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Annaburroo experimental grassland fire data

The Annaburroo grassland fire experiments, conducted in the Northern Territory, Australia, during the dry season of 1986, was the largest study of fire behaviour in grassy fuels ever conducted in Australia. It created a unique dataset of more than one hundred fire behaviour experiments across a wide range of burning conditions consisting of detailed observations of fuels (amount, arrangement and condition), weather and fire behaviour. This dataset is now publicly available via the CSIRO Data Access Portal.

Introduction

In collaboration with many Australian State and Territory rural fire and land management agencies, the CSIRO conducted a large experimental burning programme in grasslands at Annaburroo Station, 100 km south-east of Darwin, in the Northern Territory, Australia. These free-burning fire experiments were conducted during the dry season of July and August 1986 with the specific objective of quantifying the effect of grass fuel load, fuel bed height, and fuel arrangement on fire rate of forward spread.

The main findings of the Annaburroo experiments were the quantification of the absence of an effect of fuel load on rate of spread when fuel load is within 3 to 5 t/ha (Cheney *et al.* 1993) and the development new models for the rate of forward spread of fires in grassy fuels (Cheney *et al.* 1998). These results led to the separation of the calculation of rate of fire spread from fire danger at the time. The fire spread rate models remain the recommended fire models for use in grasslands in Australia and were incorporated into the Australian Fire Danger Rating System.

Several other outputs resulted from the analysis of these data, including the development of a model of firebreak breaching probability, analysis of the effect of fireline width on fire growth and acceleration, investigation of non-dimensional convection number effects on fire spread dynamics, and the parameterisation of grassland fire spread models in the Canadian Fire Behavior Prediction System.

The data collected during this study and used to generate these outputs are now available for fire behaviour researchers around the world to use in their research under the Creative Commons Attributions licence. The dataset can be downloaded for free from the CSIRO Data Access Portal (DAP) at:

https://doi.org/10.25919/ycd3-w209

The Annaburroo fire dataset

This dataset consists of all the base environmental and fire behaviour data collected during the experiments at Annaburroo Station (Fig.1). Data are provided at different spatial and temporal scales: the collection scale, the observation period scale (average per burning observation period for each fire) and plot average scale (one value per plot).

Figure 1. Project leader Phil Cheney making observations of an experimental fire in an undisturbed grass plot at Annaburroo.

Annaburroo station is located in a broad flat area in the flood plain of the Mary River. The area was divided in ten main blocks and then subdivided into 170 experimental plots. Of these, 121 fit the requirements of the study (plots with trees or inadequate fuel distribution were excluded). The experimental plots had two sizes: 100 m × 100 m and 200 m × 200 m. Fuel breaks of bare mineral earth 1.5 or 3 m wide separated the plots.

Fuel beds consisted of either kerosene grass or kangaroo grass, which provided dissimilar physical characteristics. Fuel height and quantity were manipulated by mowing and removing cuttings or mowing and retaining cuttings, yielding six different fuel bed treatments including the undisturbed plots.

An automatic meteorological station (AWS) recording wind strength and direction, air temperature, relative humidity and solar radiation was located within the experimental area for the duration of the experimental programme. Wind speed at 2-m height was measured at each plot corner for each experimental fire.

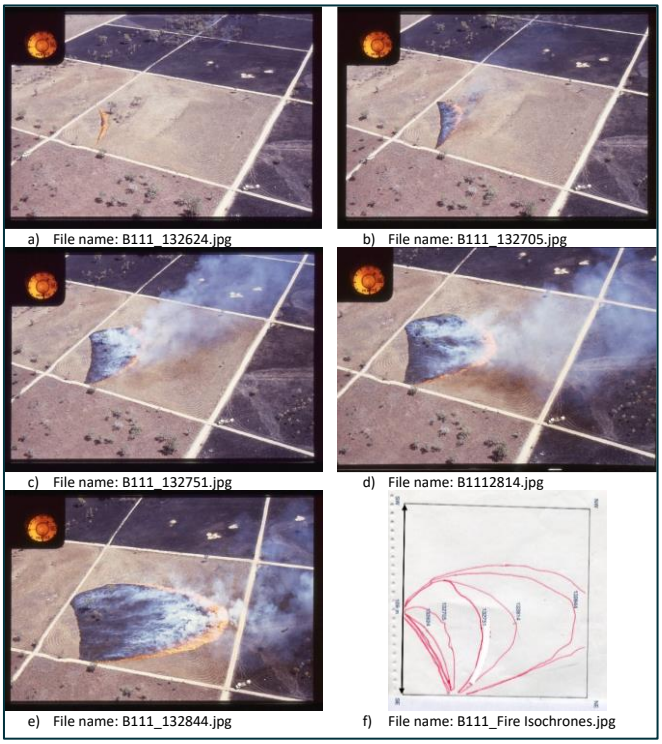

Figure 2. Example series of oblique aerial photographs (a through e) showing growth of experimental fire B111 and (f) the composite map of fire perimeter isopleths.

121 line ignition and 24 point ignition experiments were conducted over a two month period. Line ignitions aimed to rapidly produce a fire spreading at a quasi-steady-state rate of spread for the prevailing conditions. Point source ignitions aimed to create fires where the dynamics of fire acceleration could be studied. Fire behaviour observations were recorded at 1-minute intervals by experienced ground observers, noting flame characteristics, spot fire ignitions, wind changes, and updraughts and downdraughts. Oblique aerial photographs were taken from a helicopter at 15-30 sec intervals (Fig. 2a-e) which were later rectified and interpreted for fire progression (Fig. 2f) and other fire behaviour data such as head fire width and flame depth.

Dataset utilisation

While the data collected during these experiments were analysed to address the initial research objectives and resulted in the development of robust grassland fire spread models that are still the recommended operational fire behaviour prediction models for fires in continuous grass, great potential remains for further exploration of this dataset to extend our understanding grassland fire behaviour. It is hoped that with the publication of this dataset under a Creative Commons Attribution licence that fire researchers around the world will apply creative and innovative analysis techniques to generate new insights about the behaviour and spread of one of the world's fastest burning fuel types.

Further reading

Gould JS, Cruz MG, Sullivan AL (2024) The 1986 Annaburroo experimental grassland fires: data. *International Journal of Wildland Fire* **33,** WF23100. doi:10.1071/WF23100.

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CONTACT US
t 1300 363 400
+61 3 9545 2176
e enquiries@csiro.au
w www.csiro.au

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FOR FURTHER INFORMATION
Environment
Dr Andrew Sullivan
t +61 2 6246 4051
e Andrew.Sullivan@csiro.au
w http://www.csiro.au

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