Submission No.314

GRAZING AND FIRE HAZARD

A submission to the
Parliamentary Inquiry into Bushfire Disaster

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Summary

1. It has been documented that grazing by domestic stock decreases some forms of combustible material, in particular grasses and herbaceous plants. The argument that grazing reduces both fire intensity and frequency has an apparent logic: less fuel 'naturally' leads to a lower rate of spread and intensity of fire. However, this view, which has been strongly represented in the aftermath of the 2002-2003 fires by groups with an economic interest in the continuance of grazing licences on public land, appears to have little support in the scientific literature.

2. The existing literature suggests that, while livestock grazing may reduce the likelihood of low intensity fires by reducing biomass in grassland and herbaceous environments, it has no impact in some environments and in others it exacerbates the fire hazard by encouraging understoreys of woody shrubs/trees which are more likely to contribute to the high intensity crown fires most often responsible for loss of life, property and infrastructure.

3. Studies in Barmah-Millewa, the Australian Alps, the Goulburn-Broken catchment in Victoria and other areas have shown very high levels of environmental damage by livestock grazing. This includes soil compaction and erosion; disappearance of some plant species, and increased abundance of exotic plants; decline in native animal species by competition or disturbance or changes to the structure and composition of vegetation, affecting food sources and shelter; increased runoff, erosion of riverbanks, increased turbidity and siltation in waterways, which threatens crustacean populations, burrowing mammals, and platypus. Australian ecosystems have evolved in the context of grazing and browsing by native animals, which do not include large hoofed animals.

4. The existing literature suggests systems of controls on livestock grazing have had little effect in reducing the environmental impact; they are costly and difficult to maintain and there are no strategies that are effective in protecting large areas.

5. Australian ecosystems have also evolved in the context of the land management practices of Indigenous Nations, which include controlled, targeted, low intensity burns, taking account of the needs of particular ecosystems and species as well as seasonal and weather factors. Such fires have been shown to contribute to biodiversity as well as reducing forest fuel levels and helping to protect against high intensity crown fires. This Collective believes that joint management with Indigenous Nations and recognition of the importance of traditional fire management systems in maintaining Australian ecosystems are appropriate strategies in management of National Parks and other public lands.

6. We recommend that livestock grazing should be removed from all National Parks and public lands.

Authorship

This submission is presented by the Barmah-Millewa Collective of Friends of the Earth Melbourne. The submission is jointly authored by Lindy Orthia, Amanda LoCascio, Alisoun Neville, and Helen Neville. The contact author is Lindy Orthia.

The submission has been approved at a meeting of the Barmah-Millewa Collective and authorised by Cam Walker, National Liaison Officer for Friends of the Earth Melbourne.

Scope

The submission is relevant to the following Terms of Reference of the Parliamentary Inquiry:

(b) The causes and risk factors contributing to the impact and severity of the bushfires, including land management practices and policies in national parks, State forests other Crown land and private property

(c) the adequacy and economic and environmental impact of hazard reduction and other strategies for bushfire prevention, suppression and control;

(d) appropriate land management policies and practices to mitigate the damage caused by bushfires to the environment, property, community facilities and infrastructure and the potential environmental impact of such policies and practices;

(e) any alternative or developmental bushfire mitigation and prevention approaches, and the appropriate direction of research into bushfire mitigation.

In particular the submission addresses the issue of whether livestock grazing reduces bush fire hazard and should be included in land management policies on publicly owned land.

It also addresses the issue of fuel reduction burning, arguing the importance of traditional fire management practices of Indigenous Nations in both protection of the natural ecosystems and protection against fire damage to property and infrastructure in surrounding areas.

While the interest of the Collective relates specifically to the Barmah-Millewa forest wetland ecosystem of northern Victoria and southern New South Wales, which did not experience major fires in the 2002-2003 season, the arguments presented here have a broader application.

1. The effects of grazing on fire hazard

Stock grazing has been advocated as a fire prevention method based on the idea that cattle reduce the fine fuel load in the forest (DCE 1992). After the 2002-2003 fires, Brian Gilligan, Director General of the NSW Park and Wildlife Service, described this as "a proposition that was debunked by government decision based on good science 50 years ago. Every time people have tried to revisit it, to put livestock back into parks, every scientist that's looked at it has debunked it" and used the example of the burning of what is now Kosciusko National Park in the 1939 fires despite the presence of "up to 200,000 sheep and 17,000 cattle roaming around" (ABC *7.30 Report*, 21 January 2003).

Despite this, cattle grazing continues in the Alpine National Park (Australian Alps National Parks *Education Kit*, 7, 2003) and on other public lands, including the Barmah-Millewa state forests and Barmah state park. Groups with an economic interest in public-subsidised grazing continue to use the argument that the removal of grazing results in an increase in the frequency and intensity of fires (*Shepparton News*, 2 May, 2003; *The Age*, 12 March 2003).

The argument in this submission is that while grazing may reduce fine fuel loads in grasslands and herbaceous understoreys, in other ecosystems it appears to have little or no effect, and the scientific literature suggests that its overall effect is likely to be to *increase* fire hazard.

In a scientific study of the Barmah Forest in 1993, Silvers compared the levels of fine fuel load present in plots that excluded all grazing mammals (including rabbits and kangaroos), plots that excluded only cattle and horses, and plots that allowed access to all grazing animals, in eight different vegetation types. In only two vegetation types (moira grasslands, red gum with wallaby grass understorey), cattle and horse grazing caused a significant reduction in fuel loads. In three vegetation types (giant rush, red gum with an introduced species understorey, black box woodland), grazing had no impact on fine fuel loads. In the remaining three vegetation types (grey/yellow box woodland, red gum with terete culm-sedge understorey, red gum with terete culm-sedge/warrego summer-grass understorey), grazing by cattle and horses had a fuel reduction impact either equal to or less than the impact of kangaroos and rabbits (Silvers 1993).

Silvers' study gives little support to the argument that stock grazing is a useful fire prevention tool. Moira grassland, for example, is not likely to be the site of major fires, since it is inundated for long periods of time and contains no woody species (Ward 1991). Red gum forest with a wallaby grass understorey, the only other vegetation type for which cattle grazing reduced the fuel load, is also probably unlikely to pose a major fire risk. In 1986, the New South Wales Forestry Commission stated that control burns were rarely carried out in red gum forests because fine fuel loads were generally low, the absence of shrubs made crown fires rare, and what fuel there was (fine grass and reed foliage) was usually green or flooded during high fire danger periods (cited in Parson 1991). If kangaroos and rabbits can keep fuel loads down in the Barmah-Millewa forest, non-hoofed mammals may be capable of keeping fuel loads low in other ecosystems too[1].

While grazing may reduce fine fuel loads in grassland/herbaceous ecosystems, the argument that grazing reduces fire hazard more broadly must take account of the effects on grazing on the shrub-grass balance. A number of studies, Australian and international, suggest that grazing, over extended periods of times, promotes woody shrub encroachment on grasslands, thickening of scrub, and the establishment of 'almost continuous woodlands' (e.g. Howden et al., 2001; Liedloff et al., 2001; Bachelet et al., 2000). In a study of cattle grazing within sub-alpine heathland and grassland communities on the Bogong High Plains (1990) Williams showed that grazing, as the primary agent of disturbance, increases the number of shrubs, which are dependent on disturbance for establishment. While palatable shrubs may be kept down, the less palatable species will persist and increase in number, thus changing the shrub grass balance in favour of shrubs.

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[1] The eradication or reduction in numbers of rabbits (if ever achieved), would likely see an increase in the number of kangaroos as a result of decreased competition. In environmental impact terms, kangaroos and cattle are different, because kangaroos impact on a narrower range of species than cattle and they don't degrade soil by trampling around water points (Wilson 1990).

By removing the grasses that compete with tree shrub and tree seedlings for germination, and creating the bare disturbed sites required by seedlings for germination, grazing favours the establishment of shrub and tree seedlings. Also, shrub species less palatable to cattle are more likely to be dry woody shrubs, which burn more intensely than grass. In forest environments, the effects of this combination of disturbance and selective grazing will be to encourage the development of a layer of woody shrubs beneath the canopy, which substantially increases the risk of crown fires.

Increasing levels of disturbance is often associated with invasion of natural ecosystems by weeds. A study carried out in dry rainforest-open forest in north eastern NSW (Duggin and Gentle, 1988) suggests that cattle may play a part in the propagation of invasive thicket-forming woody weeds, such as *Lantana camara*. The study concluded that increasing plant performance was evident with an increase in intensity and type of disturbance, such as cattle grazing and high intensity wild fires. Duggin and Gentle state that, ideally, wildfires should be 'removed' from ecotones, but acknowledge that low intensity fires do not significantly increase recruitment of Lantana and may be necessary for fuel management. The shrub layer is likely to be the more dense where there is an absence of regular low-intensity fires which burn the young shrubs and saplings as well as grasses.

A long-term study, which compared grazed and ungrazed experimental plots at Rocky Valley Victoria, showed that shrub cover continued to increase in the grazed plot over a 45 year period from 1946, while in the ungrazed plot, shrub cover increased in the first 20 years but decreased as the shrubs died and were replaced by grasses (cited in Australian Alps National Parks *Education Kit,* 7).

A paper by Chesterfield (1994) on native grassland management in the Australian Alps supports the argument that grazing 'does not reduce the fire hazard or control weeds'.

The rationale for using grazing for the reduction of fine fuel loads as a hazard reduction strategy is therefore unconvincing. The scientific literature suggests that although grazing appears to reduce the biomass of grasses and herbaceous plants in some ecosystems, in the longer term, by changing the shrub-grass balance and encouraging the development of a flammable woody shrub layer, it substantially increases the risk of the high-intensity crown fires that are more likely to result in loss of life, property and infrastructure.

2. Damage to native ecosystems caused by grazing

While these studies suggest there is no reason to keep cattle or sheep in Australian forests and woodlands, there are plenty of reasons to exclude them. Australian ecosystems have evolved in the absence of larger animals, in particular hoofed animals. Both the soils and the vegetation are highly susceptible to damage by such animals. It is implicitly understood by natural resource managers that grazing has a disturbing impact on natural environments. This is revealed in admissions that an absence of grazing in certain areas has left them "in a relatively undisturbed condition" (Forests Commission Victoria 1983: 27), that grazing is incompatible with conserving and protecting ecosystem components "in a relatively natural state" (LCC 1985: 16), and that grazing should be removed from environmentally sensitive areas (Leslie 2000).

Australian Alps National Parks *Education Kit,* 7, quotes Williams (1991):

> A substantial body of high-quality scientific evidence has accumulated over this period which has shown unequivocally that grazing by domestic livestock has had detrimental effects on the soils and vegetation of the Australian alpine environment. Common consequences of grazing are soil erosion, the selective grazing of sensitive plant species and plant communities, the alteration of vegetation composition and structure through persistent selective grazing, and an increase in the disturbance of soil and vegetation through trampling.

In a study conducted for the Goulburn Valley Environment Group, Robinson and Mann (1998) measured the effects of stock-grazing on ecological attributes of creeklines in the Goulburn-Broken

catchment. On the more heavily grazed frontages, the composition of plant species in the ground layer were found to have been heavily modified, and to have less representation of native species. These changes to the riparian environment were found to exacerbate the already poor condition of riparian and aquatic environments in much of the catchment by causing increases in salt, sediment and nutrient loads, increases in runoff, increases in soil erosion, increases in streamflows, increases in water temperature and increases in the probability of algal blooms.

The negative effects of stock-grazing within the Barmah-Millewa ecosystem include: decline of vast expanses of rushland, attributed to selective grazing; encroachment of redgum on the moira grass plains; reduction in native fish numbers and demise of crustaceans, waterbirds, mammals, terrestrial invertebrates and frogs - attributed to reduction in breeding habitat and shelter and changes to nutrients with loss of species-richness, stem densities, biomass and percentage cover of aquatic plant communities in wetlands; decline in cover and diversity of shrubs on species-rich box ridges from overgrazing, particularly in times of flooding; disappearance of some plant species, and increased abundance of exotic plants; decline in native animal species by competition or disturbance; in particular the threat to the survival of the superb parrot from changes to vegetation structure & composition caused by grazing; compaction of soils, increased runoff, erosion of riverbanks, increased turbidity and siltation in waterways; this threatens crustacean populations, burrowing mammals, platypus and others. For a detailed discussion of the mechanisms of these effects, and references, see Orthia's paper, *Evidence from the scientific literature supporting the environmental component of the Yorta Yorta Management Plan for the Barmah-Millewa forest ecosystem* (2002), pp. 21-23.

In Queensland, Ensley, Mathieson and Smith (2000) report that, though there is a perception among forest managers that grazing has some beneficial effects in state forests, there are concerns about impacts which may outweigh the benefits. These concerns include damage to fauna and flora through browsing and rubbing on vegetation, soil compaction and erosion, eutrophication of sources, spread of weeds, deliberate destruction of trees for enhancing fodder production, and alteration of fire regimes.

However, general acceptance of the negative environmental impact of grazing has not led to the enforced removal of stock from native forests. The argument of graziers now is that with a system of licencing, limits on the number of cattle, seasonal restrictions, fencing of the more sensitive area, and other controls, the negative environmental impacts of grazing no longer apply. Even when grazing impacts have been articulated explicitly, stock have not necessarily been removed. For example, the management recommendations for the protection of the superb parrot within Barmah-Millewa included phasing out of grazing and the removal of grazing from box woodland within 10 kilometres of known parrot nesting colonies where significant ecological damage was likely to result (Webster & Ahern 1992). This would take in almost all box ridges throughout the whole forest system. However grazing continues in Barmah-Millewa, and also within the Victorian Alps.

3. The effectiveness of controls on grazing

In the Barmah Forest, where cattle are currently grazed under agistment and licencing arrangements (DCE 1992), observations by members of this Collective and others suggest that management of cattle in the forest is very lax. They are supposedly excluded from Ulupna Island, the two reference areas in the forest and other sensitive zones, by fences and a herdsperson, for conservation reasons (LCC 1985; DCE 1992). When the Land Conservation Council proposed the creation of Barmah State Park in 1985, it recommended that cattle be removed from the Park within three years of the acceptance of the proposal (LCC, 1985). In practice cattle get into all of these areas, and basically have the run of the park. Fences around the western reference area were found to be in a serious state of disrepair in August 2001, and the area was full of cowpats (Indira Narayan, pers.comm.). The moira grass plains in the western portion of Barmah State Park were found to be full of cattle in July 2001(pers.obs.). Their cowpats covered the grass plains and their pats and pugs had created a mudslick of the shoreline of Hut Lake, which was seriously devegetated (pers.obs.). Ulupna Island in 1972 had suffered little from grazing (Muir 1974) and contained a very rich flora of 178 species (Muir 1974; LCC 1985); now low water flows in Ulupna Creek allow cattle to cross regularly onto Ulupna Island to graze (Peter Barker, per.comm.).

Several sites of cultural significance in the park have also been fenced to exclude cattle, but cattle get in anyway: cows were grazing on the Bucks Sandhill site in April 2001, for example (pers.obs.). Cattle numbers are supposed to be reduced over winter to lessen the impact they have on the box ridges, where they retreat to during floods (DCE 1992). In fact numbers are only reduced during prolonged droughts or floods, and usually supplemental feeding occurs instead of removal when all other available forage has been consumed (Leslie 2000).

The Robinson and Mann study in the Goulburn-Broken catchment (1998), referred to above, investigated the effectiveness of fencing as a management tool. Fencing was found to significantly improve the ecological condition of creeklines. The resulting decrease in stock grazing permitted the fairly rapid recovery of most of the ecological attributes measured, reduced the rate of land and water degradation and increased the scope for biodiversity conservation. However, fencing is expensive to install and maintain, and therefore of little practical use as a control measure for protecting large areas.

Robinson and Mann's study also examined the effects of licencing, comparing licenced and unlicenced frontages. Licenced frontages were found to be grazed significantly more than unlicenced frontages and to have less groundcover biomass, less tree regeneration, fewer shrubs, more noxious or regionally controlled weeds, and more bare ground. The study concluded that 'the current management practice of allowing some public land frontages to be licenced for grazing is not environmentally sustainable, as it is causing the active degradation of land and water resources throughout the catchment' (p.3).

Chesterfield's paper on native grasslands management in the Victorian Alps (1994) described the monitoring and protection program to be developed in the alpine park, involving fencing, cattle grids, variations in stocking levels and other on-ground works to minimise damage from grazing. In practice, according to *Education Kit 7*, published by Australian Alps National Parks (2003), most of the area is not fenced; cattle are discouraged from straying excessively by the use of salt licks and mustering (involving horses and dogs, which add to the environmental stresses). The impacts of controls such as these on ecosystems and the movement of native animals is another concern.

One of the reasons for the failure of controls is clearly the cost and difficulty of establishing and – particularly - maintaining them, as evidenced in Barmah-Millewa. Graziers pay for licences, but Chesterfield (1994) reported that annual fees for alpine and bush grazing do not cover the department's costs of administration, monitoring and managing grazing.

Given the difficulty and expense of such monitoring and managing, and the evidence of the failures of the system of licencing and other controls, there would need to be *substantial* evidence of *significant* reductions in fire hazard to justify the continuance of any grazing in national parks and on other public lands. As discussed in 1 above, the scientific evidence for the effectiveness of grazing in reducing the incidence and intensity of major fires appears to be lacking, while there are convincing arguments that grazing may contribute to *increasing* fire hazard.

4. Indigenous use of fire in land management strategies

This Collective believes that joint management with Indigenous Nations, as already exists in some areas of Australia and as proposed for the Barmah-Millewa (Friends of the Earth, Barmah-Millewa Collective, 2202) provides the most appropriate model for developing effective management strategies on public lands, and that restoring traditional fire regimes may be a way of developing a sustainable system of fire management that will at least reduce the risk of cataclysmic fires.

In Barmah Millewa current managers seem to wish to exclude fire, to prevent losses to the timber industry (Forests Commission Victoria 1983; LCC 1985; DCE 1992). However the aim of totally preventing fires in forest environments is questionable. Fires have been a natural and anthropogenic feature of landscape, and particularly of southeastern Australia, for many thousands of years (ABRS 1999; Yorta Yorta Clans Group 2001). Many Australian plants rely on fire to reproduce (McIlroy 1978), and some Australian animals have a preference for habitat of a certain

age-since-last-fire (Wilson 1990; Richards et al 1999). It is also likely that by removing plants that compete for water and nutrients, cool burning increases the biomass of forest trees.

Since the Barmah-Millewa forest ecosystem was shaped by the regular burn regime of the traditional owners, the Yorta Yorta Nation, it is a strong possibility that biodiversity values of the forest would be best maintained by reintroducing fire to the system. Black box eucalypts, for example, may benefit from fire: they have limited germination under a canopy but adult trees are fire tolerant (Parson 1991), so burning may encourage recruitment. Grazing, in contrast, significantly reduces seedling survival in black box (Parson 1991). The same arguments apply to all native vegetation in Australia, which traditional owners have also managed by applying a regular mosaic burn program that reduces the area affected by any fire that is spontaneously ignited.

Fire is also good for biodiversity (Lunt, 1997; Gilfedder and Kirkpatrick, 1998). However, the literature suggests that the responses to flora and fauna are complex, and dependent on many variables (Ensley, Mathieson and Smith, 2000; Gill et al.). Lunt's study, using exclusion studies and modelling in SE Gippsland, showed that frequently burnt sites contained distinctly different flora from rarely burnt sites, with greater biodiversity in frequently burnt sites. The study suggests that in terms of long term management, in select areas, frequent burning should be maintained as an integral component of grassy forest and woodland management. Gilfedder and Kirkpatrick (1998) in a study of remnant bushland in sub-humid Tasmania, showed that in ungrazed sites, lack of fire (while it decreased the abundance of exotics) decreased the richness of native species. Ensley, Mathieson and Smith (2000) state that severe fire, or too frequent burning, may lead to regional extinction of plant species; however, burning a mosaic of patches at differing seral stages at a range of intensities can produce vegetation mosaics, which will enhance community cycles and life cycle process.

Cool burning is also useful for reducing the understorey of woody shrubs in forest ecosystems. A modelling study in the Victoria River district in northern Australia (Liedloff et al., 2001) concluded that over a period of 40 years, the results of simulating fire - with minimal or no grazing pressure - revealed a reduction in shrub and woody plants, a reduction in grasses, and no influence on the tree structure (given mild fires).

From a conservation viewpoint, there is nothing to stop the implementation of a control burn program in Australian forests. The Land Conservation Council of Victoria (1985) supported control burns as an acceptable management practice in conservation areas. State authorities are beginning to incorporate the impact of frequency, intensity, and extent of fire on ecosystems in planning programs of fuel reduction burning and to manage and plan fires on public lands on a landscape basis, in a mosaic of patches (Ensley, Mathieson and Smith, 2000; Friend, 2002). State Forests of New South Wales is currently investigating the use of control burns in assisting the recovery of native ground layer plants to recover from grazing effects (cited in Leslie 2000). It seems that conservation biologists have spent the last thirty years catching up in knowledge to what Indigenous traditional owners of the land already knew. Fire management, using controlled, targeted, low-intensity fire, played a significant role in ecosystem and species management by Australian Indigenous people. In many places, including Barmah-Millewa (Uncle Colin Walker, pers. comm.) the traditional owners are interested in reinstating their traditional fire regime in the forest.

The Yorta Yorta, like traditional owners elsewhere in Australia, have a long history of managing their country sustainably, that is, in such a way that all species maximise their chances of survival into the future without impinging on the survival chances of others. This includes managing vegetation so that fires do not get out of control and destroy whole stands of bush. Since part of the Yorta Yorta's motivation in management is to conserve food species, they have a vested interest in maintaining healthy vegetation communities. Traditional management practices are therefore highly compatible with conservation as well as the prevention of large fires.

The environmental aspects of the Yorta Yorta proposed management plan for Barmah-Millewa (Yorta Yorta Clans Groups, 2001) are in agreement with the scientific literature in most respects. That fact reflects one thing: the landscape was managed and shaped by the Yorta Yorta over thousands of years. To maintain the landscape in the condition that Europeans found it, the best possible strategy is to re-employ Yorta Yorta management methods. The Yorta Yorta have adapted their traditional management program to deal with threats to their land that non-indigenous people

introduced. In doing so, they have clearly demonstrated that they have the skills to manage their land in a way that would meet their own criteria for good management (ie the conservation of all features of the forest for a sustainable future) and that would satisfy the concerns of conservation biologists (primarily biodiversity conservation).

It needs to be stated here that fires on the scale of the 2002-2003 fires are rare events, determined by the coincidence of sustained, severe drought, extreme weather conditions and the limitations on cool burning programs imposed by weather. Given the nature of the Australian bush and weather patterns, such intense fires have happened in the past (1901, 1926, 1939) and are likely to happen again. Protection against the effects of these extreme fires on human life, property and infrastructure will require changes to planning regulations, building codes and other controls on where and how human beings do things. However, appropriate management practices in forest areas – whether these are on private land, in plantations, or in national parks and state forests – is of critical importance in relation to preventable fires. The scientific literature suggests that any management system that combines grazing with total fire suppression is likely to have a profound impact on fire behaviour, especially during periods of drought and extreme weather.

We argue that livestock grazing is an inappropriate management strategy. By encouraging a flammable woody understorey it increases the risk of fires crowning. It also has damaging impacts on soils, flora and fauna, riverbanks and waterways, which are unsustainable. We support joint management with Indigenous Nations on public lands, and the restoration of traditional fire regimes as a sustainable system of fire management that will at least reduce the risk of cataclysmic fires.

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