Outcomes of the 1993 Fire Weather Conference

Reporting notes taken by Rick McRae.

The conference was held at the Craigieburn Conference Centre in Bowral from May 2 to May 7, 1993. It was attended by roughly 35 meteorologists and 10 fire agencies representatives. The five-day agenda covered a range of issues relevant to fire weather.

Highlights of the agenda are discussed below, followed a review of significant outcomes.

**Highlights**

**Conference opening**

**Cold front reconnaissance report**
The programme flying a specially outfitted aircraft into cold fronts as they approach the SE of Australia over the Bight has been running for some time now. Much useful experimental data were obtained. Its operational effectiveness was discussed. Two views were held: (1) Maintain the program on a limited, more cost-effective basis for the really "blow-up" days; (2) Scrap the program altogether. The latter appears most likely, pending review of operating costs.

As a result of the program, much more is now known about the behaviour of maritime cold-fronts, including the role of meso-scale lows that develop in unexpected places.

**Communications in the computer age.**
It became apparent that the Mets have only just begun to learn effective communications with their clients. The best example was the style of fire weather forecasting in Victoria, which went from highly technical in style in '91 to an almost colloquial style today. Neither are appropriate, and the Met needs to follow the learning curve a little longer before a good product emerges.

The ADMIN system available from AEMI was discussed and seen as useful.

It is relevant that the BoM has not been involved in the AEMI workshop "information management in disaster response"

**Smoke dispersion in WA.**
A case study of extreme air pollution over Perth caused by the interaction of burn-off smoke and weather patterns was reviewed.

It was agreed that smoke management would be a key area of Bureau client interaction.
Aerosonde.
The aerosonde project was described - a lightweight pilotless aircraft (3m wingspan, 12 kg fuelled weight, 45,000 foot ceiling, 10,000 km 5 days endurance) using GPS for navigation and satellite communications. A number of further years of research and development are needed. The benefits from improved forecasting worldwide from this project are enormous.

Ageostrophic flow around cold fronts.
It was made entirely clear that the mathematics of modelling winds that do not follow pressure gradients are extremely complicated. Hidden amongst the mathematics were some important lessons about what occurs around the 3-dimensional structure of a cold-front. The less commonly understood winds (from the fire perspective) are the ones that may cause the most unexpectedly severe fire behaviour.

Meso-scale modelling.
Recent advances in the software used to model weather systems on a ten-kilometer grid have allowed detailed local-area modelling. This will be available across the Bureau, and will allow improved understanding of various local phenomena.

The Haines Index.
The US National Weather Service claims value from an index that combines ground to middle level stability and dewpoint depression. The index allows the distinction to be made between wind-driven fires and convection-driven fires. High values of this index, the Haines index or the Lower Atmosphere Stability Index - LASI, can explain why some fires grow larger than others, all other factors being equal. It was agrees that the Index be made available to fire managers over the next two years for evaluation purposes.

Outposting.
The outposting service developed in Victoria has now shown its value and is to be considered by other Regions of the Bureau.

Update of the Grassland FDI models.
A review of progress on developing new grassland fire danger models was presented by Phil Cheney.
Key points discussed were:

- The Bureau says that the fire agencies could give better advice on curing levels.
- The new models don't work well for non-uniform curing - as this leads to non-uniform fire spread. At 100% curing this problem disappears.
- There is a need to separate out modelling for fire spread from fire danger.
- There is a general consensus on using the McArthur Mark 4 Grassland Fire Danger Meter for FDI work.
Forecasting for fuel reduction burning.
Rick Sneeuwjagt from CALM WA gave a talk on their needs for forecasting for fuel reduction burning purposes and how they have opted to use the services of Oceanroutes on a contract basis for this. Details of the contractual performance agreements and verification procedures were presented.

Fuel assessment using remote sensing.
A climatology of severe weather events in SW WA.

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Personal notes taken by Rick McRae

**SOA P BOX**

- Demarcation lines -
  - between fuel authorities at state border
  - between Met Regions / HO sections.

- Case study 1
  - Natural phenomena don't recognize such borders.
  - e.g. Extreme grass fuel loads throughout SA Australia - "A huge disaster"!
  - large fires and/or flagpoles.

- Case study 2
  - Some large infrastructure items are too expensive/complex for one agency to run. E.g. lightning detection???

- Implication is that, on a multi-agency, multi-jurisdictional basis, we must learn to share resources to a higher degree than at present. Models:
  1. Informal cross-regional liaison.
  2. Pooling resources - involved agencies.
  3. Formal cooperation - RARFA/BOM.

- Case Study 3
  - Case Study 2
  - (IV) Informal interagency, working group/conference.

- Satellite imagery map consortium in SE NSW Region
  - Footed - Digital data
    - Satellite imagery purchasing
    - Tourist map production
    - Budget management, income/expenditure
  - NSW DPIE / NSW DBES / ACTRFS / AUSLIG
Severe Nat Mdl Matter

8 Check if ACIES is developing action statements
to go on Severe Weather/Storm Warnings
 NSW 5-star goal: 5+6 warnings for Sydney area.

Strong: Routine forecasts for
whole state + SES message.
Recent BoM workshops e.g. Work & AEMI workshop
Soon on action statements/sociological statements.

National Natural Hazards GIS
- BoM, CSIRO, Geol Survey Org, NRCC
- Federal project.
- F105 - earthquakes, cyclones.

Increasing profile - joint effort BoM, agencies.

Chenery: I'm in agreement in general, to standardize on

Check with Geoff re ADMIN - ARNET - McIDAS link?
? Get dial-up access.

AVHRR

* ch 3-4 adjust by 0.25 pixels (sensor misalignment).
* ch 3-5 adjust by 0.15 pixels.

* McIDAS area 5.991

* Able to detect on-going fires by locating extremes
  on Channel 3... or rather of $B_{-4}$

* CSIRO Tas has an AVHRR archive.
NDVI on Web Computer (MeDAS)

Bureau wants to buy lightning detection system capital costs shared with users on a consortium basis.

Haines Index to be made available for evaluation.

INFO SHARING
> Distribution of NSW Fire Weather Course Note

TONY: Any comments welcome.

Next Conference
1. Outcomes from '93
2. Review in '94
3. Visit lead to region a few months before '95 conference
4. Less tech. technical waffle

Interaction between weather and bushfires (Parkham)

- Conservation of momentum
- Moisture
- Heat
- Mass
Training of Fire Weather Meteo

* Key specialists/practitioners/basic level
* Each different training
  - 1 CS
  - visit fire ground

Circulate examples of Fire Weather products

Phil Cheney

Separate FDI equations (eg Milton) (untested)
from COS equations (eg new NBRU model)

NBRU doesn't cover effects of curing less than 100%
because heterogeneous curing & hetero spread
gives poor derived meaningful estimate

Discussion on how to give regional evapoestimates
Bob says forests don't give good advice
Scheuring.

CALM web contract with Oceanrocks re weather for
ABBA. Verification parameters defined. If
predictions within limits a certain fraud of days/year
better than Home

eg 3 test stations, $4k/month per station,
penalty = $1000, bonus ? $1200, percent hits target < 75-80%

Prescriptions: (25,000 ha/annum) ... fairly standard
but need 80% coverage, and need stable air
(when an inversion) to proceed.

Fire Mission Training
(Cascader)

Needs for fire weather forecaster
* commitment to user driven sewer
* good comms ability
* know fire weather for region
* " " meso-scale fire weather processes
* " " tech systems

Qs
Who should do the training?
Should nets be trained on fire behaviour?
Prior experience before training?
Assessable/verifiable?
Case studies for training?
Future of FDI's (Packham)
* Who are clients? (eg. Ambulance at higher standby?)
* FRA
* Public warnings (- too much reliance on actual FDI)
* What does MBG warn for?
* MAI - lots of meso-scale models
  - various fire models
  - new models - new Rothermel, Harris
    - activity level models

AeroZonde
* Funding base of Tropical cyclone work

WISH LIST:
  * 3-4 Wingspan, PKG 1000 km 3-5 days RGJ needed
  * GPS Nav, Satellite comm, 45,000' ceiling 2 years more
  * Autonomous ops.
Haines Index
(Lower Atmosphere Stability Index - LASI)
Stability & dryness

<table>
<thead>
<tr>
<th>HI</th>
<th>2 days. Average wind direction</th>
<th>Average wind speed</th>
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</thead>
<tbody>
<tr>
<td>6</td>
<td>NW 52° 45</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>N 44</td>
<td>increased</td>
</tr>
<tr>
<td>4</td>
<td>SE 38 5</td>
<td>increase</td>
</tr>
<tr>
<td>3</td>
<td>ESE 45 6</td>
<td></td>
</tr>
</tbody>
</table>

Use Water Vapor Imagery to back up radiosonde data to map HI.

High HI = more spotting, larger convection.

<table>
<thead>
<tr>
<th>Meteorological condition</th>
<th>HI</th>
<th>Winds into fire</th>
<th>Unbalanced wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral</td>
<td>HI</td>
<td>Neutral wind</td>
<td>Balanced wind</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td>Winds into fire</td>
<td>Unbalanced wind</td>
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</tbody>
</table>

Wind speed: hi
Cold Front Recon (John Ball)

- used to use RAAF - only under dire circumstances
- needed a standing call beforehand.
- little ops benefits - lots of research benefits
- best for "west coast" fires - little lead time.

Expected... found...

Unstable boundary
larger
(60 km wind)

Comms clients in computer age (No)

- ADMIN (AEM)
  - ADMIN
  - Enhanced forecast data
    - presentation in Vic (flow on from '91)
  - BUT gone too far from coding
    - almost colloquial briefings - just as ambiguous
  - Pro forma for requesting AEM forecasts.
Smoke Dispersion

- In WA: rule of thumb
  "Max from area = distance from Perth x 20!"
  \[ \text{Sum diameter} \times (\text{distance})^2 \]

- Small developing meso-scale
  Particle drift model, on 10km grid,
  mixing via sea-breezes.

- 22-3 Oct '92 - worst air pollution for Perth, from
  run-offs.

- Normally brought in by
  moves inland,
  and pressure grad.
  gives strong sea-breeze
  which disperses
  inversion.

- Continental air
  moves inland
  and pressure grad.
  gives strong sea-breeze
  which disperses
  inversion.

- [Diagram with labels: West, East, Continental, Shallow, Pressure Gradient, Alt.]}