation risk and, in severe cases, completely removes habitat (Beever 2013, cited in Braysher and Arman 2014; K Green *in litt.* 3 September 2015). Broad-toothed Rats are detected (visually and via trapping) less frequently in horse impacted areas when

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compared with unimpacted control sites (K Green *in litt.* 3 September 2015; OEH 2016). Feral horse impacts have also been reported to have increased in the last ten years in the Barrington Tops region (OEH 2012d) which is within the habitat of the Broad-toothed Rat. Climate change lead to the uphill movement of the snowline, changes to snow permanence, snow area and depth along with altered precipitation regimes. These changes are projected to continue under future climate scenarios (CSIRO & BOM 2015). These climate change impacts are likely to increase the area of habitat available to feral horses in winter, increasing the carrying capacity for horses and consequently compounding the impact of other climate change related threats (e.g. more frequent fire, altered snow regimes) on small mammal populations in the alpine zone (Hughes 2003).

11. Feral horses are impacting a wide range of ecological communities across the Australian Alpine region of NSW, a declared UNESCO Biosphere Reserve. These communities include treeless alpine and sub-alpine communities, and woodlands of the lower slopes such as the White Cypress Pine–White Box woodlands (a sub-assembly of the Endangered Ecological Community White Box Yellow Box Blakely’s Red Gum woodland) most notably in the Byadbo and Pilot Wilderness of Kosciuszko National Park (Bishwokarma *et al.* 2014, cited in OEH 2016; Doherty *et al.* 2015; D Darlington *in litt* 11 June 2018). Feral horses are also causing ecological damage in Oxley Wild Rivers, Cunnawarra and Barrington Tops National Parks which are World Heritage listed (Gondwana Rainforests of Australia), the UNESCO World Heritage Listed Greater Blue Mountains Area which includes eight protected areas, and Guy Fawkes River National Park, a biodiversity hotspot (NSW NPWS 2001; DEC 2005; NSW NPWS 2006; DECC 2009; OEH 2012e). The impact of feral horses on soils and vegetation threaten the World Heritage Listed Dry Rainforest, Macleay Gorges and the Kunderang Wilderness areas (OEH 2012b).
12. Feral Horse (*Equus caballus*) and Feral Donkey (*E. asinus*) are listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* within the Key Threatening Process “Novel biota and their impact on biodiversity”; degradation and loss of habitats caused by feral Horses (*Equus caballus*) is listed as a Potentially Threatening Process under the Victorian *Flora and Fauna Guarantee Act 1988*; and in the Australian Capital Territory Feral Horses are determined to be an invasive species and controlled under the Namadgi National Park Feral Horse Management Plan (ACT Parks Management and Lands 2007).
13. Endangered Ecological Communities impacted by feral horses:
  - Endangered Ecological Community (EPBC Act 1999)**
    - Alpine Sphagnum Bogs and Associated Fens
    - White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland
  - Critically Endangered Ecological Community (BC Act 2016)**
    - Snowpatch Feldmark in the Australian Alps bioregion
  - Endangered Ecological Community (BC Act 2016)**
    - Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps Bioregions
    - White Box Yellow Box Blakely’s Red Gum Woodland
  - Vulnerable Ecological Communities**
    - Blue Mountains Swamps in the Sydney Basin Bioregion

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14. Plant species, occurring within the distribution of feral horses, which are likely to be impacted by feral horses:

The following threatened plant species occur within the current range of feral horses in Kosciuszko National Park and the neighbouring Bago State Forest:

Species	BC Act*	EPBC Act <sup>+</sup>
<i>Caladenia montana</i>	Vulnerable	
<i>Calotis glandulosa</i>	Vulnerable	
<i>Calotis pubescens</i>	Endangered	
<i>Carex archeri</i>	Endangered	
<i>Carex raleighii</i>	Endangered	
<i>Discaria nitaria</i>	Vulnerable	
<i>Diuris ochroma</i>	Endangered	Vulnerable
<i>Glycine latrobeana</i>	Critically Endangered	
<i>Pomaderris pallida</i>	Vulnerable	Vulnerable
<i>Prasophyllum bagoense</i>	Critically Endangered	
<i>Prasophyllum innubum</i>	Critically Endangered	Critically Endangered
<i>Prasophyllum keltonii</i>	Critically Endangered	
<i>Prasophyllum retroflexum</i>	Vulnerable	
<i>Pterostylus alpina</i>	Vulnerable	
<i>Pterostylis foliata</i>	Vulnerable	
<i>Pterostylis oreophila</i>	Endangered	Critically Endangered
<i>Ranunculus anemoneus</i>	Vulnerable	Vulnerable
<i>Rutidosia leiolepis</i>	Vulnerable	Vulnerable
<i>Rytidosperma pumilum</i>	Vulnerable	
<i>Rytidosperma vickeryae</i>	Endangered	
<i>Thelmitra alpicola</i>	Vulnerable	
<i>Thelymitra atronitida</i>	Critically Endangered	
<i>Xerochrysum palustre</i>		Vulnerable

\*Biodiversity Conservation Act 2016

<sup>+</sup>Environment Protection and Biodiversity Conservation Act 1999

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### 15. Fauna impacted by feral horses through habitat destruction:

Species	BC Act*	EPBC Act <sup>+</sup>	FM Act <sup>++</sup>	IUCN <sup>+++</sup>
Stocky Galaxis <i>Galaxis tantangara</i>			Critically Endangered	
Alpine Spiny Crayfish <i>Euastacus crassus</i>		Endangered		
Freshwater Crayfish <i>Euastacus rieki</i>				Endangered
Northern Corroboree Frog <i>Pseudophryne pengilleyi</i>	Critically Endangered	Critically Endangered		Critically Endangered
Southern Corroboree Frog <i>Pseudophryne corroborree</i>	Critically Endangered	Critically Endangered		Critically Endangered
Alpine Tree Frog <i>Littoria verreauxii alpina</i>	Endangered	Vulnerable		
Guthega Skink <i>Liopholis guthega</i>	Endangered			Endangered
Alpine She-oak Skink <i>Cyclodomorphus praealtus</i>	Endangered			Endangered
Mountain Pygmy Possum <i>Burramys parvus</i>	Endangered			Critically Endangered
Broad-toothed Rat <i>Mastacomys fuscus</i>	Vulnerable			Near Threatened
Latham's Snipe <i>Gallinago hardwickii</i>		Marine and Migratory		

\*Biodiversity Conservation Act 2016

<sup>+</sup>Environment Protection and Biodiversity Conservation Act 1999

<sup>++</sup>Fisheries Management Act 1994

<sup>+++</sup>IUCN RedList (IUCN 2018)

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16. Habitat degradation and loss by feral horses (brumbies, wild horses) is eligible to be listed as a Key Threatening Process as, in the opinion of the Scientific Committee:
- (a) it adversely affects threatened species or ecological communities, or
  - (b) it could cause species or ecological communities that are not threatened to become threatened.

Dr Marco Duretto  
Chairperson  
NSW Scientific Committee

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