The Darwin Smoke Project

A research partnership of Charles Darwin University, the NT Government and the Bureau of Meteorology

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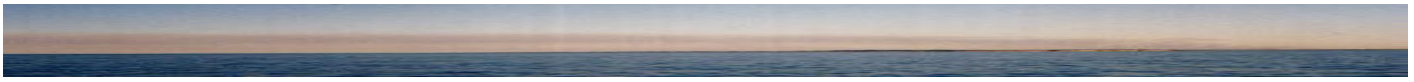


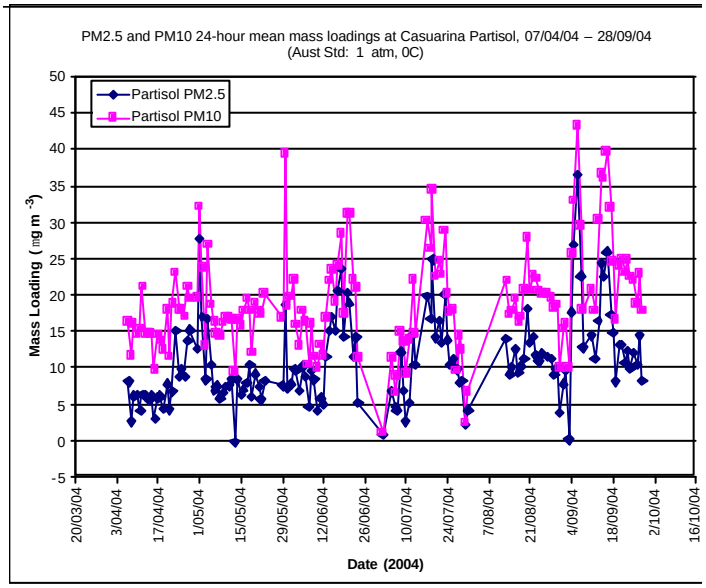
Welcome to the second newsletter from the Darwin Smoke project, a unique multi-disciplinary research program that aims to identify causes and consequences of high air pollution episodes in the Darwin region. The project has several components:

- ***Atmospheric Chemistry*** – measuring the concentration of particles arising from smoke pollution in Darwin and Palmerston.
- ***Aero-biology*** – measuring the amount of pollen and fungal spores in our air and identifying the predominant species.
- ***Meteorology*** – measuring the daily temperature, rainfall and humidity, wind speed, direction and temperature inversions to help understand and predict the dispersal of smoke from savanna fires.
- ***Landscape Ecology*** – examining how different land management affects the fuel loads and fire cycles in the savannas and examining the timing and geographic distribution of fires using satellite imagery.
- ***Epidemiology*** – examining the impacts of environmental factors including smoke pollution, weather, fungi and pollen counts on the health of the population of Darwin.

Atmospheric Chemistry

The Team: A/Prof David Parry, Francoise Foti and Dr Tony Jong - Charles Darwin University, Dr John Gras – CSIRO Atmospheric Research. Contact – david.parry@cdu.edu.au

The measurement of particulate matter (PM10 and PM2.5) is continuing at the Palmerston Campus and Casuarina Campus sites of the Charles Darwin University, together with PM10 measurements in the Darwin City area. PM10 and PM2.5 data from the Partisol Dichotomous Sampler at Casuarina Campus is shown below.



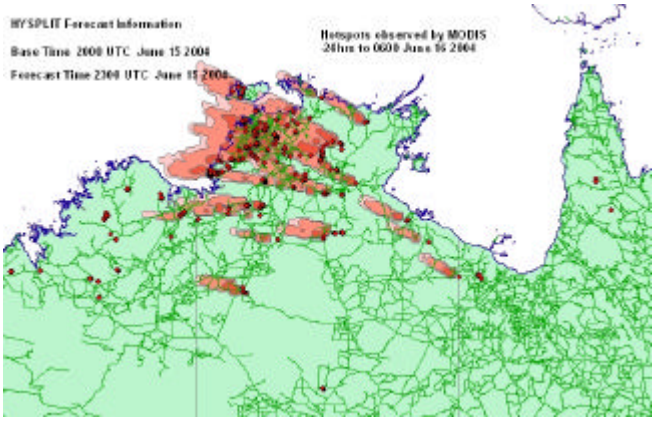
The data up until 28 September 2004 at Casuarina showed no exceedences of the PM10 NEPM standard (daily average 50 µg/m^3), however there were 4 exceedences of the PM2.5 NEPM (NEPM daily average 25 µg/m^3).

Dr John Gras from CSIRO Atmospheric Research in Melbourne visited on 26 to 28 July 2004 to assist with the calibration of the instruments and to review the aerosol sampling program. The Tapered Element Oscillating Microbalance (TEOM) for PM10 and the Automatic Cartridge Collection Unit (ACCU) for PM2.5 both passed all calibration checks. However, a fault was identified with the Partisol Dichotomous Sampler that could not be rectified on site so it was returned to the supplier in Melbourne. We were fortunate that the supplier had a spare unit which he shipped to us, resulting in minimum down time. The instrument has now been repaired and the supplier has agreed to us retaining the spare Partisol to allow us to do some parallel measurements for quality control purposes at both Casuarina and Palmerston sites.

The MicroVol has also developed a flow problem which has necessitated it be returned to Melbourne for repair.

We are currently conducting quality control on our weighing methodologies by having filters check weighed by the CSIRO Atmospheric laboratory. Results to date show good agreement between our two laboratories.

Modelled smoke plumes for June 16th 2004. The model uses a combination of satellite images, GIS, the HYSPLIT program being run by Alan Wain.



The Sporewatch samplers have been running continuously. The pollen samples are collected on tape that is mounted and stained and sent to Dr Simon Haberle at the Australian National University for counting.

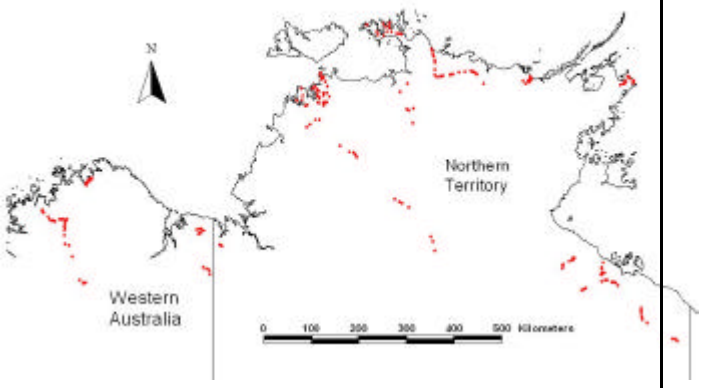
Landscape Ecology

The team: Prof David Bowman and Don Franklin from the ARC Key Centre for Tropical Wildlife Management.

Contact – david.bowman@cdu.edu.au

The aim of the Landscape ecology project is to examine the relative importance of fire management and environmental conditions on grass fuel loads. It has previously been suggested that high frequencies of fire activity have driven a 'grass-fire' cycle resulting in bigger, hotter and more polluting bushfires.

Four months of fieldwork during the dry season is now over. Christine Maas and Don Franklin assessed the contribution of grasses and forbs to fuel loads as 211 sites in Stringybark (*Eucalyptus tetrodonta*) dominated savannas. Sites, shown in red on the map, were distributed across north-western Australia, from Kalumburu and the Mitchell Plateau in the north-west to Cobourg and Gove Peninsulas in the north, inland to Larrimah, and south-east beyond Borroloola and almost to Wollogorang.

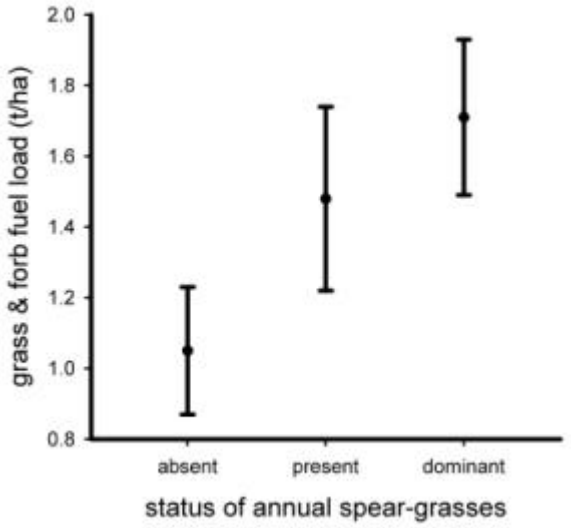


Owen Price and Don Franklin have now started the data analysis with input from David Bowman.

Some interesting trends have emerged, not all as anticipated. The grass and herb fuel loads were generally rather lower than anticipated, and there is a

weak negative relationship with mean annual rainfall – the highest fuel loads were associated with Spinifex (*Triodia*) in drier regions. Some higher rainfall regions and especially Gove Peninsula had remarkably low fuel loads. But the overwhelming impression is of extraordinary variability between sites often even when separated by just a few kilometres.

In regions where annual spear-grasses (*Sarga intrans* and *S. timorense* - these were formerly in the genus *Sorghum*) occur, the presence and especially dominance of these grasses is associated with higher fuel loads



However, this doesn't necessarily mean that spear-grass is invading and increasing fuel loads. It could well be spear-grass occurs where conditions favour more lush growth. This is something we hope to tease out from the data. Nonetheless, the result shows that grass fuel loads are the result of a complex interplay between biophysical conditions, geographic regions, and management regimes. How this variation relates to fire management patterns and associated variation in smoke pollution remains to be determined.

Epidemiology

The team: A/Prof Ross Bailie (Menzies), Prof Louis Pilotto (Flinders University), Dr Fay Johnston, (Centre for Remote Health), Dr Ros Webby (ANU and Darwin Centre for Disease Control), Anne Myerscough and Janelle Fisher (CDU).

Contact – fay.johnston@cdu.edu.au

The Darwin Asthma Study

The collection of data from our cohort of 236 adult and children with asthma will conclude on November 7. These participants have been completing a daily diary with details of symptoms, medication use and health care attendance since March, providing the study with 36 weeks of asthma data. The first 3 months of data is currently being analysed using STATA.

The Darwin Pollen and Hay fever Study

The *Darwin Pollen and Hayfever Study* has commenced analysis of the data between March and August 2004. Though initial findings revealed different sales trends for Telfast, Clarinase, Rhinocort and Beconase, sales tended to reach a peak in May (Telfast) and June (other products).

Between late March and early June there was a conspicuous presence of grass pollens in the pollen count. Other significant plant taxa during this period included *Acacia* (Wattles), palms, *Eucalypts* (Gums) and *Callitris* (Cypress Pine).

Further analysis will be conducted to determine the their relationship with pollens, smoke and other environmental conditions.

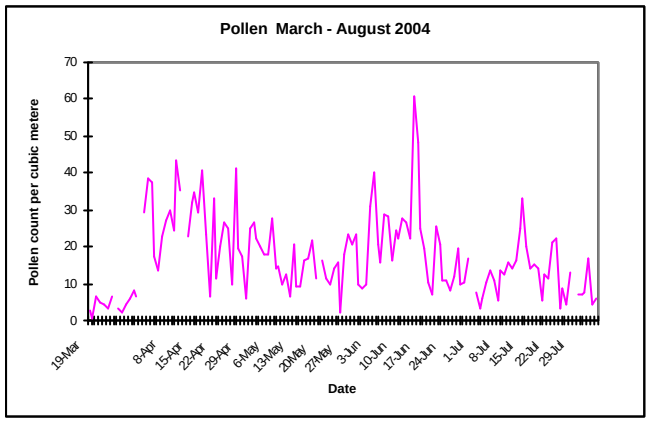
Plant specimen collection is continuing in both Casuarina and Palmerston areas. Flowering specimens are collected, pressed and dried before being taken to the NT Herbarium for identification. Flower specimens are then sent to Dr Simon Haberle at ANU for comparison with pollen specimens collected by the aerosol samplers and for inclusion in a pollen database. A total of 101 different flowering plants have been sent to ANU to date.

Hospital Studies

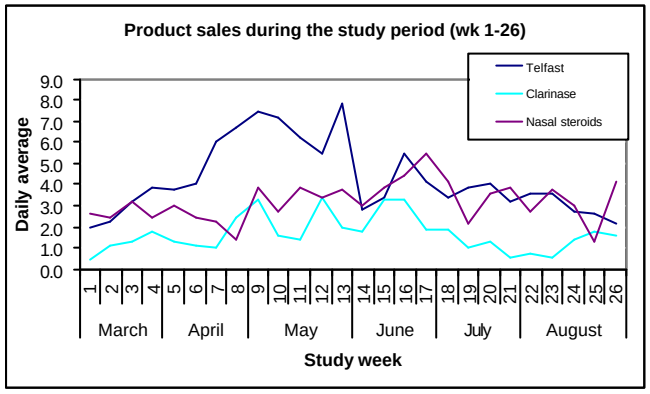
Planning for the extraction of RDH hospital data has commenced. Presentation and admission data from 2000 to the end of 2005 for respiratory and cardiovascular conditions will be examined in the next stage of the study.

Some results so far…..

Total pollen



Pharmacy sales of products for hay fever



The palynology team at ANU

Dr Simon Haberle and Janelle Stevenson in the pollen lab.

Meteorology

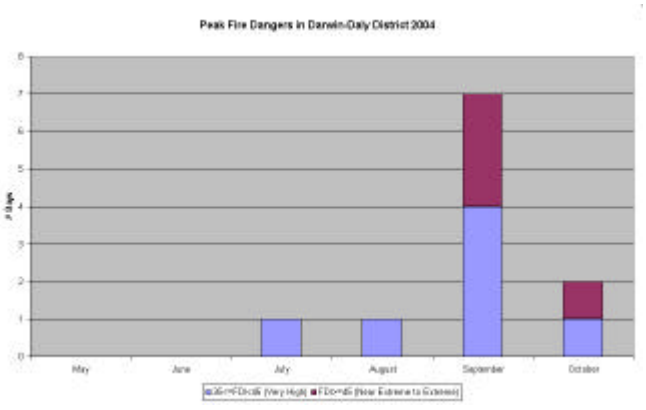
The team: Jim Arthur, Ian Shepherd, and Dr Michael Foley, BOM Darwin and Alan Wain, BOM Melbourne

Contact –m.foley@bom.gov.au

The 2004 fire season for the northwestern Top End got off to a late start after rainfall encroached into the early Dry Season. (Darwin Airport had a record June rainfall total of 50.6 mm.) The rains reduced fuel curing early in the season and contributed to lower fire dangers in May and June.

The figure below shows the number of days in each month when the peak fire danger index recorded in the Darwin-Daly district exceeded Very High 35 (marginal fire weather warning conditions) or Near Extreme 45. It can be seen that this year, fire dangers for the northwestern Top End peaked during September. A procession of strong high pressure systems moving through the Great Australian Bight during September maintained unusually fresh and dry southeasterly wind flow over the Top End. This combined with high fuel curing and typical hot 'Build Up' temperatures to give increased fire dangers during the month.

Days per month with notable fire danger values.



For more information about the Darwin Smoke Project contact Trisha Butler at the Key Centre for Tropical Wildlife Management Charles Darwin University NT 0909 telephone 89466574 or email patricia.butler@cdu.edu.au