



The Ecology and Management of Australian Heathlands
Tony Hastings, August 2007



BIO262 Vegetation Ecology Assessment item 1

Cover picture: Wet Heathland in Mallacoota Foreshore Reserve, Victoria, (Hastings July 2006).

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Preface

This report is written as an assessment item for the Vegetation Ecology module, as part of Charles Sturt University's Environment Science (Management) degree. The information contained is based on a literature review. It seems a paradox that the assignment brief requires fairly low-brow information, for example the longevity of selected species, this information would be much more easily gleaned from a herbarium than the literature review required, which instead offers highly specific information about various research projects, often highly technical in nature as researchers try to impress their supervisors and funding agents.

Summary

Heath communities are incredibly diverse, with management requirements varying. Coastal dry or wet heathland is substantially different from sub-alpine communities, particularly in terms of fire frequency and intensity. It is likely that coastal heaths have been regularly burnt whether by wildfire or fire-stick farming, and prescribed fires are required in an irregular temporal and spatial framework to maintain biodiversity.

Introduction

Australian heathlands are extremely diverse, both biodiverse within each ecosystem and diverse between ecosystems. Nutrient poor soils, frequent fires, periodic waterlogging or periodic drought, and other extreme climatic conditions create heathlands. Heath species are typically shrubs or herbs which have adaptations that allow them to survive or reproduce in this extreme conditions, out-competing larger life forms.

National Distribution

The classification of 'Heathland' as a major vegetation group is based on its structural form; low dense scrub, typically occurring on low nutrient soils, with composition that differentiates it from Mallee scrub.

Specific Ecological Vegetation Classes included in the broad description of 'Heathland' include 18 different Ecological Vegetation Classes (EVCs) in Victoria alone (DSE 2006), and Standard and Layered Blanket Moors, and Southwestern Sedgey in Tasmania (Bryant 1994). Dwarf Heath, Sheltered Dry Heath, and Wet Heath at Cape York (Cuff 1999).

Ecological vegetation mapping

Three maps intending to show the distribution of major vegetation types including heathlands were studied (eg: Emuit undated), which were substantially different from each other. The inconsistency is most likely explained by two factors; the term “heathland” is very broad and vague, and heaths typically occur as small openings in a forest context, rather than broad areas such as woodlands.

Environmental determinants of distribution

The soils are well to poorly drained (Bryant 1994) and can be coarse sand to heavy clay (personal observation). This variance has lead to descriptions of two general types of heath; wet heath and dry heath. Wet heath occurs on poorly drained clay soils with a shallow B horizon, while dry heaths occur on deep, sandy, well-drained soils (Groves and Specht 1965). A further set is described as “Sub-alpine Heaths”, which could be

considered a sub-set of wet heaths that occur on clay, peat or rocky soils, where extreme climatic conditions limit plant development (DSE 2006).

Heath communities consistently occur on soils low in essential plant nutrient, especially phosphate (Groves and Specht 1965, Jeffrey 1968) and nitrate (EPA 2005). Heathlands are prone to recurrent fires (DEWR 2004, Baker and Whelan 1994). Adaptations of heathland species to fire include woody seed-pods and re-sprouting (Myerscough and Clarke 2007). Root adaptations also allow heathland species to survive anaerobic water-logging and drought (EPA 2005).

Heathlands do not occur on all sites of similar soil and climate; additional factors of wind exposure, salinity, periodic water-logging, periodic drought, frosts, high temperatures and fire regimes also influence vegetation composition and structure (EPA 2005, Bryant 1994, Groves and Specht 1965, DSE 2006). Too frequent fires can eliminate some heath species, but mostly site conditions rather than fire regime determines species occurrence (Bradstock et al 1997)

Tropical heathlands are unique, and occur on the eastern side of Cape York (Cuff 1999). They occur on siliceous sands and are subject to periodic waterlogging (Cuff 1999).

European heaths are often anthropologically derived resulting from deforestation, while Australian heaths are considered naturally occurring (Groves and Specht 1965). There may be some examples where aboriginal fire management favoured replacement of grassy forests with heath species (Thomas and Kirkpatrick 1996). Grazing in alpine areas has been shown to prevent heath recruitment on stony pavements (Wahren et al 2001)

Conservation Status

Within the broad description of “Heathland” are common and rare flora communities.

Eastern Stirling Range Montane Heath and Thicket is listed as Endangered under the Environment Protection Biodiversity Conservation Act 1999 (Cth), (DEWR 1999)

Representation in Reserves

As heathland generally occurs on nutrient poor soils, there has been little demand for its use for agriculture and it is well represented in reserves, in both coastal and alpine areas. Significant Heathlands are conserved in national parks and state parks in Victoria, providing relatively high proportional representation (DNRE undated). Heathlands often occur adjacent to or part of wetlands, offering them protection as part of 25 Nationally Important Wetlands (EPA 2005).

Typical dominant species

Dominant species

Heathlands are dominated by tough, hard-leaved plants, particularly Epacridaceae, Proteaceae, Papilionaceae and Myrtaceae family species (DNRE undated).

Life-history attributes

Species growing in Heathlands recruit after fire, and can be classed into 5 different functional groups (Keith and Bradstock 1994):

1. overstorey shrub obligate seeders with serotinous seed banks;
2. understorey shrub resprouters with serotinous seed banks;
3. understorey shrub obligate seeders with soil seed banks;
4. understorey herb resprouters either with soil seed banks or non-dormant seed; and
5. understorey herb obligate seeders with soil seed banks.

Resprouters regenerate from root stock that survives the fire despite 100% leaf scorch, obligate seeds are obliged to regenerate from seed as the adult plant is killed by fire, serotinous plants retain seed on the branches, while soil seed banks refers to plants that drop seeds that survive fire in the soil (Gill 1981 in Watson 2006). Obligate seeders generally produce more seed and have faster seedling growth rates than resprouters, but can be eliminated by repeated fires in close succession (Watson 2006).

As heath communities are extremely diverse, a local ecosystem was inspected as a case study for research. Three species which dominate Wet Heath in the Mallacoota foreshore

reserve are: Coast Wattle, *Acacia longifolia*, Bushy Needlewood, *Hakea sericea*, and Scrub She-Oak, *Allocasuarina paludosa*. Some information about the vital attributes of these species follows:

Coast Wattle

Coast Wattle is a weed in South Africa, as it produces a large number seeds. It therefore is an obligate seeder, likely to be killed by fire, and relies on reproduction by seed. Individual plant longevity is typically determined by disturbance regime, rather than senescence.

Bushy Needlewood

All *Hakea* are serotinous (Watson 2006). Bushy Needlewood is a serotinous obligate seeder, which has wings as part of its seed. This adaptation combines with the clear, open conditions that occur after fire to allow for seed dispersal by wind. Seed dispersal helps ensure the species survival, as fires tend to be irregular in intensity and a wider distribution increases the possibility of survival (Hammill et al 1998). The species is also a weed in South Africa, where comparisons have been made with other *Hakeas* to determine why it is such an effective weed. The conclusion was that it was the volume of seed produced in the absence of seed predators that gave it an advantage (Richardson et al 1986).

Scrub She-Oak

Scrub She-oaks have been found to possess nitrogen fixing nodules, when growing in coastal environments (Lawrie 1982). The woody capsules are serotinous, classifying it in type 2, above.

All three species are obligate seeders, suggesting that local conditions have not included frequent fires at short intervals, and are predictable, relative to inland forests (Clarke and Knox 2002).

Major Management Issues

Threats

Weeds are not generally a threat to Australian Heaths, due to the nutrient poor soils (DNRE undated). At Howe Flat in Croajingolong National Park, Blackberry patches extended for several hectares through heathland and sedgeland (personal observation).

Fire frequency is critical to maintaining diversity in heaths; too frequent fires can eliminate fire sensitive shrubs, while too infrequent can eliminate short-lived herbs and shrubs. Consecutive fires of intermediate intervals can eliminate sub-dominant herbs and shrubs, while repeated fires of too low an intensity can eliminate heat-stimulated seed banks (Watson 2006). The specific time intervals vary between ecosystems.

Management

Heath communities are incredibly diverse, with management requirements varying. Coastal dry or wet heathland is substantially different from sub-alpine communities, particularly in terms of fire frequency and intensity. It is likely that coastal heaths have been regularly burnt whether by wildfire or fire-stick farming, and prescribed fires are required in an irregular temporal and spatial framework to maintain biodiversity.

Conclusion

The information presented in this report is a brief glimpse at a distant mountain of information contained in hundreds of scientific reports and books on heaths.

Heathlands species have adaptations to frequent disturbance and harsh conditions, such as resprouting and producing huge numbers of seeds. Managing heaths requires understanding and either allowing or producing disturbances that continue these reproduction strategies.

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