Carbon budgets and implications for fuel load and flammability of shrub-dominated ecosystems in the high country

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Introduction, Aims and Objectives:

Heathland vegetation is found from temperate to tropical areas of Australia, and from the lowlands to the alps. Fire is an integral factor in all Australian heathlands. The dense structure of mature communities and an abundance of flammable volatile oils and resins in shrub foliage, make heathlands and heathy forests and woodlands highly flammable, especially during periods of drought (Specht, 1994).

In biological terms, fuels represent the build up of organic matter that results from the balances between growth and respiration, and between litterfall and the chemical, physical and biological decomposition of that litter (Tolhurst & Kelly, 2003). The standing shrub component of a forest or woodland is often overlooked when fuel loads are being assessed. Shrub biomass must be included if the full fuel load complex and its contribution of the fire behaviours and effects, are to be fully appreciated (Good, 1982).

The amount of available fuel determines the amount of heat that can be potentially produced by a fire, and understanding the fuel components of any ecosystem is essential to understanding fire dynamics. Shrub species play an especially important role as they provide a link for ground fires to extend to the canopy.

This Project focuses on developing a fundamental understanding of shrub growth and distribution in the Australian high country. In scientific terms, shrub growth and hence fuel load is an expression of the carbon budget. For example the above ground biomass of a shrub community is dependant upon a range of physiological processes, such as carbon fixation, carbon emissions, litter production from plants, and the below ground processes of root biomass and soils and their contribution to the carbon cycle through emissions.

Methodologies:

This project will be primarily based in two locations, the Snowy Plains in NSW and the Bogong High Plains in Victoria. Research sites established on the Bogong High plans by Tina Bell and Mark Adams prior to the 2003 fires will be utilised and additionally, sites on the Snowy Plains a newly developed research area under the HighFire Project will be used.

A series of techniques will be employed during this study including: Infra-red Gas Analysis (IRGA), Gas Chromatography (GC), Stable isotope techniques and Mass spectroscopy (MS).

In order to reliably predict shrub biomass and fine fuel load and condition, it is essential to be able to quantify the full carbon cycle. In particular, if we are to be able to build process based models of shrub communities, we need to have a set of sites where we can calibrate any such model against empirical data.

The outcomes of this study, both field and laboratory data and analysis, will be synthesised into a carbon budget model, which should allow us to predict the distribution and mass of shrub fuels.

References:

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