



Australian Brumby Alliance (ABA)

Brumby Resource Information-3.7

www.australianbrumbyalliance.org.au

Brumby Weed Concerns

Most, if not all, National Park and government agencies list the many impacts that they are convinced are caused by Brumbies (Wild Horses). Of the impacts claimed, this ABA paper reviews the claims that Brumbies or Wild Horses cause the following negative impacts:

- *Wild horses have the potential to disperse weeds both long and short distances and can subsequently contribute to the establishment of weed species at several scales”;*
- *Weed species are dispersed through attachment to the body of the wild horse or by being ingested and later excreted;*
- *Wild horse disturbance (i.e. dung, soil disturbance and pugging) can provide favourable environmental conditions for the germination and colonisation of weed species”;* and
- *In the Australian Alps, exotic species were found to colonise the disturbed area of wild horse tracks.*

1. Have the potential to disperse weeds both long and short distances and can subsequently contribute to the establishment of weed species at several scales”

Most seeds are dry or otherwise inconspicuous and are not associated with specific dispersal agents (e.g., the horse). Seeds are primarily dispersed by gravity, wind, movement of surface water, soil erosion, birds, ants, dung beetles and rodents [Ref-1].

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http://www.bcha.org/media/uploads/2015/11/13/files/Gower2008_Forest_Ecology_Eastern_US_weeds-horses_full_article.pdf

The paper “Mopping up the great Snowy River tip” [Ref-2] explains that:

- *“Half a century ago it was thought the best way to stabilise eroding river banks was to plant invasive, exotic willows”, and*
- *“Today the weeds have spread, infesting and choking hundreds of kilometres of waterways within the park. Another introduced weed, broom, was used extensively. It, too, has had a devastating impact on the ecosystems of Kosciuszko National Park”* [Ref-2].

In the 1950s and 1960s Scotch or Spanish Broom, Lupins, willows and other exotic trees were introduced during the building of the Snowy Scheme. While NPWS was not involved in introducing these weeds, a major restoration program treating and removing these species is in place. [Ref-6 - NPWS NSW reply to online chat website query 2015]

The Snowy Hydro-Electric and Irrigation Scheme – A situation and critical analysis by Diane Cousineau and Nathan Cammerman [Ref-3] explains that the Fourth Principle Proposed (2002) by Arthington & Bunn states: “The invasion and success of exotic and introduced species in rivers is facilitated by the alteration of flow regimes” [ref 3a].

Cousineau and Cammerman give many examples of the ecological impacts that have resulted from the altered flow regimes caused by the Hydro-electric scheme, including;

- that narrowing of channels “has caused the isolation of the river channel from riparian vegetation in some reaches” [Ref-3], and
- the “invasion of the channel by invasive vegetation in others” [Ref-3],
- the “willow tree and blackberry have become a nuisance in areas which used to be regularly flooded, but are now usually dry (along the Snowy, Eucumbene and Tumut Rivers)” [Ref-3], and the
- “Population decline of riverine crayfish and snails” [Ref-3].

2. Disperse weed species on their coat or by eating and excreting

In the United States, a five state (USA - NC, KY, IL, MI, and WI) study was conducted to determine if horse hay, manure and hoof debris contained viable seeds of non-native weeds, and if so, do the seeds of non-native weeds successfully germinate on horse trails. [Ref-1].

The results of the study showed that non-native weeds did not germinate from hoof debris or manure samples grown in pots, but on average 5.4 % of the hay samples from 20 horse/rider teams at the five endurance rides did contain non-native weeds (Gower 2008). [Ref-1].

No seeds were found on the coat, tail or mane of any horse at the nine rides.

http://www.bcha.org/media/uploads/2015/11/13/files/Gower2008_Forest_Ecology_Eastern_US_weeds-horses_full_article.pdf

While many of us use manure to increase the quality of our plant growth, we soon find that planting directly in fresh horse manure, actually burns the plants and they die. Harmon (1934) noted that “composted horse manure virtually kills all weed seeds”. However, old or ‘aged’ horse manure does stimulate good plant growth. [Ref-1].

Janzen [Ref-1] reported that “The longer the seeds are in the animal (or buried in composted dung), the higher the seed mortality by digestive processes”.

Bullock (2011) conducted a study to identify whether the bush walking hikers spread invasive plant seeds on their clothing. “Scientists know that infrastructure like roads and tracks for tourists help spread weeds around pristine areas, but few studies have looked at how tourists' clothing helps spread weeds' seeds” [ref-8]. The study analysed how seeds from five different invasive plants are scattered by the hikers in Kosciuszko National Park and calculated that in just one hiking season “up to 1.9 million plant seeds could be carried on the (33,000) walkers' socks”, and that “2.4 million seeds could attach themselves to the hikers trousers” [ref-8].

'Walking is seen as a relatively low impact activity, but our study shows that it can have a long-term, indirect impact on the environment,' Bullock [ref-8].

The five plants that Bullock reviewed in Kosciuszko (Bidgee-widgee, Sheep's sorrel, Sweet vernal grass, Cocksfoot grass and Red fescue grass) are

considered problem species that spread in pristine areas and push out native species [ref-8]. Bullock found that the type of clothing hikers wear has a huge effect on the number of seeds dispersed, and that *becoming attached to people's clothing (especially socks) is a particularly good way for seeds to get dispersed* [ref-8].

3. Can provide favourable environmental conditions for the germination and colonisation of weed species by dung, soil disturbance and pugging

Janzen [Ref-1], a researcher who has done the most studies on seeds in horse manure, found that the horses killed a substantial fraction of the seeds they swallowed through chewing and from the inorganic acids and enzymes of digestion. Among Janzen's conclusions are:

- Horse gut differs from cow gut. No horse had a seed passage rate anywhere near as fast, or a seed survival rate as high, as the cow. [Ref-1].
- There is no evidence that passage through the horse "enhances" germination of surviving seeds. [Ref-1] and
- Seeds must be sufficiently small, tough, hard, and inconspicuous to escape the molar mill and spitting response of a large mammal. Seed coats must have the ability to resist digestion during a transit period of days to months".

While old dung piles are associated with some alien invasive plants, the same dung piles might represent refuges for palatable (native) species, since horses avoid them for grazing [Ref-7].

However an Argentinian study (2009) on different aged wild horse dung found that vegetation on dung piles in montane pampas grasslands differed from grassland controls and noted that older horse dung helped both the Red Star Thistle (an alien invasive species) *and* the native grazing-intolerant grass. [Ref-7].

4. Colonise exotic species in the disturbed area of their tracks

The Janzen study [Ref-1] also compared the presence and abundance of non-native plant species along both horse trails and trails that prohibited horses. No non-native weeds germinated from the hay, manure, or hoof debris samples placed **on the trails** at the five sites. Also, non-native weeds did not germinate from manure or hoof debris samples placed in the pots and grown in ideal conditions [Ref-1].

Benninger-Truax studied edge effects of trails in Colorado. In her Master's thesis, Benninger did a greenhouse study on seeds extracted from horse manure. Seeds from 15 plants grew, but only 8 were identified. While all 8 were exotic, NONE of them appeared in her test **plots on the trail**, although she observed them elsewhere along trails [Ref-1].

So it seems that although some seeds can survive the journey through the horse mouth and gut [paragraph above], Janzen's statement suggests its fate: "*While an Enterolobium seedling germinating in a dung pile is picturesque, its chances of surviving the dung beetles, mice, dryness, and root exposure characteristic of dung piles are very slim*" [Ref-1].

The few seeds that survived the horses gut to germinate in its dung were a few that managed to grow under an ideal greenhouse environment (Benninger-Truax) but **none** grew on the test plots on the **outside** trails.

Nimmo and Miller (2007) are often quoted to back claims of negative Brumby impacts. Interestingly, however, on further reading their work "*Ecological and human dimensions of*

management of feral horses in Australia: a review” [Ref-5] the authors also raise concerns about the research methods used to date and the current data available. [Ref-5]

For example Nimmo and Miller (2007) state: “*Further confounding results is the fact that past research into the effects of feral horses have typically included only a small number of response variables* (Beever et al. 2003), *usually measuring direct effects of disturbance on a few plant characteristics, ignoring both direct effects on other taxa* (Beever and Brussard 2004) *and indirect effects occurring con-currently and subsequently from the formation of feedback loops* (Beever and Herrick 2006).” [Ref-5]

Furthermore, “*we [Nimmo and Miller] are not aware of any peer-reviewed research that analyses the effects of feral horses on native environments in Australia.*” [Ref-5]

However, government agencies and environmental groups still persist to claim that Brumbies disperse weeds and spread weed species at *several scales*, without acknowledging that:

- Humans introduced exotic weeds, (Scotch/Spanish Broom, Lupins, willows etc.) [Ref-6];
- Seeds are primarily dispersed by gravity, wind, surface water movement, soil erosion, birds, ants, dung beetles and rodents [Ref-4];
- The invasion and success of exotic and introduced species in rivers *is facilitated* by the alteration of (Snowy Hydro Scheme) flow regimes [Ref-3], and
- How clothing on 33,000 annual hikers visiting Kosciuszko spread seeds [Ref-8].

Claims that Brumbies disperse weed species on their coat or by eating and excreting them are not based on sound evidence, and ignore the fact that *seeds are primarily dispersed by gravity, wind, surface water movement, soil erosion, birds, ants, dung beetles and rodents.*

I will leave readers to judge for themselves how weeds were introduced and how they spread.

Australian Brumby Alliance 23-April-2016

References

1. <http://www.americantrails.org/resources/wildlife/horseenvironment.html> Janzen is the researcher who has done the most studies on seeds in horse manure.

2. Mopping up the great Snowy River tip <http://www.smh.com.au/news/national/mopping-up-the-great-snowy-river-tip/2005/12/09/1134086806879.html?page=4>

3. The Snowy Hydro-Electric and Irrigation Scheme – A situation and critical analysis by Diane Cousineau and Nathan Cammerman
<http://www.watercentre.org/education/programs/attachments/case-study2.pdf>

3a. The Four Principles were proposed in Arthington & Bunn (2002) to explain the impacts of flow on aquatic biodiversity are;

1. *Flow is a major determinant of physical habitat in streams, which in turn is a major determinant of biotic composition.*
2. *Aquatic species have evolved life history strategies primarily in direct response to the natural flow regimes.*
3. *Maintenance of natural patterns of longitudinal and lateral connectivity is essential to the viability of populations of many riverine species.*

4. *The invasion and success of exotic and introduced species in rivers is facilitated by the alteration of flow regimes.*

4. http://www.bcha.org/media/uploads/2015/11/13/files/Gower2008_Forest_Ecology_Eastern_US_weeds-horses_full_article.pdf Are horses responsible for introducing noxious weeds onto trails and adjacent ecosystems in the western USA, by Tom Gower, Dept Forest Ecology & Management Wisconsin Uni.

5. <http://www.southwestnrm.org.au/sites/default/files/uploads/ihub/nimmo-dg-miller-kk-2007-ecological-and-human-dimensions-management-feral.pdf> “Ecological and human dimensions of management of feral horses in Australia: a review” by Dale Graeme Nimmo and Kelly K. Miller 2007

6. https://engage.environment.nsw.gov.au/protectsnowies/forum_topics/what-is-more-important-to-consider-the-estimated-population-of-wild-horses-or-the-impact-of-wild-horses-on-the-national-park-or-both In the 50s and 60s Scotch/Spanish Broom, Lupins, willows and other exotic trees were introduced during the building of the Snowy Scheme. [NPWS Admin reply to queries raised in the “Protect the Snowies” Chat room process].

7. <http://link.springer.com/article/10.1007/s11258-008-9468-0#/page-1> Compares vegetation on Horse dung.

8. <http://weedsnetwork.com/traction/permalink/WeedsNews1938> Hikers spread invasive plant seeds (2011)