

## Trampling after Landscape Level Disturbance: Impacts on Subalpine Vegetation and Soils in the Australian Alps

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*Keywords: Trampling, subalpine, bushfires, recovery, visitation, protected areas, sustainability, Australia.*

The effects of trampling on soils and vegetation are among the most well studied areas in recreation ecology. A major gap in this field of study however, is research that examines the impact of recreation in conjunction with natural disturbance. This recognises that natural disturbances are key ecological processes and that protected areas can experience landscape level disturbance, which with subsequent visitor use following the natural disturbance could well exacerbate the impacts on the environment (Figure 1). Therefore, issues that need to be investigated by recreation ecology, include:

- 1) Comparing the severity of impacts of recreation activities vs impacts of natural disturbances.
- 2) Examining if recreation impacts can alter the pattern of recovery from natural disturbance in ecosystems, including the possible slowing or altering of the process of natural recovery.
- 3) If it is appropriate for management to allow visitation in protected areas after landscape level disturbances such as long term droughts or fires.

As part of a larger study into recreational impacts in the Australian Alps, this research examined the impact of visitor use before and after a large landscape level disturbance caused by bushfires in the subalpine grasslands of the Australian Alps in southeastern Australia (Figure 2). The Australian Alps area is recognised for its high conservation value and is a popular tourism destination in both summer and winter.

In January-February 2003 the Australian Alps experienced their largest bushfires in over 60 years with approximately 70% of the subalpine area burnt during the fires. The intensity of the fires was not constant however, with some areas being only partially burnt and resulting in a mosaic of unburnt



Figure 1: Visitor use following bushfires can exacerbate the impacts on the environment.

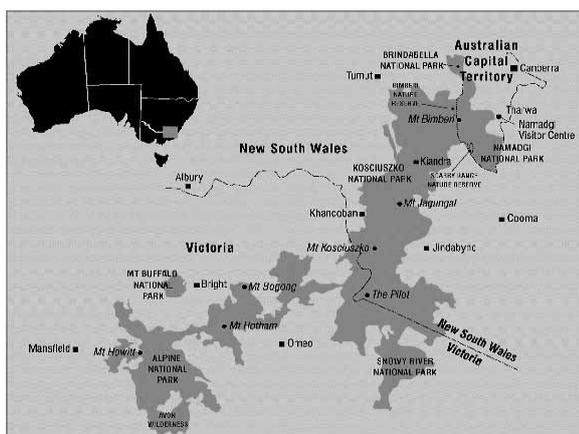


Figure 2: Protected areas in the Australian Alps.

and burnt vegetation, while other areas were extensively affected with no above ground vegetation remaining after the fire.

In studies prior to the fire, the subalpine grasslands community was identified as having a trampling threshold level of 150-200 passes before significant short-term damage began to occur to vegetation. Following the fire, a study was undertaken to compare the effect of trampling on the partially burnt and extensively burnt environments to see if the impacts of trampling by visitors differed with the intensity of disturbance.

The experimental trampling studies were based on the approach developed by Cole and Bayfield (1993). Trampling was applied at two time periods: within weeks of the fire, and then one-year after the fire when vegetation was starting to recover. Vegetation cover and composition and soil characteristics were each examined. The study found that for trampling that occurred within weeks of the bushfires:

- (1) Significant short-term impacts occurred with extensive changes to the soil surface evident after only 30 passes.
- (2) Natural events (i.e. rainfall) eclipsed the damage caused from up to 200 passes with no significant difference apparent after six weeks;
- (3) More than 200 passes may exceed a recovery threshold and exacerbate soil loss post fire;
- (4) Recovery of species one year after bushfire does not appear to have been affected by trampling activities.

When trampling occurred on new sites one-year after the bushfires there were significant impacts on both vegetation and soils. Changes occurred after as few as 100 passes with reductions occurring in vegetation cover, increases in litter and rapid increases in soil compaction.

These results indicate that trampling at low intensities soon after fire can change soil conditions and vegetation cover, with thresholds lower than occurred prior to the disturbance. Despite this, natural processes of recovery and change rapidly eclipsed these impacts. Trampling on recovering vegetation a year after the fire is of greater concern however, with trampling affecting soils and early colonizing species indicating that the system may have lost its resilience to disturbance. Longer-term effects on soils and vegetation may occur from trampling at this time.

These results should be treated as a best case scenario for post fire impacts in the Australian Alps, as trampling under wet conditions or on areas with a steeper gradient are likely to cause greater damage. Further, once disturbance thresholds have been passed, sites are likely to remain susceptible to damage in the future. Further research into recreation impacts in protected areas after natural disturbance will continue to enhance our understanding of these interactions and processes.

## References

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