

## **EXPERT REPORT**

### **Horse Riding in Wilderness Areas**

**Our Reference: EDO 16-842**

**Date: 3<sup>rd</sup> October 2016**

**Author: Elizabeth Ashby**

## 1. EXECUTIVE SUMMARY

- 1.1 This expert report considers the trial of horse riding in three NSW wilderness areas over a two-year period. The impacts of horse riding in these areas has been monitored by the NSW Office of Environment and Heritage and some of the raw data published on their website.
- 1.2 The Review of Environmental Factors prepared for each trial are deficient in many significant ways, including a fundamental flaw in the definition of the subject site and study area, lack of consideration of endangered ecological communities, insufficient consideration of potential impacts on threatened species and the lack of recognition of the action of Key Threatening Processes.
- 1.3 Inspection of the collection methods and the reported data also show the trial to be lacking in scientific method. There was no control sample throughout the study period and no experimental approach or controls on the use of the trails. The methodology was changed as the trial was being conducted and there was significant equipment failure. The trial was carried out over only 2 years and the horse riders knew they were riding under test conditions. These flaws mean that the results have no predictive power and are no better than anecdotal reports.
- 1.4 Measurable impacts to the environment are likely to occur over the long term and interact with stochastic processes, which were not encountered over short 2-year trial period.
- 1.5 Alarming, there is a blurring of what should be an objective scientific aim of a trial and the delivery of a policy decision by government.
- 1.6 The scientific literature indicates that horse riding in natural areas has the potential to do great environmental harm, including such things as the spread of weeds, soil compaction, soil erosion, spread of pathogens, and damage to the habitats of threatened species and endangered ecological communities.
- 1.7 In my opinion, this trial has not been adequate to address these anticipated impacts and such impacts may be significant and adverse.

## 2. BACKGROUND

- 2.1 The NSW Office of Environment and Heritage (OEH) have been running a two-year trial of horse riding in declared Wilderness Areas (the Pilot Program) in 5 national parks in four localities, being Kosciuszko National Park (KNP), Deua and Monga NPs (D-MNP), Mummel Gulf NP (MGNP) and Curracabundi NP (CNP).
- 2.2 I have been engaged by the Colong Foundation to provide independent expert advice regarding the environmental impacts arising from horse riding trials currently underway in declared NSW Wilderness Areas.
- 2.1 This Expert Report has been prepared in accordance with the Expert Witness Code of Conduct provided in Schedule 7 of the Uniform Civil Procedures Rules 2005. I have read the Code and agree to be bound by it.
- 2.2 I have been a past employee of the NSW National Parks and Wildlife Service (NPWS) (1983 to 1993) and as a consultant I have undertaken a small number of short-term contracts for the Office

of Environment and Heritage (OEH), the latest being in 2011. I believe there is no conflict of interest that would interfere with my capacity to provide this expert report.

### 3. EXPERT CAPACITY

3.1 I have worked as a professional ecologist since 1983 for both government and the private sector. My Curriculum Vitae is attached at Annexure A.

3.2 My most relevant experience is as follows:

3.2.1 Being part of a wide ranging experimental landscape ecology research project at NSW NPWS, run by Dr Dan Lunney. The focus of this research was the investigation of the impacts of woodchip logging, drought and fire on the fauna of the south east forests;

3.2.2 Undertaking vegetation sampling, classification and mapping with Dr David Keith at the NSW National Parks and Wildlife Service and Dr John Benson at the National Herbarium of the Royal Botanic Gardens. This research established the benchmark for such work and was carried out in a diverse range of environments across NSW;

3.2.3 Ecological impact assessment as a consultant, responsible for hundreds of assessment reports (including EIS and SIS) pursuant to NSW and Commonwealth legislation; and

3.2.4 Providing expert evidence to the NSW Land and Environment Court on a wide range of matters but particularly impacts on endangered ecological communities and threatened species.

### 4. TERMS OF REFERENCE

4.1 The brief I have been provided is attached at Annexure B and includes the following as matters for consideration:

4.1.1 Review the publicly-available documents relating to the trial, particularly:

- **environmental assessment documents** - Review of Environmental Factors (REF) for KNP, D-MNP and MGNP and the Draft Plan of Management (DPoM) for CNP;
- **monitoring and evaluation documents** – *Monitoring Framework* (OEH April 2014), *Monitoring Methods* (OEH June 2015) *Developing Management Thresholds* (de Bie and Morris no date), *Indicators, management thresholds and management responses* (OEH June 2015);
- **data collected** – *Baseline weed assessment* (OEH June 2015), and *Monitoring data reports* for KNP, D-MNP and MGNP; and
- **data review** – summary snapshot documents for the trials (OEH September 2016).

4.1.2 Provide opinion regarding the likely impacts to arise from horse riding in wilderness areas;

4.1.3 Provide opinion regarding the scientific methods of the monitoring trial;

4.1.4 Provide opinion regarding the adequacy of the monitoring trial; and

4.1.5 Provide opinion regarding any other matter I consider relevant.

## 5. The REFs

- 5.1 The purpose of any REF is to characterise the potential impacts of an activity on the environment. Although OEH believes the trial is not an activity as defined under Part 5 of the *Environmental Planning and Assessment Act 1979* (see for example pp 12 KNP REF), they have undertaken the REF as a “precautionary” measure “in recognition of the level of community interest and the wilderness values of these areas” (for example, see pp 4, paragraph 4 of the KNP REF).
- 5.2 The component of any REF that is relevant to biodiversity is confined to impacts on listed matters under the NSW *Threatened Species Conservation Act 1995* (i.e. threatened species, endangered populations and endangered ecological communities) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (Matters of National Environmental Significance).
- 5.3 The potential impacts are assessed for NSW-listed matters by the application of the Assessment of Significance procedure (also known as a Seven Part Test).
- 5.4 This Assessment of Significance is to be applied to all listed matters with the potential to be impacted by the action (including both direct and indirect impacts). It is important to note that there need only be potential habitat available within the zone of influence of an action to trigger the need for an Assessment of Significance.

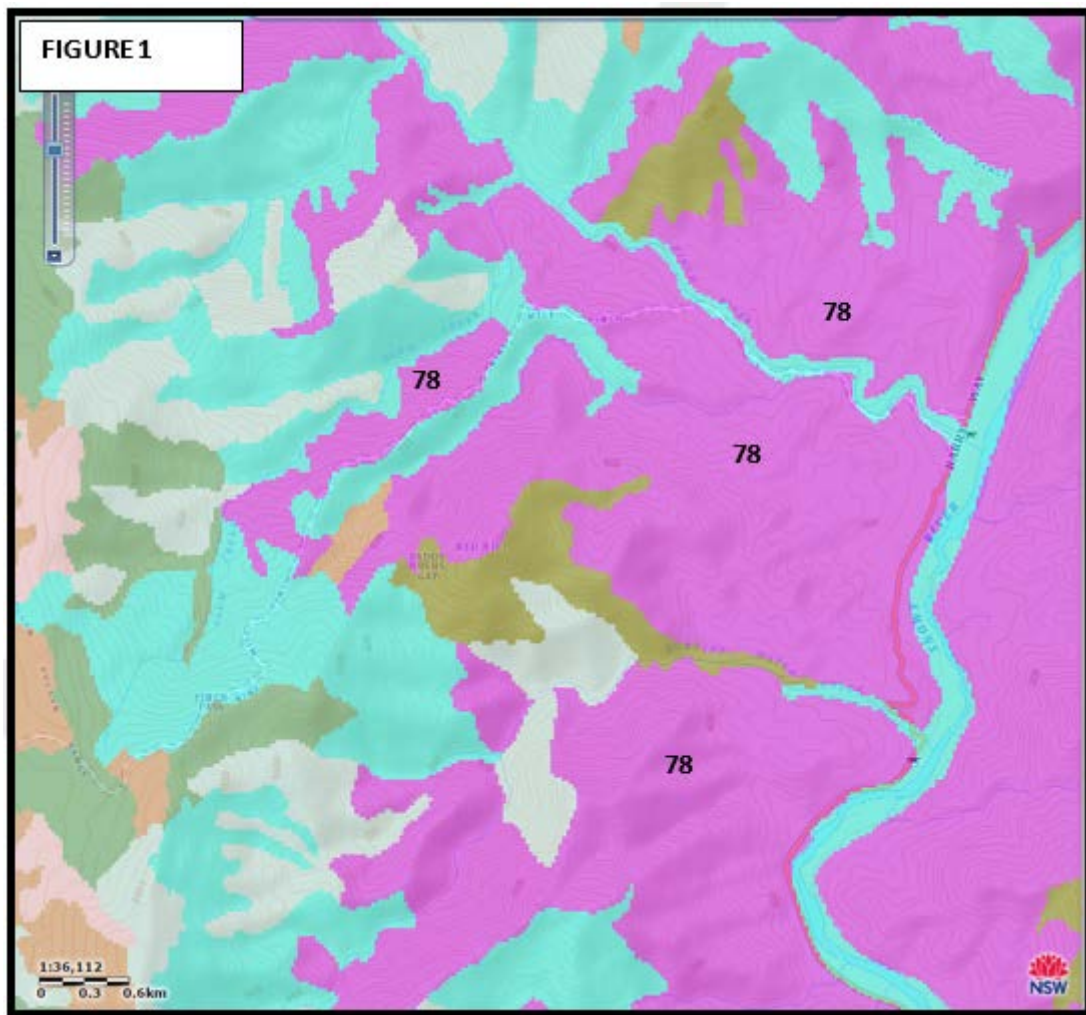
### Assessment of Significance

- 5.5 Best practice dictates that the Assessment of Significance is underpinned by examination of past records in the area, together with expert habitat assessment and survey appropriate to the biota in question.
- 5.6 However, the subject REFs are deficient in a number of areas, notably in the consideration of potential impacts on threatened species, endangered populations and endangered ecological communities. Examples of these deficiencies are explored below.
- 5.7 The KNP REF details the activity as being horse riding on existing tracks and trails, along with bush camping allowed in three locations. It relies upon the riders voluntarily complying with the rules regarding group size, staying to the tracks, camping only in the designated areas and observing a Code of Conduct (which I assume is the *Code of practice for horse riding in parks* April 2014).
- 5.8 The route of the KNP trial crosses a series of topographic positions including creeks and low-lying ground, as well as different environments including open grassy clearings and forest / woodlands.
- 5.9 The KNP REF states that “No EECs occur within the immediate vicinity of the trial route” (pp 38) and this is the basis upon which no potential impact is assessed for any endangered ecological community.
- 5.10 The best available vegetation classification and mapping of KNP<sup>1</sup> (Gellie 2005) shows that the Nine Mile Pinch section of the trail passes through an area of Vegetation Group 78 Lower Snowy White Box Dry Shrub/Herb Woodland, which is part of the Vegetation class 6a Lower Snowy White Box

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<sup>1</sup> Nicholas James Holman Gellie (2005) Native Vegetation of the Southern Forests: South-east Highlands, Australian Alps, South-west Slopes, and SE Corner bioregions. *Cunninghamia* 9(2):219-254

Woodland. An extract of the vegetation map<sup>2</sup> in the vicinity of the Nine Mile Pinch arising from this study is shown in Figure 1 below. Vegetation Group 78 is shown as the pink areas.



- 5.11 The legal definition of the NSW-listed endangered ecological community of White Box Yellow Box Blakely's Red Gum Woodland is provided in the NSW Scientific Committee's Final Determination<sup>3</sup>. Comparison of the Final Determination with the vegetation profile provided in Appendix 5 of Gellie (2005) for Vegetation Group 78 Lower Snowy White Box Dry Shrub/Herb Woodland reveals a high likelihood that Vegetation Group 78 is an example of the EEC. The relevant characteristics shared by the EEC and Vegetation Group 78 are tabulated below:

Final Determination (NSW Scientific Committee 2002)	Vegetation Group 78 (Gellie 2005)
Found on relatively fertile soils on the tablelands and western slopes of NSW.	Occurs on sandy clay loams.
Generally occurs between the 400 and 800 mm isohyets	Bureau of Meteorology climate data shows the Nine Mile Pinch area as receiving between 500 and 800 mm average annual rainfall.
Generally occurs at an altitude of c. 170m to c. 1200 m.	Occurs between 200 and 700 metres elevation.
Occurs within the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney	Mapped occurrence of this vegetation is within both the South Eastern Highlands and the adjacent South

<sup>2</sup> Vegetation layer FE\_CRA\_STHN\_REVISIED05\_E\_3858 available at [http://maps.six.nsw.gov.au/apps/channels\\_3.5/?config=vegetation](http://maps.six.nsw.gov.au/apps/channels_3.5/?config=vegetation).

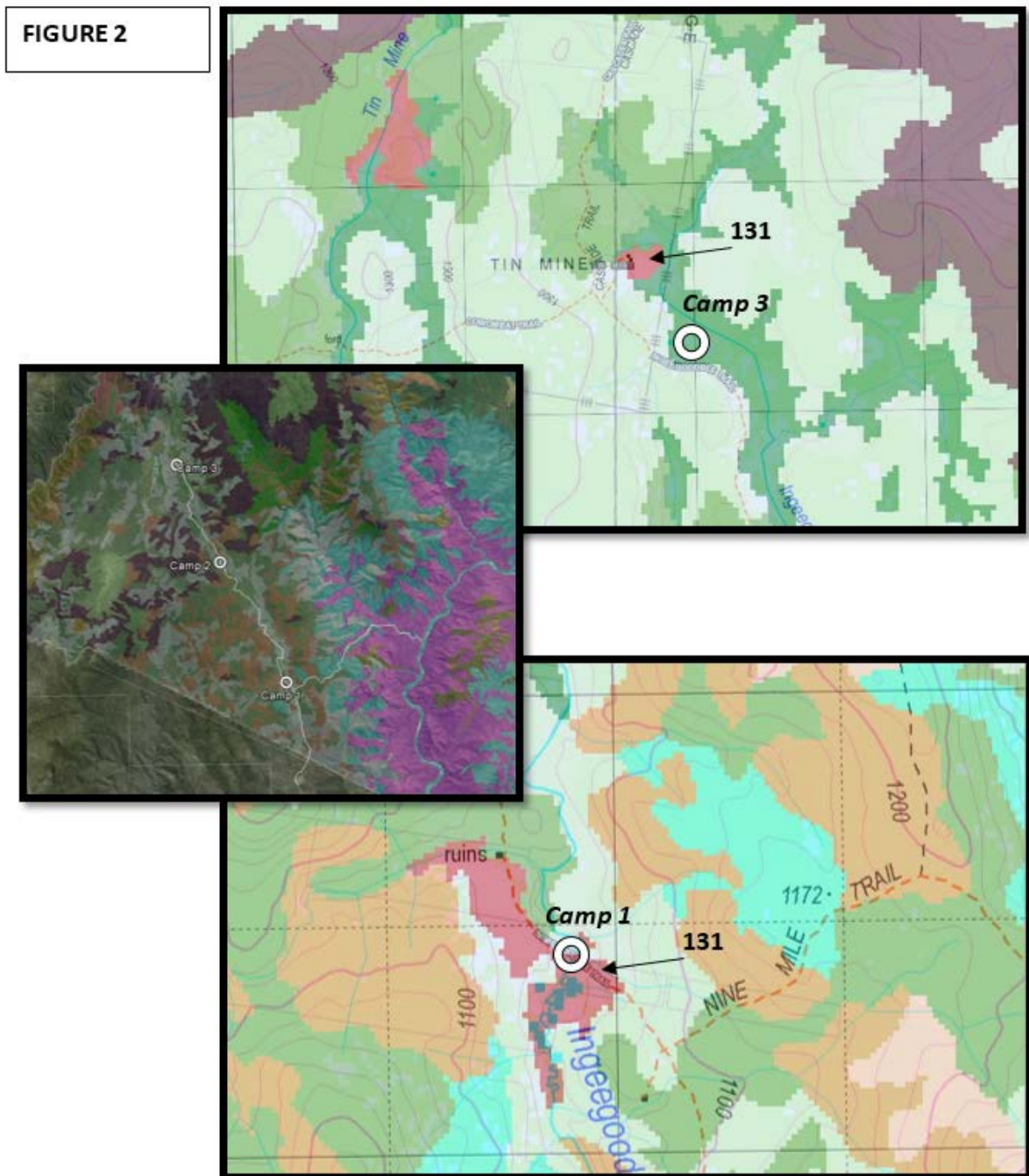
<sup>3</sup> NSW Scientific Committee (2002) Final Determination of White box yellow box Blakely's red gum woodland – endangered ecological community listing

Basin, South Eastern Highlands and NSW South Western Slopes Bioregions.	Eastern Corner. The Nine Mile Pinch trail passes through the Eastern Highlands and along the boundary with it and the adjacent South Eastern Corner.  The inherent locational errors of these maps that may arise simply due to differing production scales requires further consideration of the EEC's occurrence in this area in the South Eastern Highlands Bioregion or the extension of its occurrence into the South Eastern Corner.
Includes those woodlands where the characteristic tree species include one or more of the following species in varying proportions and combinations - <i>Eucalyptus albens</i> White Box, <i>Eucalyptus melliodora</i> Yellow Box or <i>Eucalyptus blakelyi</i> Blakely's Red Gum.	The vegetation profile lists two canopy species as diagnostic for this community: <i>Eucalyptus albens</i> White Box and <i>Callitris glaucophylla</i> White Cypress Pine.
Grass and herbaceous species generally characterise the ground layer.	The Vegetation Group's name is descriptive in this regard – a dry shrub / herb woodland.
Shrubs are generally sparse or absent, though they may be locally common.	Of the 17 diagnostic species reported by Gellie (2015) defining this vegetation group, 10 of the species are grasses and herbs.  Only 4 species of shrubs are listed as diagnostic species for this vegetation group.
Characterised by an assemblage of species detailed in paragraph 3, but many species may be present in only some sites or in very small quantity. In any particular site not all of the assemblage listed may be present.	A number of diagnostic species for this vegetation group are contained in the list of characteristic species for the EEC.  Importantly, all of the canopy trees, 40% of the mid canopy species and 30% of the diagnostic species listed in the vegetation profile (Gellie 2005) are common to the list of characteristic species in the EEC's final determination.

- 5.12 No such analysis or recognition of this potential has been provided or acknowledged in the KNP REF and as a result, no Assessment of Significance has been undertaken. In my opinion, this is a serious oversight.
- 5.13 A single Assessment of Significance was undertaken for all threatened species of flora and fauna deemed to have habitat along the trail route and with the potential to be impacted by use of the trail for horse riding. This is not best practice. Each species has different responses to disturbance and different habitat requirements and therefore should be treated separately.
- 5.14 Of the 2 threatened flora species known to occur within 5 kilometres of the proposed trail, *Calotis pubescens* is acknowledged in the REF as subject to threats that may potentially arise from horses.
- 5.15 No targeted survey was reportedly undertaken for this species, the KNP REF instead relying on the Park's "long history of flora research and mapping" as sufficient. No evidence was provided to show that the areas potentially impacted by the trial have been appropriately surveyed during this long history.
- 5.16 Potential habitat for *Calotis pubescens* is within "sub alpine dry grasslands and heathlands and valley slopes"<sup>4</sup> and of the vegetation groups mapped along the route by Gellie (2005), Vegetation Group 131 Sub-Alpine Grassland is equivalent.

<sup>4</sup> Threatened Species Profile database, <http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10137>.

- 5.17 Significantly, there are only two patches of this vegetation type (and thus potential habitat for this species) along the route. Although the exact camp sites are difficult to discern on the OEH maps, Camp 3 is located close to the mapped extent of one patch of vegetation group 131 and Camp 1 is within the other patch. Their relative locations are shown in Figure 2 below.

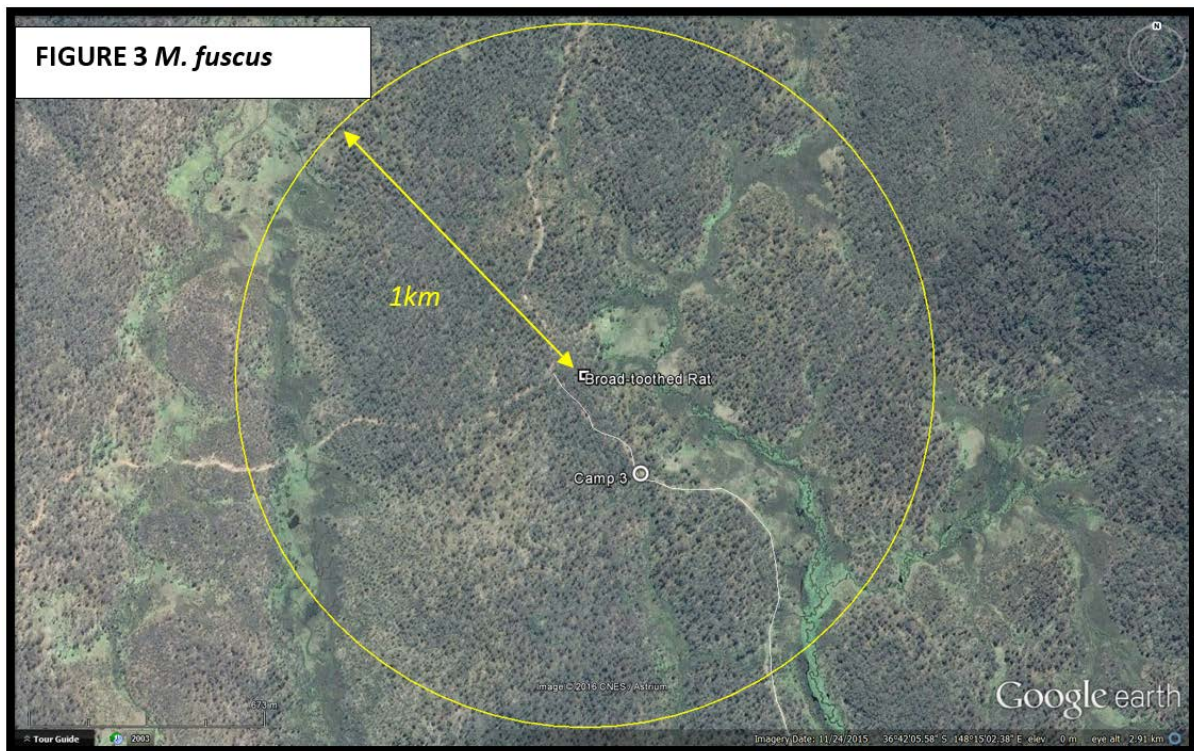


- 5.18 The Assessment of Significance acknowledges that trampling and browsing by horses are threats to *Calotis pubescens*, yet 2 of the 3 camp sites are located where there is potential for maximum impact in their rare habitat. While it is acknowledged that wild horses may trample and browse such habitats already, the scale of impacts are potentially less as they are not confined to a small area, but importantly they are not shod and carrying additional loads (riders and pack).
- 5.19 Similarly, of the threatened fauna species under consideration (see part (a) on page 59 of the KNP REF), the potential habitats for *Litoria verreauxii alpina* Alpine Tree Frog, *Mastacomys fuscus* Broad-toothed Rat and *Pseudomys fumeus* Smoky Mouse are considered by me as the most



vulnerable to impacts from horse riding, and most particularly in camp site locations. However, no survey was undertaken for any of these species or specific habitat analysis conducted along the route of the trail.

- 5.20 BioNet records of *Mastacomys fuscus* Broad-toothed Rat in the vicinity of the trial area are few (presumably due partly to the lack of targeted survey), but the closest to the trail is shown in Figure 3. This record has a spatial accuracy of +/- 1 kilometre, which is shown as a yellow circle. The environments that this species is known to occupy are likely to occur within the area delineated for Camp 3. In the absence of targeted survey and expert analysis, the conclusions in the Assessment of Significance in regards to this species cannot be relied upon.



### **Infection and Pathogen Control**

- 5.21 The Assessment of Significance for part (g), states that “*The activity is not part of a key threatening process nor will it contribute to the operation of or exacerbate a key threatening process.*” This is incorrect. While horse riding by itself is not specifically mentioned in legislation as a key threatening process, it certainly is implicated in the actions of at least two, being “Infection of native plants by *Phytophthora cinnamomi*” and “Invasion of native plant communities by exotic perennial grasses”.
- 5.22 Horses are recognised as a potential vector for *Phytophthora cinnamomi* and the National Best Practice Guidelines suggest that horse riding may pose an unacceptable risk where high conservation values are at stake.<sup>5</sup> Prevention of spread is reliant on implementation of specific hygiene protocols.

<sup>5</sup> E. O’Gara, K. Howard, B. Wilson and G.E.Stj. Hardy (2005) Management of *Phytophthora cinnamomi* for Biodiversity Conservation in Australia: Part 2 - National Best Practice Guidelines / Appendix 2. A report funded by the Commonwealth Government Department of the Environment and Heritage by the Centre for *Phytophthora* Science and Management, Murdoch University, Western Australia (Page 7)



- 5.23 For pathogen control, the KNP REF relies upon the voluntary behaviour controls (e.g. group size, trail riding) and encouragement of riders to abide by the Code of Conduct. Presumably this is the Code of Practice (see 5.7 above), but there is no mention of pathogen control in general or prevention of spread of *Phytophthora* in particular.
- 5.24 Other pathogens may also be spread by horse riding (such as Myrtle Rust), but this too has not been acknowledged in the KNP REF impact assessment.
- 5.25 Bush campsites do not have toilet facilities, yet the potential for the spread and control of human pathogens has not been acknowledged or discussed.
- 5.26 Horse riding in natural areas can also contribute to the Key Threatening Process “Invasion of native plant communities by exotic perennial grasses”. A recent review of the literature<sup>6</sup> found that of the 249 species that reportedly germinate from horse dung, 22% are grasses and over half of all species are perennial. Specifically, *Ehrharta calycina* Perennial Veldtgrass has been observed germinating from horse dung on horse trails in John Forrest National Park<sup>7</sup>.

#### **Over reliance on controls**

- 5.27 In order to reach the conclusion that the horse riding trial will not impose a potential significant adverse impact on those species considered, the Assessment of Significance relies heavily on both the absence of the subject biota and on the controls being successful.
- 5.28 These controls are group sizes smaller than 8 horses, riders remaining within the formed track, seasonal closures allowing for natural rehabilitation and implementation of successful ameliorative actions. However, the controls regarding rider behaviour and group sizes are entirely voluntary and should not be relied upon. Also, while group sizes are requested to be voluntarily limited to 8, there are no controls on the numbers of groups. The Assessment of Significance is flawed in this regard.
- 5.29 The D-MNP and MGNP REFs detail the activity as being horse riding on existing or historical bridle tracks (D-MNP) or established trails (MGNP); a limit on the group size to 20 horses; with the riders voluntarily complying with the rules regarding group size, the route, the prohibition on camping and observing a Code of Conduct (which is presumably the *Code of practice for horse riding in parks* April 2014).
- 5.30 While group sizes are requested to be voluntarily limited to 8 (KNP) or 20 (D-MNP and MGNP), there are no controls to ensure compliance, nor are there any proposed controls on the numbers of groups.

#### **Lack of defined study site**

- 5.31 Any competent Assessment of Significance must follow the Threatened Species Assessment Guidelines issued by OEH’s predecessor, the Department of Environment and Climate Change<sup>8</sup>. It is necessary to define the subject site, the study area, the factors at work in those areas as a result of the proposed action, and the local population of a threatened plant or animal species in the

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<sup>6</sup> Ansong, M. and Pickering, C. (2013) A global review of weeds that can germinate from horse dung. *Ecological Management and Restoration* 14(3):216-223 (pp 6 and 9)

<sup>7</sup> Newsome, D., Smith, A, and Moore, S.A. (2008) Horse riding in protected areas: a critical review and implications for research and management. *Current Issues in Tourism* 11(2)144-166 (see page 153)

<sup>8</sup> Department of Environment and Climate Change NSW (August 2007) *Threatened species assessment guidelines – the assessment of significance*.

context of those defined areas and actions. Also, if “multiple populations occur in the study area, each population should be assessed separately”<sup>9</sup>. This might be the case where a subject site and study area is long and linear and potentially traverses separated populations, such as for the horse riding trial.

No such definitions or consideration of subject site, study area or local populations have been undertaken as part of the Assessment of Significance, and so it is fatally flawed and cannot be relied upon.

- 5.32 In the absence of a competent Assessment of Significance, the Precautionary Principle should be applied and a significant impact assumed.

**Damage to soil quality, land stability and watercourse**

- 5.33 In Section 8 of the KNP REF (Impact Assessment), the likely impact levels are all determined as “low”, “negligible” or “minor”.

- 5.34 In terms of damage to soil quality, land stability and watercourses (Section 8.1, questions 1 and 2, page 41), the potential impacts can be much greater than “low”, particularly given the fact that campsites are located adjacent to watercourses and crossings and that “parts of the Nine Mile Trail are steep and challenging” (Section 8.3, question 4, page 47). I note that the photographs at pages 23 and 24 illustrate the existing damage wrought by wild horses to soils and bank stability at water crossings and on steep sections of tracks. Domesticated and wild horses both impose such impacts on the environment, although shod horses with riders and packs can be expected to impose a greater degree of impact to delicate soils.

- 5.35 In terms of emissions, at Section 8.1 question 6 (page 42), the impact level from manure is deemed to be “low” as “small amounts of manure will be deposited on the trail and in camping areas”. However, this is not quantified and the concentration of manure in camp sites has not been considered as a separate potential hotspot of nutrients and weed propagules. Concentrated build-up of manure from horses fed on commercially-produced feed has the potential to pollute water and soil and produce or exacerbate a weed problem. Given the locations on and near water, these problems have the potential to spread downstream beyond the immediate vicinity of the trail.

- 5.36 The D-MNP REF and MGNP REF differ from the KNP REF in that they are assessing the impact of trials with different characteristics in different areas, but they are similarly flawed as the REFs are identical in their underlying assumptions and responses. The responses provided in Section 8 of the three REFs are generic, with no reference to site-specific characteristics, such as soil types, vegetation, degree of naturalness or likely species affected.

- 5.37 Similarly, the Assessments of Significance are all flawed as none of them are underpinned by targeted survey, none define the subject site and study area, nor do they acknowledge the presence of likely EECs or recognise the contribution of the activity to Key Threatening Processes.

- 5.38 For the D-MNP REF, the potential presence of 3 EECs has not been considered as part of the REF. Interrogation of the available vegetation mapping (FE\_CRA\_STHN\_REVISIED05\_E\_3858, South Coast\_SCIVI\_v14\_E\_2230 and Shoalhaven\_EECs\_v2\_E\_3901) and comparison with the physical features of the proposed trial route and the published Final Determinations of candidate EECs,

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<sup>9</sup> Pp 5 of DECC (2007)

reveals that Araluen Scarp Grassy Forest EEC, Lowland Grassy Woodland in the South East Corner EEC and River-flat Eucalypt Forest EEC may all occur in and around the proposed route of the trail.

- 5.39 All of these EECs have the potential to be adversely impacted by horse riding through such things as trampling and soil compaction, weed spread or exacerbation of certain Key Threatening Processes.
- 5.40 No detailed habitat or distributional analysis has been provided for the threatened flora and fauna species listed in the D-MNP REF as potentially vulnerable to impacts from horse riding. In my estimation, *Eucalyptus kartzoffiana* Araluen Gum and *Litoria littlejohni* Littlejohn's Tree Frog are both particularly vulnerable, as they are known from riparian areas where the presence of horses can do maximum damage.
- 5.41 The illustrative photographs in the MGNP REF suggest that horse riding will be restricted to well-formed vehicular tracks that are already used for management purposes, unlike the indistinct and vegetated walking trails in the other NPs.
- 5.42 Nevertheless, available vegetation mapping in and around MGNP (FE\_CRA\_NTHN\_LNE\_B\_3883) suggests that there is potential for the presence of Ribbon Gum - Mountain Gum - Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion EEC along the higher parts of the trail. This has not been acknowledged or the potential impacts explored in the MGNP REF.

## 6. Monitoring design

- 6.1 The *Code of practice for horse riding in parks* (April 2014, page 2) states that the trial's objective is to "determine the impacts of horse riding in wilderness areas".
- 6.2 The *Wilderness Horse Riding Trial: Monitoring methods* (June 2015, page 1) states that the monitoring project aims to:
- Detect impacts that may occur to key values as a result of horse riding on the pilot wilderness trails within the two-year trial period;
  - Define thresholds for implementing management interventions to protect key values from irreversible damage and inform park managers of any threshold triggers; and
  - Detect whether interventions are successful in ensuring key values and protected from irreversible damage.
- 6.3 However, the aim of the trial of horse riding in wilderness areas is, surprisingly, **not** to determine the impact of horse riding in wilderness areas, but rather to "determine whether potential impacts on park and wilderness values can be managed within acceptable thresholds" (quoted on page 3 of each REF).
- 6.4 Implicit in this statement is that some potential impacts may not be acceptable; however, determining whether the impacts are acceptable is not an option as one of the "overarching goals" of the proposed activity (the trial) is "to improve opportunities for sustainable recreational horse riding in NSW national parks" (quoted on page 6 of each REF), which is demonstrably a political objective and not a scientific one.
- 6.5 Moreover, the Monitoring Framework (April 2014, page 4) states that "The trial is not designed to detect what impacts are associated with horse riding in wilderness, rather those impacts associated with horse riding on wilderness trails can be managed without causing irreversible damage" [sic].

Although it seems that a word is missing from this sentence, I understand it to say that horse riding in wilderness areas is a *fait accompli* and that the trial is designed to meet a policy and political objective.

- 6.6 This setting of an *a priori* outcome has, I believe, blurred the objective scientific method that should otherwise have been employed and driven the trial. A truly objective scientific investigation would have as its objectives to (i) determine the impacts of horse riding (their types and scale), (ii) devise management strategies to control impacts, and (iii) determine whether these management strategies are successful in controlling said impacts.
- 6.7 "Irreversible damage" has not been defined despite it being the stated limit to what is acceptable. In my opinion, even the loss of some local populations of threatened species can be reversed given enough resources, but should be considered an unacceptable impact.
- 6.8 The Monitoring Framework justifies the absence of the collection of data on threatened species partially with the desktop assessment undertaken as part of the REFs. However, as discussed previously, this assessment was insufficient.
- 6.9 This absence of attention to threatened species is also justified in the Framework by the monitoring of habitats, which is in turn justified by the short time frame of the trial. However, the short time frame is a problem in itself, as the damage to habitats from horse riding is likely to manifest over the long term. For example, the establishment of a new weed requires several seasons at least for the population to grow, a seedbank to build up, and for it to disrupt or alienate habitat for native species. Any knock-on effects for other species relying on those native habitats would then only emerge after the habitat had been altered to a sufficient degree to impact on their life cycles, and so on. Such impacts will not be observed within 2 years.
- 6.10 Serious and / or irreversible impacts are likely to emerge after the imposition of other inevitable stochastic disturbances, such as drought and fire. The multiplier effect of disturbances will not be detected by a short monitoring program, and particularly one without adequate controls. The ability for a system to respond to multiple events cannot be addressed in a two-year trial, and is a serious design flaw, particularly for one where the focus is on habitat recovery.
- 6.11 Also implicit in the statement of the aim of the trial ("*determine whether potential impacts on park and wilderness values can be managed within acceptable thresholds*") is the need for predictive power from the results. However, the design is flawed in that it does not take an experimental approach and is lacking a proper control.
- 6.12 In order to be able to tease out the impact of horse riding and the need for management actions (as opposed to say, weather effects unconnected with horse riding), then monitoring needs to be undertaken on a trail without horse riding at the same time as the horse riding trail is monitored. Of course measurements should also be replicated, but it is acknowledged that a replicate trail is virtually impossible. Therefore, it is assumed here that each sampling site along each trail are going to serve as pseudo-replicates. However, these are poor pseudo-replicates as the only feature they share is an assumed high vulnerability to impacts from horse riding.
- 6.13 The design of this trial allows only for conclusions to be made about the impacts observed during the trial conditions. For example, without an experimental approach, there is no way to assess whether controlling group size is necessary, or whether management actions might be triggered in certain areas after certain rain events, irrespective of horse use.

- 6.14 According to the controls listed in the REFs, horse rider behaviour is pivotal to the success of the proposed amelioration strategies. However, the design of the monitoring program is confounded in this regard because the horse riders knew they were participating in a trial when using the tracks. The use of the trails during the trial period will not necessarily reflect behaviour outside of the trial period, although it is to be used to determine management responses to horse riding outside of the trial period.
- 6.15 There seems to be no consideration given to how the data are to be analysed. The Monitoring Framework (April 2014 page 9) states that *“Data will be compiled and evaluated following each data collection event ... An evaluation will be undertaken at the end of the two-year trial.”* Data analysis is not mentioned at all in the Monitoring Methods paper. The absence of data analysis perhaps helps to explain the lack of a rigorous scientific design.

## 7. **The data**

- 7.1 The data collection is very sloppy. While it is acknowledged that the sites are relatively remote, inclement weather can interfere with scheduling and equipment can fail, all of these factors should have been planned for with sufficient time and personnel available for the field works program and sufficient redundancy in the remote camera stations. Unfortunately, the uneven nature of the data collection makes meaningful comparisons impossible.

### **Inadequacy and lack of camera data**

- 7.2 The KNP trial began on 5th March 2014 with data collected at 12 or 14 sites (it is unclear which). In Spring (no date indicated), 2 additional sites outside of the trial horse riding area were added “for reference” and 2 of the 3 camp sites were measured. It is unclear if data were ever collected for Camp 1.
- 7.3 The additional “reference” sites were located on the Cascade Trail and are somehow intended to aid in the assessment of wild horse impacts. It is unclear how they will achieve this objective. No additional reference sites were used for the trials in D-MNP or MGNP.
- 7.4 Camera data collection is very patchy. In KNP, 3 remote cameras were set up (location unknown) in the period from March to November 2014, giving an anticipated total of collection of data over 874 camera days. However, due to equipment theft and failure, data were collected only 51% of the time, on 451 camera days in that period.
- 7.5 As one camera was stolen from the outset of the KNP trial, only 2 of 3 cameras were in place from March to August, with only 1 operational in September and October. No cameras worked at all for the last 5 days of that sample period.
- 7.6 The degree of camera failure was significant for the rest of the trial in KNP. One camera was reportedly “inaccessible” and no data retrieved from it for the period from 19 – 30 November 2014. By 3 April of 2015, 1 of the 2 remaining cameras failed, then a camera was “displaced” and another failure resulted in only 1 camera working from the 13 May 2015 to 24 November. Data were collected from 3 cameras from 24 – 30 November 2015 but by the 9 December, again the data were being collected by a single camera until the end of the trial in April 2016.
- 7.7 Camera failure was also rife in the other trials. For example, in D-MNP, no camera data were collected at all for one third of the year (22 February to 2 July 2015) on the Georges Pack Track and for almost half of the year (9 September 2014 to March 2015) on the Shoebridge Track.



- 7.8 Because the camera locations have not been revealed, it is impossible to accurately determine the influence of poor camera performance on the conclusions to be drawn about trail use. Nevertheless, the patchy nature of the collection effort would not allow for robust comparisons to be made. For example, no horse riding was recorded in MGNP at all, but this may be due to camera failure and not absence of riders.
- 7.9 The poor execution of the camera data collection, the poor performance of the equipment and the lack of clarity in the reporting of the data means that the information collected is of anecdotal value only.

**Lack of soil compaction data**

- 7.10 Another departure from the intended design was the abandonment of the collection of soil compaction data. This arose because the data collected indicated significant compaction across most areas that would have necessitated strong management action, which was not supported by visual assessment.
- 7.11 It is unfortunate that this was abandoned as compaction was one of the characteristics anticipated to be an important indicator of damage by heavy hard-hoofed animals with iron shoes on the delicate erodible soils of the high country. The scientific literature indicates that it is likely to be one of the more significant impacts and is, for example, one of the variables implicated in the long-term dieback events observed in the New England Tablelands. It is unclear why the readings were unreliable and I look forward to a full explanation.

**Inadequate weed data**

- 7.12 The baseline weed data that have been provided is very poor, being no more than a list of exotic species for each track. However, the *Monitoring methods* document indicates a that more detailed assessment was to be undertaken, recording cover abundances of weed species in a series of parallel transects radiating out from the track (see page 13). A report prepared by EcoLogical<sup>10</sup> is referred to (see page 13), but it has not been made available.
- 7.13 There is no indication of how the rapid weed survey was undertaken or by whom, no indication of the locations of the weed species, no indication of their abundance, or any other useful information.
- 7.14 This rapid survey (and presumably the detailed parallel transect survey) is to be repeated, but no information is yet forthcoming.
- 7.15 The Monitoring framework (page 9) indicates that photo points along with monitoring data will be posted to the OEH web site and updated as they become available. However, only a few select photo points were published.
- 7.16 In my opinion, the design and implementation of the data monitoring does not accord with the Scientific Rigour Position Statement of OEH.

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<sup>10</sup> Eco Logical Australia 2014, *Rapid baseline weed surveys: Kosciuszko, Deua, Monga and Mummel Gulf National Parks*. Prepared for NSW Office of Environment and Heritage

## 8. Data snapshots - cameras

- 8.1 For KNP, only “legitimate” riders are reported (see page 6 of the KNP snapshot document); those with dogs in tow or the ones with foals or riding when the trail is ostensibly closed have been omitted. This does not make sense, as there is no way to discern whether these users are completely independent of the trial. The legitimacy of their behaviour should not exclude them from the data set as the trial is supposedly assessing the use of the trails by domesticated horses and their riders, irrespective of their assumed intention. There was no such restriction to the data foreshadowed in the methods documents.
- 8.2 It is unclear how the snapshot numbers have been deduced with a number of discrepancies evident.
- 8.3 For KNP, OEH reported that there was a total of 60 riders detected on 32 occasions (page 5 of the KNP snapshot document) but the data shown in the graph (page 6) totals 48. The Excel spreadsheets of data indicate a total of 93 riders were detected during the trial periods when the cameras were working (which includes the “illegitimate” riders).
- 8.4 Using a similar logic, for D-MNP, OEH reported a total of 91 riders on 14 occasions (page 5), but the graph (page 6) indicates a total of 173 riders, whereas the Excel spreadsheets indicate 189 were detected during the trial periods when the cameras were working. There were no illegitimate riders reportedly detected in this trial.
- 8.5 For the October 2014 sample of the Georges Pack Track in D-MNP trial, the total number of horses with riders according to the Excel spreadsheet was 52. This is inexplicably 26 in the snapshot report.
- 8.6 For both KNP and D-MNP, the numbers of pack horses were not referred to in the snapshot reports. This is unexplained and they should be counted. The Excel spreadsheets indicate a total of 15 pack horses for KNP and 46 for D-MNP were detected during the trial periods when the cameras were working.
- 8.7 Overall, the snapshot reports pose more questions than they answer and seem to suffer from sloppy quality control.

## 9. Likely impacts as indicated by the scientific literature

- 9.1 The scientific literature is clear and in agreement that horse riding in natural areas has the potential to cause environmental harm. The two most recent review papers are instructive in that regard: Newsome et al. (2008)<sup>11</sup> and Ansong and Pickering (2013)<sup>12</sup>. It is these papers that are relied upon here, as they have reviewed the literature that has gone before.
- 9.2 Newsome et al. (2008) state that “*The growing number of scientific studies demonstrates the high impacts of horse riding, both on the natural environment and on other users*” (pp145). Impacts have been particularly demonstrated on soils, surface water and vegetation and are listed in a compilation table, which is partially reproduced here:

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<sup>11</sup> Newsome, D., Smith, A. and Moore, S.A. (2008) Horse Riding in Protected Areas: A Critical Review and Implications for Research and Management. *Current Issues in Tourism* 11(2):144-166

<sup>12</sup> Ansong, M. and Pickering, C. (2013) A global review of weeds that can germinate from horse dung. *Ecological Management and Restoration* 14(3):216-223

<i>Impact</i>	<i>Significance</i>
<b>Soil</b>	
Soil erosion	Soil and nutrient loss, water turbidity, sedimentation, alteration of water runoff.
Soil compaction	Reduced infiltration, reduced germination, reduced vigour and growth of certain plant species.
Churning and lifting of surface soil particles	Accelerated erosion rates.
	Changes in soil depth.
<b>Water movement</b>	
Reduced water infiltration rates	Strong contributor to tread widening and multiple track creation s users seek to circumvent muddy sections of trails.
Increased surface run-off	Accelerated erosion rates.
<b>Vegetation</b>	
Trampling and loss of vegetative cover	Vegetation loss, replacement by trampling resistant species, increased amount of bare ground, reduced vegetation height.
Alteration of plant species composition	Species that are less tolerant to trampling are replaced by species that are more resistant to trampling such as more aggressive native colonizers (e.g. grasses and / or exotic species).
Tree damage and root exposure	Root damage, reduced tree health, intolerance to drought.
Plant defoliation through grazing	Reduction in plant vigour, damage to aerial parts of some plants thereby reducing flowering ability and hence reproductive success.
<b>Structural changes to trail</b>	
Increased trail width	Vegetation loss, increased amount of bare ground.
Informal and multiple trail development	Vegetation loss, wildlife habitat fragmentation.
<b>Introduction of foreign material</b>	
Manure on trails	Introduction of weed species.
Spread of plant disease	Vegetation loss, reduction in plant vigour.

- 9.3 Every one of those biophysical impacts described above is relevant to the trial areas, and particularly on those parts of the trails that cross creeks, are on steep slopes and in areas where tracks are not formal service roads, being otherwise on natural ground with regrowth native vegetation (such as in parts of KNP including camp sites, and on bridle tracks in D-MNP).
- 9.4 Newsome et al. (2008) also highlighted that the susceptibility of a trail to impact is dependent on a number of factors, including the effectiveness of the trail management system. Given that sections of the D-MNP trail were deemed too remote to monitor, then it is difficult to see how effective management might be implemented, particularly by an agency that is poorly-funded.
- 9.5 Newsome et al. (2008) reported on a study of horse riders themselves. This survey established that although they believed that their activities had minimal environmental impact because they rode on designated trails, 16% volunteered that they rode off-trail on occasion. Thus, the evidence indicates that the characteristic most relied upon to avoid and minimise damage in wilderness areas – rider behaviour and voluntary compliance with a Code of Practice / Conduct – probably cannot be relied upon for a substantial proportion of riders.

- 9.6 Newsome et al. (2008) have extracted a set of management strategies that have been proposed in order to avoid, minimise and ameliorate impacts of horse riding in protected areas. These are listed below, with a response added (column 3) which describes the applicability to this trial:

<b>Management Strategy</b>	<b>Details</b>	<b>Applicability</b>
<b>Zoning</b>		
Use specific zoning	Set aside areas for horse use only e.g. designated bridle trails.	Not designated trails; instead they are multi-use trails.
	Locate trails near edges of protected areas or in modified zones.	Route is through the middle of wilderness areas.
	Exclude horse riding from ecologically sensitive areas.	Route is through potential EECs, across creeks and camp sites located in threatened species habitat and on sensitive riparian areas.
<b>Site (trail) management</b>		
Locating trails	Locate trail on contour and on level ground, trail grade to below 10%.	Some sections on very steep land.
	Control water, for example, bridges, drainage dips, outsloped treads, water bars and ditches.	No works proposed.
	Re-route short sections of trail to stop trail degradation in problem areas.	May be considered, but not part of trial.
Managing trails	Apply trail hardening and surfacing techniques.	Has been considered, but not part of trial.
	Reinforce soil structure.	Has been considered, but not part of trial.
	Clear overhanging vegetation.	To be undertaken.
<b>Visitor management</b>		
Information and education: Codes of conduct	Ride and stay on designated trails.	Not all of these controls are included in the Code of Practice. Code is voluntary. No policing of these behaviours. Some management actions impossible to achieve e.g. avoid areas easily damaged by horses.
	Ride in single file on trails to reduce width.	
	Use facilities provided.	
	Keep horses under control at all times.	
	Spread out in untracked country.	
	If possible, do not shoe horse before a trip as new shoes cut up the ground more.	
	Feed horses on commercial, processed feeds prior to and during trip to reduce likelihood of introducing weeds. Feed horses using a nosebag while in the protected area.	
	Hold horses at least 30m from water sources.	
	Use hitching rails or other holding facilities provided. Keep horses away from tree trunks and roots. Use a low power electric fence or tether where facilities are not provided.	
	Avoid crossing areas easily damaged by horses such as sphagnum moss beds, swamps, and steep or boggy creek crossings.	
Introduce horse users to consequences of use and encourage them to adopt low-impact practices.		
Regulating visitor use: numbers of horses	Visit in small groups (4-8 people/horses).	Trial conditions included voluntary control on group size: maximum group size of 20 horses in D-MNP and MGNP; maximum group size of 8 in KNP. No checking of

<b>Management Strategy</b>	<b>Details</b>	<b>Applicability</b>
		group size undertaken or planned. Horse riding in wilderness areas now proposed for extension to the end of 2017 but not clear if trial conditions still apply.
	Limit use, for example, number of horses that visit per year.	No limit imposed.
	Limit the numbers of groups with horses.	No limit during trial. Horse riding in wilderness areas now proposed for extension to the end of 2017 but not clear if trial conditions still apply.
Length of stay	Limit the length of time horse users can access the area, most often applied to camp sites.	No limit during trial. Horse riding in wilderness areas now proposed for extension to the end of 2017 but not clear if trial conditions still apply.
Feed type	Encourage use of “permitted feeds” such as good quality, clean chaff, cracked grain and processed feed. All feeds must be as weed free as possible.	Voluntary and not policed.

9.7 Newsome et al. (2008) identified that damage by horses using trails in natural areas is an area that is particularly poorly understood and has not yet been explored properly by the application of well-designed scientific investigations. This trial provided an opportunity to fill some of that knowledge gap, but it has wasted that opportunity due to poor planning and poor design.

9.8 Ansong and Pickering (2013) in their review of 15 studies established that:

- horse manure carries viable weed seed;
- Almost two-thirds of the species were forbs, 33% graminoids;
- Of those graminoids, 22% were grasses, including perennial grasses;
- Over half of all the species dispersed in horse dung are perennials; and
- Disturbances associated with trampling facilitates the germination.

9.9 These conclusions lead me to believe that the potential for impact by weed spread arising from horse riding in wilderness areas is real and potentially significant.

9.10 Lesser impacts are likely to arise as a result of the presence of wild horses as they are feeding on exotic and native species that already occur in the park. Therefore, while wild horses have the potential to spread weeds in their manure, they do not have the potential to introduce species otherwise not found in the park.



**ANNEXURE A - CURRICULUM VITAE OF ELIZABETH ASHBY**

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**Elizabeth Ashby – Principal Consultant Keystone Ecological Pty Ltd**

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**PROFESSIONAL QUALIFICATIONS****Bachelor of Science**

University of Sydney, 1983, Double major in Zoology and Botany

**Master of Science (Preliminary),**

University of Sydney, 1984, Distinction by coursework

**Cert IV Workplace Assessment and Training,**

North Sydney TAFE, 2002

**BioBanking and Biocertification Assessor (Accreditation Number 0001)**

Northern Sydney Institute of TAFE / Department of Environment and Climate Change, 2009; most recently reaccredited 2015 for BioBanking and Biocertification.

**PROFESSIONAL AFFILIATIONS****Member and past President,** Ecological Consultants Association of NSW**Scientific Member,** Royal Zoological Society of New South Wales**Member,** Australian Mammal Society**SPECIALISED COMPETENCE**

Ecological impact assessment and research

Forest, woodland, heath and grassland flora

Forest fauna

Flora and fauna survey methodology

Geographic information systems

BioBanking Assessment

Data management

Project management

Advocacy and expert evidence

I am a recognised authority on forest conservation issues and have refereed many papers for Australian scientific journals.

I have delivered an invited lecture and workshop for students at the University of Canberra regarding implementing the ecological components of the *Environmental Planning and Assessment Act*.

I have served on a scientific panel of invited experts regarding the conservation status of Cumberland Plain Woodland and associated vegetation communities for the (then) Commonwealth Department of Environment, Water, Heritage and the Arts.

I have also served on a small working group, reporting to the Director-General of the (then) NSW Department of Conservation and Conservation regarding the accreditation of ecological consultants, pursuant to the Threatened Species Legislation Amendment Act (2004).

I also provide regular training in environmental matters to Environmental Land Contracting Pty Ltd.

I have provided expert evidence in the Land and Environment Court in a number of matters. My opinion has been sought on diverse questions such as the structure of forest vegetation and its consequence on bushfire protection requirements, the presence or otherwise of endangered ecological communities and the likely impact of development on threatened species. I am currently acting as a court-appointed expert on a matter regarding rehabilitation management of foreshore wetland in Colongra Swamp Nature Reserve.

**ADDITIONAL TRAINING**

4WD Operator's Certificate – National Parks and Wildlife Service

Chainsaw Operator's Certificate - National Parks and Wildlife Service

OHS General Induction Certificate for Construction Work– Master Builders Association

Introduction to ArcView GIS - ESRI

Working with ArcView Spatial Analyst – ESRI

Return to Work Co-ordinator Training - WorkCover

**PROFESSIONAL EXPERIENCE****Private Consultancy**

*Keystone Ecological Pty Ltd (2004–present)* Principal Consultant responsible for a range of ecological reports incorporating flora and fauna surveys, assessment of conservation values, assessment of impacts, recommendation of mitigation measures and formulation of management plans.

*Conacher Travers Pty Ltd Environmental Consultants (2002–2004)* Senior Ecologist responsible for specialist input into a number of ecological impact assessments, recommendation of mitigation measures and formulation of management plans.

**Public Authorities**

*Royal Botanic Gardens (1993–1999)* Senior Technical Officer responsible for development of the Geographic Information System, data management, production of vegetation maps across NSW, preparation of scientific papers, contribution to research projects on vegetation determinants and conservation matters.

*NSW National Parks and Wildlife Service (1983–1993)* Technical Officer responsible for flora and fauna survey, research data collection and data management, preparation of scientific papers for projects across NSW.

**PUBLICATIONS**

- Daniel Lunney, **Elizabeth Ashby**, Jan Grigg and Michael O’Connell (1986). Food availability and habitat selection of *Sminthopsis leucopus* (Gray) (Marsupialia:Dasyuridae) in logged forest on the south coast of New South Wales. *Australian Mammalogy* 9:105-110.
- Daniel Lunney and **Elizabeth Ashby** (1987). Population changes in *Sminthopsis leucopus* (Gray) (Marsupialia:Dasyuridae), and other small mammal species, in forest regenerating from logging and fire near Bega, New South Wales. *Australian Wildlife Research* 14:275-284.
- Daniel Lunney, **Elizabeth Ashby**, Jan Grigg and Michael O’Connell (1989). Diets of Scincid lizards *Lampropholis guichenoti* (Dumeril and Bibron) and *L. delicata* in Mumbulla State Forest on the south coast of New South Wales. *Australian Wildlife Research* 16:307-312.
- Daniel Lunney, Barbara Triggs, Peggy Eby and **Elizabeth Ashby** (1990). Analysis of Scats of Dogs *Canis familiaris* and Foxes *Vulpes vulpes* (Canidae:Carnivora) in coastal forests near Bega, New South Wales. *Australian Wildlife Research* 17:61-68.
- Elizabeth Ashby**, Daniel Lunney, John Robertshaw and Robert Harden (1990). Distribution and status of bandicoots in New South Wales. Pp 43-50 in BANDICOOTS AND BILBIES, ed by J.H. Seebeck, P.R. Brown, R.L. Wallis and C.M. Kemper. Surrey Beatty and Sons, Sydney.
- David Keith and **Elizabeth Ashby** (1992). Vascular plants of conservation significance in the south east forests of New South Wales. Occasional Paper No. 11, NSW National Parks and Wildlife Service, Sydney.
- Marianne F. Porteners and **Elizabeth M. Ashby** (1996). Plants of Pooncarie and the Willandra Lakes. Royal Botanic Gardens, Sydney
- Marianne F. Porteners, **Elizabeth M. Ashby** and John S. Benson (1997). The natural vegetation of the Pooncarie 1:250 000 map. *Cunninghamia* 5(1):39-231.
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- J. S. Benson and **E. M. Ashby** (2000). Vegetation of the Guyra 1:100 000 map sheet, New England Bioregion, New South Wales *Cunninghamia* 6(3):511-872.

**UNPUBLISHED REPORTS**

- Elizabeth Ashby** and Daniel Lunney (1985). Review of nature conservation programmes: Dasyuridae. Unpublished report to NSW National Parks and Wildlife Service.
- Elizabeth Ashby** and Daniel Lunney (1985). Review of nature conservation programmes: Bandicoots. Unpublished report to NSW National Parks and Wildlife Service.
- Elizabeth Ashby** and Daniel Lunney (1985). Review of nature conservation programmes: Rodents. Unpublished report to NSW National Parks and Wildlife Service.
- John Benson and **Elizabeth Ashby** (1998). Vegetation of the Guyra 1:100 000 map sheet. Unpublished report to the Australian Heritage Commission.

**CONFERENCE PAPERS**

- Elizabeth Ashby** (2006). Wildlife Corridor Requirements of Flora. Proceedings of Ecological Consultants Association Annual Conference.

**Elizabeth Ashby** (2012). Are botanists lazy or do rare plants preferentially live along roadsides? Ecological Consultants Association Annual Conference, 2012.

**Elizabeth Ashby** (2013). Offsets – can they be effectively implemented to achieve the desired results? Ecological Consultants Association Annual Conference, 2013.

#### **ENVIRONMENTAL ASSESSMENT PROJECT HISTORY**

I have completed hundreds of impact assessments (including EIS and SIS) for all manner of proposed developments including large and small subdivisions, single dwellings, rezonings and industrial land development. Although this work stretches across a large number of council areas from Coffs Harbour to Moruya, it is primarily within the council areas of the Sydney basin and its fringes, the Central Coast and mid North Coast.

I have prepared scores of management plans for the rehabilitation of disturbed or cleared bushland and have been called upon by Councils to provide such work.

I have also been contracted to provide expert critique for submission to the Department of Planning regarding the North West Growth Centres and for a similar growth centre in the Port Macquarie area.