

**FLORA & FAUNA
GUARANTEE**

FLORA AND FAUNA GUARANTEE - SCIENTIFIC ADVISORY COMMITTEE

FINAL RECOMMENDATION ON A NOMINATION FOR LISTING

Degradation and loss of habitats caused by feral Horses (*Equus caballus*) (Potentially Threatening Process)

Date of receipt of the nomination: 8 July 2010 File No.: FF/54/3253
Date of preliminary recommendation: 24 February 2011
Date of final recommendation: 16 August 2011

Validity: The nomination is for a valid item

Prescribed Information: The prescribed information was provided.

Name of the Nominator is adequately provided.

Name and Description of the process:

In the opinion of the SAC the process is adequately defined and described.

The nominated process is defined as the 'Degradation and loss of habitats caused by feral Horses (*Equus caballus*)'

Feral horses impact on habitats in two broad ways:

- via direct herbivory (consumption of native plants), in particular grazing impacts on threatened species and ecological communities, and
- through degradation of natural habitats, including fouling of waterholes, accelerating gully erosion and trampling and consuming native vegetation. Of particular concern is the degradation of habitats important for the survival of threatened species and communities.

Feral horses (also known as brumbies or wild horses) are large, heavy, hooved herbivorous mammals adapted to running. Horses arrived in the Australian high country with the first European explorers and settlers around the 1820s. Similarly, work horses arrived and were being agisted in the Barmah forests, on the Riverine plain of north-central Victoria, by around 1855 and the descendants of these horses (and others that were not mustered) still occur in Barmah (DSE & PV 2007).

The largest concentration of feral horses in Victoria is found around the Cobberas and nearby areas (including the Indi Wilderness, Davies Plain, Forlorn Hope Plain and the Buchan River headwaters) in the north-east of the state (Walter 2003, DSE 2010), but they also extend to the Nunniong Plateau (Tolsma 2008a), Bogong High Plains (Dawson and Miller 2008) and the Wonnangatta-Moroka Unit of the Alpine National Park (Menkhorst 1995, Dyring 1990, cited in Walter 2002).

The environmental impacts of horses around the world are well documented, and include damage to riparian systems, erosion, pugging, soil drying, soil compaction, weed invasion, reductions in plant biomass, decreases in plant species richness and abundance, and reductions in ground-dwelling fauna (Kauffman and Krueger 1984; Summer 1986; Rogers 1991; Beaver and Brussard 2000; Giuliano and Homyack 2004; Zalba and Cozzani 2004; Beaver et al. 2008; Loydi and Zalba 2009). Limited research in Australia's arid zone has shown similar impacts.

Feral horses mostly consume grasses, sedges and herbs, but may also eat the leaves and bark of some shrubs and trees (Menkhorst 1995). A preference is shown for high-quality, low fibre plants (Menkhorst op cit.) on floodplains and riparian habitats, and numbers may be concentrated around watering points, particularly in times of drought (James et al. 1999, Dawson 2010). Swampy areas are targeted for their emergent and sub-emergent plants (Dobbie et al. 1993). Horses generally prefer access to open grassy areas (DEH 2004).

Australia's ecosystems have evolved without the grazing pressure and physical impact of heavy, hard-hoofed animals (Carr and Turner 1959, Ashton and Williams 1989, Green et al. 2005). Activity by these animals in alpine regions or seasonally-inundated floodplains therefore represents a type and intensity of impact to which plants and communities may not be adapted. In the far east of Victoria, very few areas of high-altitude wetland, grassland or open snowgum woodland are unaffected by the activity of feral horses, with bare ground, tracks and piles of dung being common (Tolsma 2008b). Permanent and seasonal wetland areas are particularly susceptible to damage by horses or other ungulates, with selective grazing, trampling, pugging of peat and stream bank slumping.

In recent surveys on the Nunniong Plateau and the East Alps Unit of the Alpine National Park, evidence of feral horse activity (tracks, compaction, trampling, pugging and stream bank slumping) was observed in 85 of 98 peatlands assessed. The majority of these affected peatlands are threatened Alpine Bogs and Fens (Table 5) (Tolsma 2008a, b). Pugging by feral horses is also common in Barmah Forest, particularly across seasonally-inundated Spiny Mud-grass (*Pseudoraphis spinescens*) plains, reflecting the availability of palatable food and water (Chesterfield 1986, Dawson 2010). Grazing and other anthropogenic disturbance have been responsible for substantial degradation and loss of wetland habitat in the Barmah forest region, with changes in native species composition and weed invasion (Chesterfield 1986, Silvers 1993, SAC 1997a, b; Dawson 2010). On average, 25% of all peatland areas assessed in the East Alps Unit of the Alpine National Park was affected by trampling, and 16% of peatland areas assessed in State forest to the south (Tolsma 2008a, b)

Many areas of burnt alpine peatland, particularly in the East Alps Unit, are unlikely to recover fully while feral horses remain (Tolsma 2008b). Trampling is also hampering *Sphagnum* bog recovery in naturally-regenerating peatlands, and appears to be affecting some peatlands in which active restoration work is being undertaken.

Trampling by hoofed mammals has also been considered one of the major threats to other FFG-listed alpine vegetation communities. Within the *Caltha introloba* Herbland Community, cushions of Tuft-rush (*Oreobolus*), which play an important role in reducing the erosive forces of flowing water, may be dislodged by trampling, or have their regeneration disrupted (McDougall 1982, McDougall and Walsh 2007). Similarly, the Alpine Snowpatch Community is situated on steep, sheltered slopes, where constant irrigation during thaw renders them particularly susceptible to soil loss following damage to the vegetation by trampling (McDougall 1982, Wahren et al. 2001, McDougall and Walsh 2007). Montane Swamp, because of its position in the landscape, is another listed community that may also show the impact of feral horses.

Feral horses also pose a threat to some native fauna utilising aquatic habitats, especially reptiles and frogs. Processes believed to be threatening these species include climate change, development for ski resort infrastructure, feral predators and exotic herbivores such as feral horses (Clemann 2002, 2009). In Victoria the Alpine Water Skink *Eulamprus kosciuskoi* is restricted to wet alpine habitats such as *Sphagnum* bogs / peatlands, wet heath and riparian vegetation (Meredith et al. 2003, Steane et al. 2005). These types of habitats are attractive to large herbivores such as horses and are therefore extremely vulnerable to trampling. Damage to habitat caused by feral horses is specifically identified as a threat to the federally-listed Alpine She-oak Skink *Cyclodomorphus praealtus* (Clemann 2011).

The presence of feral horses places additional pressure on the riparian and instream habitat of some highly restricted and threatened invertebrates found in the Victorian alps (Table 3). Both the Alpine Stonefly (*Thaumatoperla alpina*, Bogong High Plains) and the Mt Stirling Stonefly (*Thaumatoperla flaveola*, Mt. Buller – Mt Stirling massif) have a stream-dwelling aquatic stage and a riparian-dwelling terrestrial stage likely to be affected by horse damage to that habitat. The Cobberas area is also the habitat of at least two dragonfly species that require suitable stream habitats for their nymphal stages. The impact of feral horses is exacerbated by fire, particularly in the alpine region, where fire events are likely to become more frequent as a result of warmer temperatures and reduced rainfall (Timbal and Jones 2008)

The range of flora or fauna affected or potentially affected was adequately stated in the nomination.

Significance of the threat which the potentially threatening process poses or has the potential to pose was adequately stated in the nomination.

Eligibility for listing as a potentially threatening process under the Flora and Fauna Guarantee

The nominated item satisfies at least one criterion of the set of criteria prepared and maintained under Section 11 of the *Flora and Fauna Guarantee Act 1988*, and stated in Schedule 1 of the *Flora and Fauna Guarantee Regulations 2001*.

Evidence that criteria are satisfied:

Criterion 5.1 *the potentially threatening process poses or has the potential to pose a significant threat to the survival of a range of flora or fauna.*

Evidence:

Feral horses are considered to be a serious threat to the survival of at least six listed plant communities (Table 5), at least 23 listed or threatened plant species (Tables 1 & 2), and at least 21 listed or threatened animal species (Tables 3 & 4) across Victoria. Feral horses are considered to be a major threat to alpine ecosystems, particularly peatlands (Tolsma 2008b, Hope et al. 2009), while overgrazing is one of the primary threats to vegetation communities in the Barmah forests (DSE and PV 2007).

Sub-criterion 5.1.1 *the potentially threatening process poses or has the potential to pose a significant threat to the survival of two or more taxa.*

Evidence:

Feral horses are considered to be a serious threat to the survival of at least 23 plant species (Tables 1 & 2), and at least 21 animal species (Tables 3 & 4) in Victoria.

Sub-criterion 5.1.2 *the potentially threatening process poses or has the potential to pose a significant threat to the survival of a community of flora or fauna.*

Evidence:

Feral horses are considered to be a serious threat to the survival of at least six listed plant communities (Table 5), and are highly likely to threaten many other communities not yet identified. This threat is exacerbated by fire, particularly in the alpine region, where fire events are likely to become more frequent as a result of warmer temperatures and reduced rainfall (Hennessy et al. 2005, Hennessy 2007, Timbal and Jones 2008).

Sub-criterion 5.2 *the potentially threatening process poses or has the potential to pose a significant threat to the evolutionary development of a range of flora or fauna*

Evidence:

By threatening the long-term survival of numerous species and communities, feral horses are threatening the evolutionary development of a wide range of plant and animal species, particularly in the alpine zone. The distributions of certain species may also be affected, with local extinctions being a likely end result.

Sub-criterion 5.2.1 *the potentially threatening process poses or has the potential to pose a significant threat to the evolutionary development of two or more taxa*

Evidence:

By consuming flowers, seeds and fruits and preventing regeneration, feral horses have the potential to threaten the evolutionary development of numerous plant species. By destroying habitat and interfering with breeding, feral horses have the potential to threaten the evolutionary development of animal species. The distribution and abundance of many plant and animal species may decline, with local extinction of certain species likely and consequent changes to selection pressures on others. Threats are exacerbated in alpine areas subject to the effects of climate change and in Barmah forest areas subject to changed flooding regimes, and genetic bottlenecks or inbreeding may occur as species become isolated in small 'islands' within a highly disturbed matrix.

Sub-criterion 5.2.2 *the potentially threatening process poses or has the potential to pose a significant threat to the evolutionary development of a community of flora or fauna.*

Evidence:

By affecting numerous species living within a natural community, the community's composition may be altered. This may be as a direct result of selective grazing, by the prevention of regeneration or recruitment, or by the physical impacts of trampling and erosion. By destroying habitat and interfering with reproduction, feral horses have the potential to particularly threaten the evolutionary development of communities with restricted distributions. Alpine communities are already under threat from a range of disturbances, including climate change, and feral horses may exacerbate these threats. Similarly, threatened communities which rely on seasonal inundation in the Barmah forest are already degraded as a result of changed flooding regimes and other anthropogenic disturbances, potentially exacerbating the threats posed by feral horses. Genetic bottlenecks or inbreeding may occur as communities become isolated in small 'islands' within a highly disturbed matrix.

Additional Information

- There is a large literature related to the impact of horse grazing on habitats and plants/animals (see references).

Table 1: Plant species at risk from feral horse activity in the eastern Victorian high country.

Conservation status: e = endangered (Victoria), v = vulnerable (Victoria), V = Vulnerable (Aust.), r = rare (Victoria).

Species	Common name	EPBC/FFG Act listed	Cons. status	Main impact/s & habitat
<i>Almaleea capitata</i>	Slender Parrot-pea	FFG	v	Trampling of habitat in sub-alpine heathlands and stream fringes
<i>Bartramia subsymmetrica</i>	Bogong Apple-moss	FFG	e	Trampling, particularly of bogs and fragile stream edges in sub-alpine heathlands, bogs and stream edges. In Victoria, this species is restricted to Bogong High Plains area
<i>Botrychium australe</i>	Austral Moonwort	FFG	v	Trampling and loss of habitat in subalpine grassland and margins of bogs and streams. Intolerant of disturbance.
<i>Carex paupera</i>	Dwarf Sedge	FFG	V/v	Trampling and loss of habitat in alpine wet heathlands and bogs. Palatable to stock.
<i>Climacium dendroides</i>	Marsh Tree-moss	FFG	v	Trampling, particularly of bogs and fragile stream edges in bogs, swampy depressions and creeklines. Known only from 3 sites from near Dargo and the Bogong High Plains
<i>Juncus antarcticus</i>	Cushion Rush	FFG	v	Trampling and loss of habitat - <i>Caltha introloba</i> Herbland Community, Alpine Snowpatch Community and bog margins.
<i>Kelleria laxa</i> <i>Meesia muelleri</i>	Snow Daphne Hump Moss	FFG Not FFG listed	V/e r	Trampling of damp grass. Trampling, particularly of bogs and fragile stream edges in bogs, along watercourses in snow plains.
<i>Prasophyllum niphopedium</i>	Marsh Leek-orchid	FFG	e	Trampling and loss of habitat in alpine wet heathlands and bogs. Observed to be directly impacted (Coates et al. 2002). Trampling and grazing are listed as threats (see the FFG Action Statement for this species).

Table 2: Plant species at risk from feral horse activity in the Barmah forest area.

Conservation status: ce = critically endangered (Victoria), e = endangered (Victoria), E = endangered (EPBC Act), r = rare (Victoria), v = vulnerable (Victoria), V = Vulnerable (Aust.).
[Information from collections housed in the National Herbarium of Victoria]

Species	Common name	Listed	Cons. Status	Main impacts
<i>Amphibromus fluitans</i>	River Swamp Wallaby-grass	EPBC	V	Grazing, trampling and loss of habitat in seasonally wet swamps. Invasion of remnants by exotic species. Highly palatable.
<i>Atriplex spinibractea</i>	Spiny-fruit Saltbush	-	e	Grazing and trampling of habitat in Murray River floodplain. Limited to Barmah and Red Cliffs areas. Palatable.
<i>Brachyscome chrysoglossa</i>	Yellow-tongue Daisy	FFG	v	Grazing and trampling of habitat in seasonally inundated clay soils. Palatable.
<i>Cardamine moirensis</i>	Riverina Bitter-cress	-	r	Grazing and trampling of habitat in seasonally wet areas. Palatable. Limited to the Riverina area.
<i>Craspedia paludicola</i>	Swamp Billy-buttons	-	-	Grazing and pugging. Mostly eliminated from open vegetation.
<i>Cullen parvum</i>	Small Scurf-pea	FFG	e	Grazing and trampling of habitat in intermittently flooded grasslands and woodlands. Invasion of remnants by exotic species.
<i>Digitaria ammophila</i>	Silky Umbrella-grass	-	v	Grazing and trampling of habitat in the Murray River floodplain. Limited to the Riverina area. Palatable.
<i>Eragrostis exigua</i>	Slender Love-grass	-	e	Grazing and trampling of habitat - Murray River floodplain. Limited to the Barmah and Red Cliffs areas. Palatable.
<i>Lepidum monoplocoides</i>	Winged Peppergrass	EPBC / FFG	E, e	Grazing, trampling and loss of habitat in seasonally moist-waterlogged depressions in grasslands and woodlands. Highly palatable and does not tolerate grazing disturbance.
<i>Mimulus gracilis</i>	Slender Money-flower	-	-	Grazing. Reduced to extreme rarity by grazing.
<i>Rorippa eustylis</i>	Dwarf Bitter-cress	-	r	Grazing and trampling of habitat in seasonal swamps and floodplains. Limited to Riverina area. Palatable.
<i>Senecio campylocarpus</i>	Floodplain Fireweed	-	r	Grazing and trampling of habitat in seasonally inundated woodlands. Palatable.
<i>Swainsona adenophylla</i>	Violet Swainson-pea	FFG	e	Grazing and trampling of habitat in grasslands and woodlands. Only Victorian record is from the Barmah area. Highly palatable.
<i>Swainsona recta</i>	Mountain Swainson-pea	EPBC / FFG	E, e	Grazing, trampling and weed invasion of habitat in open woodland.

Table 3: Animal species potentially at risk from feral horse activity in the eastern Victorian high country.

Mammals	Common name	EPBC	FFG	DSE 2007, 2009	Main impacts
<i>Pseudomys fumeus</i>	Smoky Mouse	E	Listed	ce	Degradation of habitat in heathlands and montane woodlands.
<i>Mastocomys fuscus</i>	Broad-toothed Rat	-	Under consideration	dd	Loss and degradation of habitat in dense wet heathlands and grasslands.
Reptiles					
<i>Cyclodomorphus praealtus</i>	Alpine She-oak Skink	E	Listed	e	Loss and degradation of habitat in alpine tussock grasslands, alpine low heathlands. Trampling is listed as a threat (see the FFG skink Action Statement).
<i>Eulamprus kosciuskoi</i>	Alpine Water Skink	-	Listed	ce	Loss and degradation of habitat in alpine bog and fen communities. Trampling by feral horses is listed as a threat in (see the relevant Action Statement).
<i>Liopholis guthega</i>	Guthega Skink	Under	Listed	ce	Loss and degradation of

<i>Liopholis montana</i>	Mountain Skink	consideration -	-	dd	habitat in alpine heathland.
<i>Pseudomoia cryodroma</i>	Alpine Bog Skink	-	Listed	e	Loss and degradation of habitat in alpine woodlands. Loss and degradation of habitat in alpine bog and alpine fen (bog pool) communities, woodlands and heathlands.
Amphibians					
<i>Litoria verreauxii alpina</i>	Alpine Tree Frog	V	Listed	ce	Loss and degradation of habitat in alpine and subalpine wetlands, riparian zones and ephemeral pools.
Invertebrates					
<i>Euastacus crassus</i>	Alpine Spiny Cray	-	Listed	r	Loss and degradation of habitat in alpine streams. Trampling and water turbidity are threats (see the FFG cray Action Statement).
<i>Thaumatoperla alpina</i>	Alpine Stonefly	Under consideration	Listed	v	Loss and degradation of riparian zones and degradation of instream habitat. Declines in water quality: direct bank erosion and sediment inputs to streams causing siltation, nutrient enrichment and other changes to water quality (e.g. dissolved oxygen, ph).
<i>Thaumatoperla flaveola</i>	Mt Stirling Stonefly	-	Listed	v	Loss and degradation of riparian zones degradation of instream habitat. Declines in water quality: direct bank erosion and sediment inputs to streams causing siltation, nutrient enrichment and other changes to water quality (e.g. dissolved oxygen, ph).
<i>Synthemis eustalacta</i>	Swamp Tigertail (dragonfly)	-	-	-	Loss and degradation of alpine bog and marsh habitat. Declines in water quality.
<i>Austroaeschna flavomaculata</i>	Alpine Darner (dragonfly)	-	-	v	Loss and degradation of suitable instream habitat. Declines in water quality.

Table 4: Animal species potentially at risk from feral horse activity in the Barmah forest area.

Birds		EPBC	FFG	DSE (2007)	Main impact/s
<i>Botaurus poiciloptilus</i>	Australasian Bittern	-	Listed	e	Loss or degradation of habitat in shallow and deep freshwater marshes.
<i>Ixobrychus minutus</i>	Little Bittern	-	Listed	e	Loss or degradation of habitat in dense wetland vegetation and swamps.
Reptiles					
<i>Emydura macquarii</i>	Murray River Turtle	-	Listed	dd	Interference with breeding (eggs laid in nest holes in stream banks).
<i>Macrochelodina expansa</i>	Broad-shelled Turtle	-	Listed	e	Interference with breeding (eggs laid close to water).
<i>Morelia spilota metcalfei</i>	Carpet Python	-	Listed	e	Degradation of habitat in Riverine forests, and simplification of vegetation structure.

Amphibians		EPBC	FFG	DSE (2007)	Main impact/s
<i>Limnodynastes interioris</i>	Giant Bullfrog	-	Listed	ce	Degradation of habitat on Murray River floodplains. Interference with breeding (eggs laid at edge of ponds).
<i>Litoria raniformis</i>	Growling Grass Frog	V	Listed	e	Loss or degradation of habitat in swamps and ponds. Interference with breeding (in shallow parts of lagoons).
<i>Pseudophryne bibronii</i>	Brown Toadlet	-	Listed	e	Degradation of habitat in moist sites in lowland woodlands and grasslands. Interference with breeding (under leaf litter or in shallow burrows).

EPBC = Environment Protection and Biodiversity Conservation Act 1999, FFG = Flora and Fauna Guarantee Act 1988

Table 5: Victorian communities threatened by feral horse activity.

Floristic Community or Ecological Vegetation Class	EPBC	FFG	Main impacts
Alpine Bog Community	E*	Listed	Trampling (DEWHA 2009), disruption of plant regeneration, selective grazing leading to compositional changes, weed invasion, soil loss and loss of hydrological function.
Fen (Bog Pool) Community	E*	Listed	Trampling (DEWHA 2009), disruption of plant regeneration, selective grazing leading to compositional changes, weed invasion and loss of hydrological function.
Alpine Snowpatch Community	-	Listed	Severe trampling, soil loss, displacement of vegetation, weed invasion, selective grazing leading to compositional changes.
<i>Caltha introloba</i> Herbland Community	-	Listed	Soil loss, displacement of vegetation, weed invasion.
Montane Swamp Complex Community	-	Listed	Severe trampling, soil loss, displacement of vegetation, weed invasion, smothering by dung piles, selective grazing leading to compositional changes.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	-	Soil loss, displacement of vegetation, weed invasion, selective grazing leading to compositional changes, interference with regeneration.

* Alpine Bog and Fen Pool communities are combined in the EPBC Act listing.

Documentation

The published information and research data provided to the Scientific Advisory Committee (SAC) have been assessed. Based on the available information, the SAC believes that the data presented are not the subject of scientific dispute and the inferences drawn are reasonable and well supported.

Advertisement for public comment

In accordance with the requirements of Section 14 of the *Flora and Fauna Guarantee Act 1988*, the preliminary recommendation was advertised for a period of at least 30 days.

The preliminary recommendation was advertised in:

'The Herald Sun' - on 9 March 2011

'The Weekly Times' - on 9 March 2011

Government Gazette - on 10 March 2011

Submissions closed on 22 April 2011.

Further evidence provided:

Eight submissions were received on this item, but no evidence was provided to warrant a review of the Scientific Advisory Committee's preliminary recommendation that the potentially threatening process is eligible for listing.

Final Recommendation of the Scientific Advisory Committee

The Scientific Advisory Committee (SAC) concludes that on the evidence available the nominated item is eligible for listing in accordance with Section 11 of the Act because primary criteria 5.1 and 5.2 and sub-criteria 5.1.1, 5.1.2 and 5.2.1. and 5.2.2 have been satisfied.

In assessing this nomination, the SAC drew on information provided with the nomination, the published scientific literature and additional expert advice to conclude that feral horse populations currently threaten the survival and further development of a number of species and natural communities both in parts of the Victorian high country and in the Barmah forest.

They also note that:

- (a) feral horses are not native to Australia;
- (b) as a hoofed mammal, the spread of feral horses from settlements had effects on some vegetation and wetlands that had not existed in those places before their introduction,
- (c) although feral horses are not the only introduced hoofed mammals to have such effects, their effects are distinguishable from, additional to and distinct from any threats posed by other herbivores;
- (d) feral horses can be a major factor threatening certain species and communities in the places where horse concentrations are high and those species and communities are found;
- (e) the survival and future evolution of the affected species and communities depends on appropriate management actions that will reduce local feral horse concentrations in the affected areas to levels that no longer pose a significant threat.

The Scientific Advisory Committee makes a final recommendation that the nominated item be supported for listing on Schedule 3 of the *Flora and Fauna Guarantee Act 1988*.

Selected references:

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Relevant websites:

Alpine Bog Community (EPBC Act), Conservation and Listing Advice to Minister -

<http://www.environment.gov.au/biodiversity/threatened/communities/pubs/29-listing-advice.pdf>

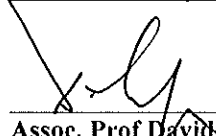
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Flora and Fauna Guarantee Act (FFG Act) Action Statements -

<http://www.dse.vic.gov.au/plants-and-animals/native-plants-and-animals/threatened-species-and-communities>

Endorsement by the Convenor of the Scientific Advisory Committee

Date


Assoc. Prof David Morgan
Convenor

22/8/11