Judbury which has difficult terrain on the southern end of the route.

The Snowy divide was subsequently included in the Tasmanian Wilderness World Heritage Area (WHA) in December 1989. The boundary in this vicinity was decided with the full knowledge that construction of a link road was likely to be required. No known specific values were attributed to this particular location, other than it approximates the eastern boundary of the Snowy Range, which has values related to alpine flora and glacial geomorphology. When the divide was included in the WHA nomination, the State Government sought and received a specific commitment from the Commonwealth Government to allow the construction of the road if required.

A road through the Snowy divide would link existing forestry roads on either side of the WHA. A road location has been identified that would traverse about two kilometres of the WHA resulting in the disturbance of less than five ha. A possible alternative route through a higher saddle just to the east of the WHA has also been identified. While a road on this route would avoid the WHA (except perhaps for a small intrusion), it would cost an additional $1.6 million to construct. Transport costs would be $0.25 million per year more due to the longer distance and greater height traversed. If constructed, the road would be paid for by forest industry to a logging road standard. The multimillion dollar construction cost would be recouped over time through transport cost savings. While the road would be a forestry road, it undoubtedly would also be utilised by tourist and inter-regional traffic, providing an alternative round trip to the Huon.

FLORA MANAGEMENT WITHIN THE WORLD HERITAGE AREA

by Jennie Whinam and Jayne Balmer
Department of Parks, Wildlife and Heritage, 134 Macquarie Street, Hobart, Tasmania 7000

INTRODUCTION

The WHA contains many of the vegetation communities which occur within Tasmania. Cool temperate rainforest, alpine moorland and upland freshwater communities are rich in groups with Gondwanan affinities, and include many Tasmanian endemics. The vegetation of the WHA demonstrates a variety of responses to fire and may be divided into 'fire sensitive' communities (dominated by conifers and deciduous beech (*Nothofagus gunnii*), rainforest and alpine communities); 'fire adapted' types that require fire for their perpetuation but

may be degraded by a frequent fire regime (most *Acacia, Eucalyptus* and *Leptospermum* dominated communities); and 'pyrogenic' vegetation which is very flammable and recovers well after fire (such as buttongrass moorland).

Management issues relating to the protection and perpetuation of vegetation in the WHA include fire management, factors affecting species rarity, control of exotic plant taxa and diseases and the appropriate control of disturbance, such as trampling and developments associated with park management and visitor facilities.

VEGETATION MAPPING

Vegetation mapping of major areas of the WHA is a project that was initiated, with the assistance of Prof. J.B. Kirkpatrick (University of Tasmania), in 1989. The project officer was initially Rachel Mackie and is currently Sib Corbett. The work has two main aims. Firstly, to evaluate the floral resource of the WHA and secondly, to guide management options. Mapping, at 1:25 000 scale, has been completed for the Central Plateau, the Lyell Highway (WHA), and is now concentrated on the Cradle Mountain-Lake St. Clair National Park. The program will then move to southwest Tasmania, concentrated along the eastern edge of the WHA.

PHYTOPHTORA

Phytophthora cinnamomi is an introduced microscopic soil fungus that causes root rot in some plants. It poses a severe threat to moorland, heath and scrub communities and *Eucalyptus nitida* forests in the WHA where the mean annual temperature is greater than 7.5°C and rainfall is greater than 600 mm. The fungus attacks a wide range of plants with varying severity and can cause death in many species of the Epacridaceae, Proteaceae and Fabaceae, with more than 120 species in the WHA being identified as susceptible to *Phythopthora*. The fungus is spread by soil, fire and water and as it is difficult to contain, the best that can be expected is to slow the rate of infestation. Departmental officers are currently involved in programs to address this managment issue. Actions include: mapping the distribution and movement/spread of *Phytophthora*; assessing the effects of the fungus on rare and threatened plant species; producing a management plan for combatting the spread of the fungus; and education to inform the public of the risk of *Phytophthora*.

FIRE ECOLOGY OF TALL FORESTS

Tall forests are a superlative natural feature defined as any forest dominated by trees exceeding 30 m in height. In Tasmania, however, they are represented by forests reaching heights in excess of 90 metres. The species achieving the

greatest height of any flowering tree in the world is the swamp gum or mountain ash *Eucalyptus regnans*. In days gone by incredibly tall *E. regnans* forests (the species most valuable for commercial exploitation) which were in excess of 100m were present in Victoria and Tasmania. The reasons for the demise in eucalypt heights is in part due to forest clearance of these highly productive lands, with some 20% of Tasmanian tall forests having been cleared since 1800 (Kirkpatrick *et al.* 1988). The last extension of Tasmania's World Heritage Area resulted in a significant increase in the conservation of tall eucalypt forest (19% reserved).

A tall forest fire ecology project has been conducted (by J. B.) to investigate age diversity and firing responses of these forests so that their fire requirements within the WHA can be determined and appropriate management strategies determined. While the literature on tall forest ecology contains the assumption that eucalypts are usually killed by fire due to their fire-prone habitat, data collected during this project has contradicted this by documenting the presence of at least 20% and possibly as much as 50% of forests dominated by at least two different ages of eucalypt. This provides evidence that eucalypts can survive fire in tall wet forests. Interestingly, the multiple aged eucalypt forests were on average predicted to be in drier locations (by the climatic model BIOCLIM) than even aged eucalypt forests. This may be explained in several ways. It is likely that in drier situations fire is more frequent and fuel development between fires events is reduced giving rise to cooler fires which are less likely to destroy all the eucalypts. Rainforest understoreys were less common beneath multi-aged eucalypt forests than they were beneath even-aged eucalypt forest.

The conclusion reached was that most tall forests within the WHA have relatively young eucalypts emergent over an understorey of wet sclerophyll species. Whilst there are areas of old growth forests well over 350 years that will succeed to pure rainforest provided they are not burnt within the next 100 years, fire is not needed to ensure the perpetuation of tall forests as a whole within the WHA for at least the next 150 years. In that time period it is likely that there will be many uncontrollable wildfires which will further ensure the regeneration of the tall forests. There may well be a need to protect forests from fire if a greater proportion of oldgrowth mixed forests is to be retained within the WHA. This is particularly important given the likely elimination of forests of that type within forests managed for wood production on a 80 to 100 year rotation.

CENTRAL PLATEAU AND THE IMPACT OF HORSE RIDING

The Central Plateau is a special and distinct part of the Tasmanian environment. Much of the Central Plateau has been shaped by its past history of glaciation, which has left a legacy of scraped surfaces and a landscape dotted with lakes, tarns and watercourses. The Central Plateau is an area containing fragile alpine

and sub-alpine ecosystems. Some of the 140 plant species which are of restricted distribution in Tasmania are found only on the Central Plateau. For example, the Central Plateau is a stronghold for the Tasmanian endemic pencil pine (*Athrotaxis cupressoides*) communities. Many endemic species are of Gondwanic origin and thus are also of significance for studies in the evolution of biota in the southern hemisphere during the Tertiary. The previously glaciated areas of the western Central Plateau contain many groups in which speciation is active, for example *Gonocarpus, Ranunculus* and *Plantago*.

Other vegetation types for which the Plateau provides an important conservation reserve include pencil pines, alpine vegetation, native grassy vegetation and wetland communities. As well, the myriad of lakes and streams on the Plateau support a range of aquatic and riparian plant communities. Some of the alpine communities which show adverse effects of trampling include *Sphagnum* bogs, cushion plant communities, sedgelands and riverine communities. Trampling of these sensitive environments can be caused by a single activity or a combination of several activities, including four wheel driving, horses riding, fishing and walking.

To assess some of the impacts of horse riding on the Central Plateau, the Department of Parks Wildlife and Heritage (by J. W.), in conjunction with the University of Tasmania and the High Country Trail Riders Association, has conducted experimental trials across a range of vegetation types. The experimental design mirrors the design of similar experiments established in New South Wales, Victoria and the A.C.T. This is the first time that experiments to scientifically assess the impacts of horse riding in the high country of Tasmania have been established. Basically, the trials concentrate on two aspects, the affects of horses after a number of passes in different high country vegetation communities and the germination (and subsequent survival) of weeds in horse manure.

Data on vegetation cover, reproductive stage, and condition of species were recorded prior to horse passes, after one pass, again after two passes, and (on an adjacent area) after twenty passes. Data on surface soils, micro reflief, compaction/ water infiltration, etc. were recorded simultaneously. Data from horse riding groups and experiments in mainland States suggest that over a period of time horses and riders (like walkers) have favoured routes. It is therefore considered valid to assess cumulative effects, as has been done in other studies. The horse passes were carried out in three different vegetation communities: sheet-eroded ridge shrubland, grassland and herbfield. In addition, similar recordings were made after both one and two passes in cushion plant communities.

Two rabbit and marsupial exclosures were constructed in each of the grassland and sheet-eroded dry shrubland environments. In each exclosure horse manure was introduced into half the exclosure, with the other half manure free. An

adjacent control area (not fenced from grazing pressures) was subjected to similar manure/manure free treatments. The soils and vegetation of these exclosure and control plots were described in detail before the addition of manure. These exclosure and control plots are being monitored monthly for at least 12 months to identify weed germination and subsequent survival rates under different experimental conditions. The experimental treatments can be summarised as:

- with and without horse manure;
- with and without marsupial and rabbit grazing;
- with and without surface disturbance;
- over the climatic extremes of all seasons.

Weeds were systematically counted throughout the year, to monitor germination and to determine whether the weeds could reach reproductive stage (i.e. be able to spread) in the climatic conditions of the Central Plateau. The weeds were traced to their germination source to ensure that the weeds observed did actually originate from the horse manure.

The data outlined above is currently being analysed. Initial results suggest that the type and extent of damage varies in different vegetation and soil types and that recovery rates also vary. The survival of weeds is most favoured by the combination of freedom from grazing and bare ground covered by horse manure. Not all weeds that germinated had reached reproductive stage 12 months after the trial commenced.

FAUNA MANAGEMENT IN THE WORLD HERITAGE AREA

by Sally L. Bryant
Department of Parks, Wildlife and Heritage, 134 Macquarie Street, Hobart, Tasmania 7000

RESEARCH AIMS

The World Heritage Area (WHA), comprising approximately 20% of Tasmania's land mass (~1.38 million hectares), contains a diversity and uniqueness of fauna which is of world significance. The priorities for work to be conducted in the field of zoology in the WHA are: inventory of the fauna; fire ecology; monitoring and management of environmental changes and communication