

Bushfire Ignition in Victoria

An adventure in wrangling spatial data

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The Fire Danger Rating System

The McArthur Forest Fire Danger Index:

$$F = 2.0\exp(-0.450 + 0.987 \ln(D) - 0.0345H + 0.0338T + 0.0234V)$$

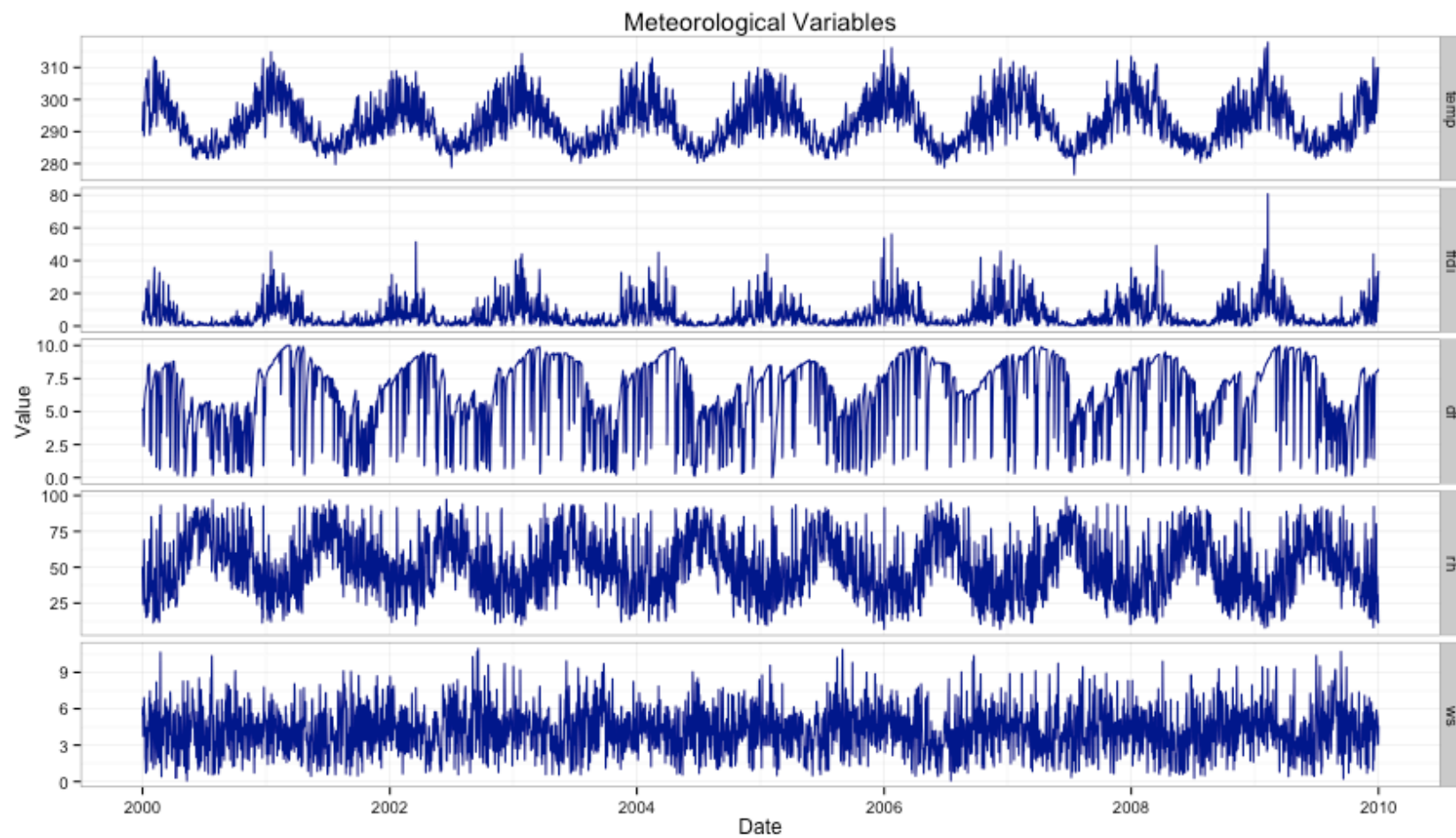


WRF Model Data in NetCDF Format

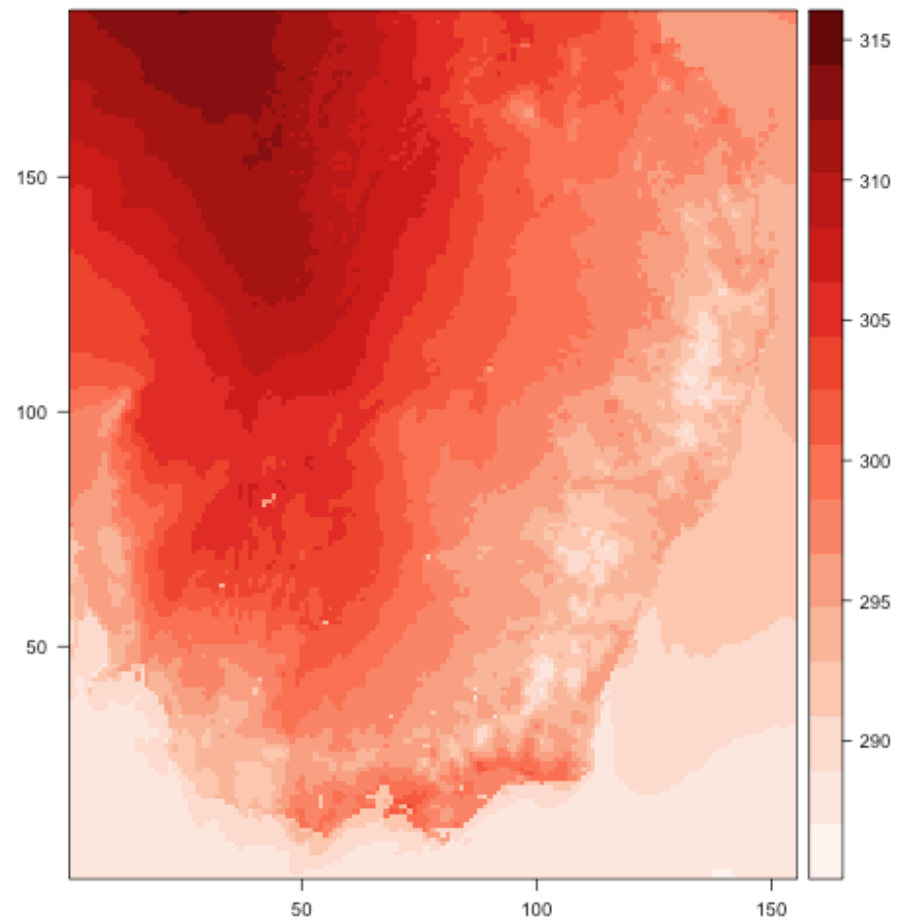
```
library(ncdf)
temp.nc <- open.ncdf("./tmax_subset.nc")
temp.nc
```

```
## [1] "file ./tmax_subset.nc has 3 dimensions:"
## [1] "time      Size: 11"
## [1] "south_north  Size: 185"
## [1] "west_east    Size: 155"
## [1] "-----"
## [1] "file ./tmax_subset.nc has 3 variables:"
## [1] "float TMAX[west_east,south_north,time]  Longname:TMAX Missval:-999"
## [1] "float XLAT[west_east,south_north]  Longname:XLAT Missval:1e+30"
## [1] "float XLONG[west_east,south_north]  Longname:XLONG Missval:1e+30"
```

WRF Data Time Series - Silvan



WRF Model Temperature



Shapefiles

```
## OGR data source with driver: ESRI Shapefile
## Source: "/Users/ellesaber/bushfire/data_raw/shps", layer: "STE11aAust"
## with 9 features
## It has 2 fields
```

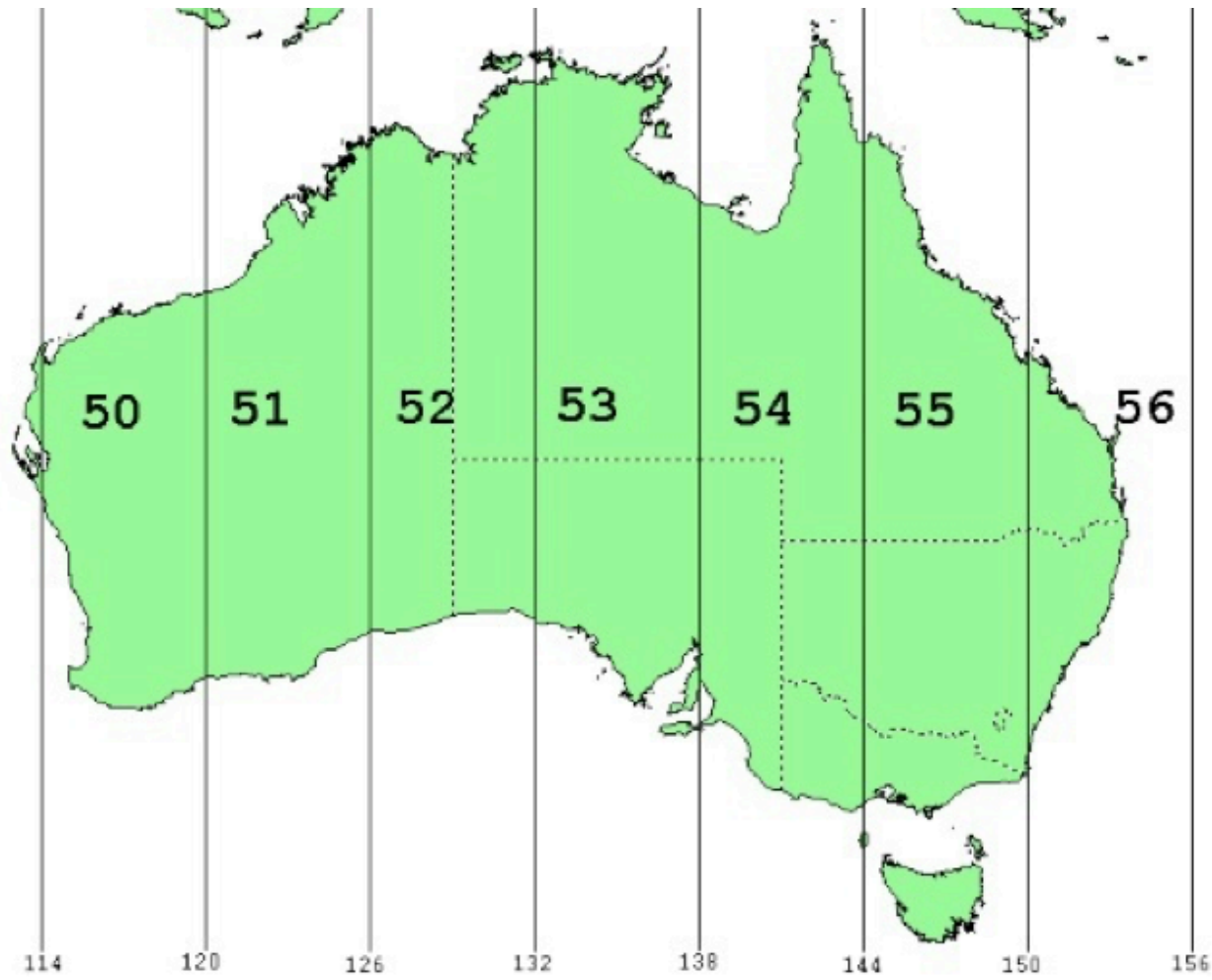
ABS Statistical Divisions

```
## OGR data source with driver: ESRI Shapefile
## Source: "/Users/ellesaber/bushfire/data_raw/shps", layer: "SD11aAust"
## with 61 features
## It has 3 fields
```

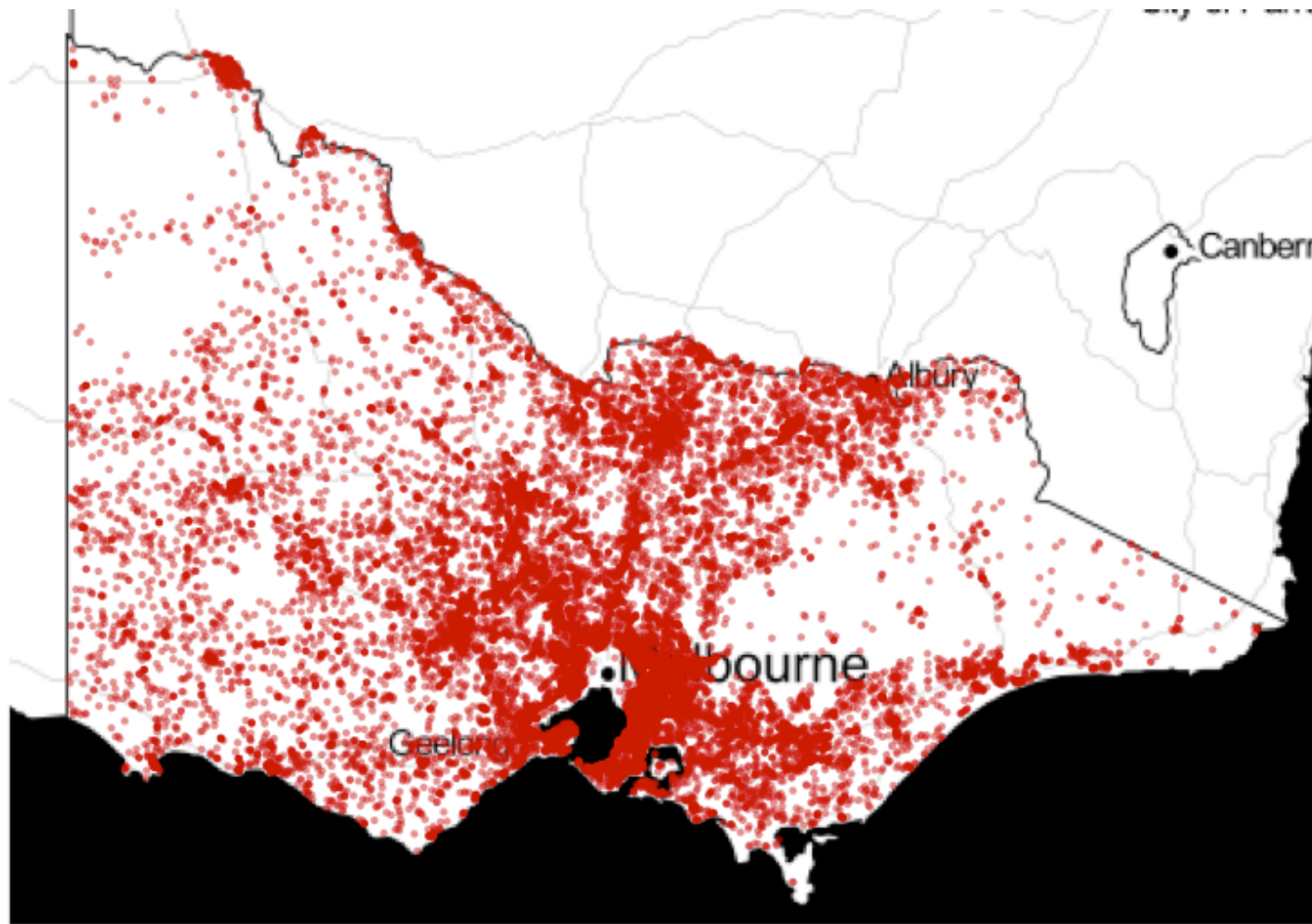

Fire & Incident Reporting Service

| | | | | | | | |
|-------------------|------------------------|-----------|-----------------|---|----|---------|-----------|
| 02/04/05 23:11:40 | MELTON | 182,474 | MELTON SOUTH | Grass fire (more than one hectare) | 55 | 286,745 | 5,825,070 |
| 02/04/05 22:15:51 | TERANG | 8,306,292 | TERANG | Scrub or bush and grass mixture fire (more than o | 54 | 666,657 | 5,765,670 |
| 02/04/05 20:09:00 | CORIO | 182,460 | BELL PARK | Grass fire (more than one hectare) | 55 | 267,181 | 5,780,087 |
| 02/04/05 18:48:41 | CRANBOURNE | 182,450 | CRANBOURNE | Grass fire (more than one hectare) | 55 | 348,117 | 5,783,408 |
| 02/04/05 13:29:31 | ROWVILLE | 182,421 | LYSTERFIELD | Grass fire (more than one hectare) | 55 | 351,621 | 5,799,809 |
| 02/04/05 13:27:00 | SEBASTOPOL | 5,608,928 | SEBASTOPOL | Grass fire (more than one hectare) | 54 | 750,421 | 5,833,977 |
| 02/04/05 12:57:42 | LESLIE MANOR | 8,306,248 | LESLIE MANOR | Scrub or bush and grass mixture fire (more than o | 54 | 704,255 | 5,782,355 |
| 02/04/05 09:09:22 | FRANKSTON | 182,396 | FRANKSTON NORTH | Grass fire (more than one hectare) | 55 | 337,848 | 5,778,794 |
| 01/04/05 19:44:17 | DANDENONG | 182,365 | DANDENONG SOUTH | Grass fire (more than one hectare) | 55 | 344,547 | 5,791,726 |
| 01/04/05 19:15:35 | DANDENONG | 182,359 | DANDENONG SOUTH | Grass fire (more than one hectare) | 55 | 344,545 | 5,790,898 |
| 01/04/05 15:19:49 | FRANKSTON | 182,336 | FRANKSTON NORTH | Grass fire (more than one hectare) | 55 | 337,614 | 5,778,831 |
| 01/04/05 14:39:20 | CLONBINANE | 8,306,196 | BROADFORD | Scrub or bush and grass mixture fire (more than o | 55 | 334,273 | 5,875,965 |
| 01/04/05 13:23:56 | DUNOLLY | 8,306,183 | DUNOLLY | Grass fire (more than one hectare) | 54 | 743,620 | 5,917,277 |
| 31/03/05 22:09:11 | KINGLAKE DISTRICT /DEI | 182,289 | KINGLAKE | Scrub or bush and grass mixture fire (more than o | 55 | 354,919 | 5,846,322 |
| 31/03/05 19:38:00 | MILDURA | 6,502,469 | MILDURA | Grass fire (more than one hectare) | 54 | 605,800 | 6,216,800 |

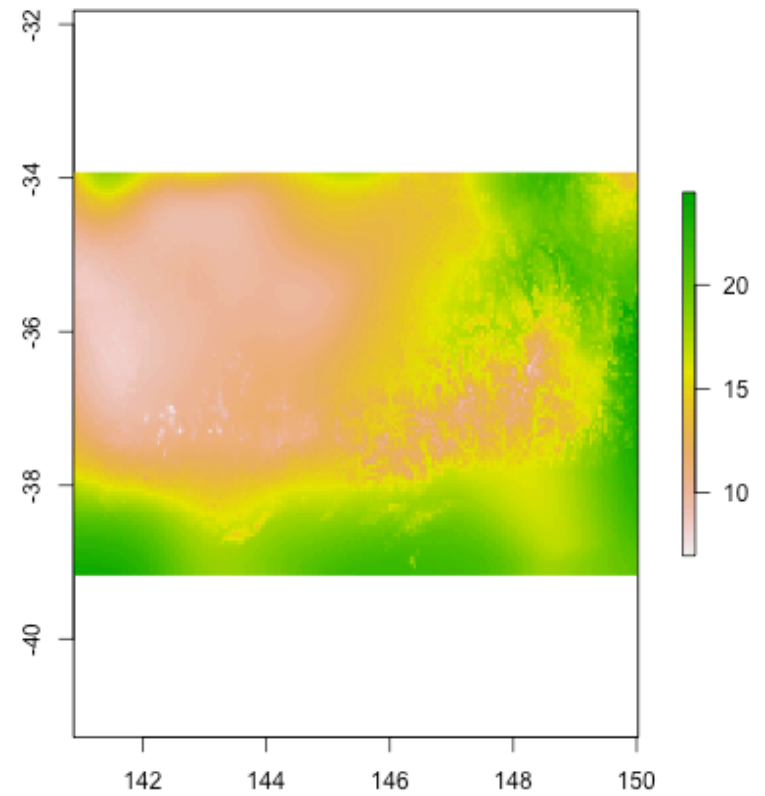
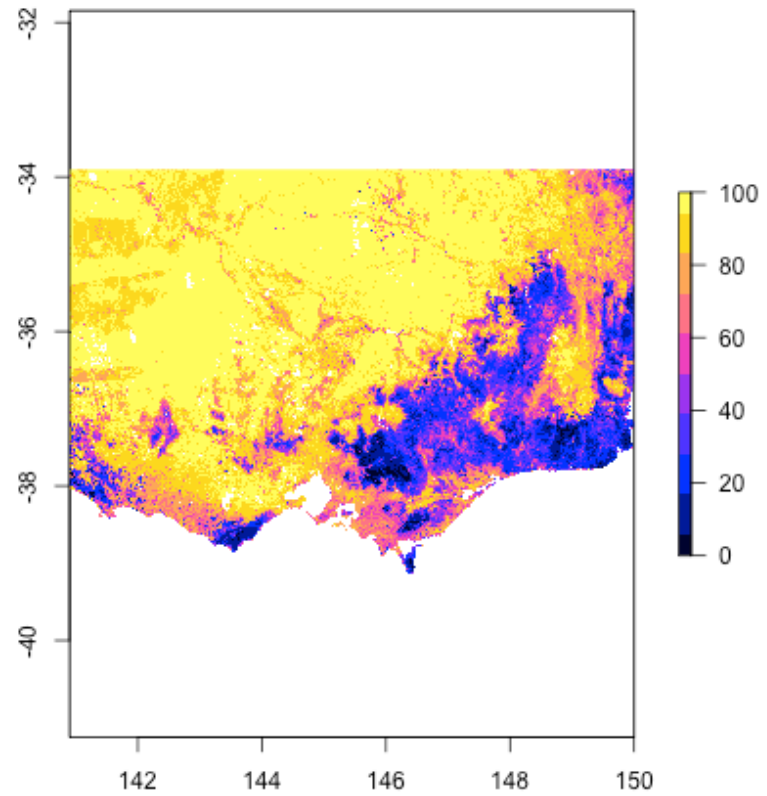
Australian Map Grid Zones



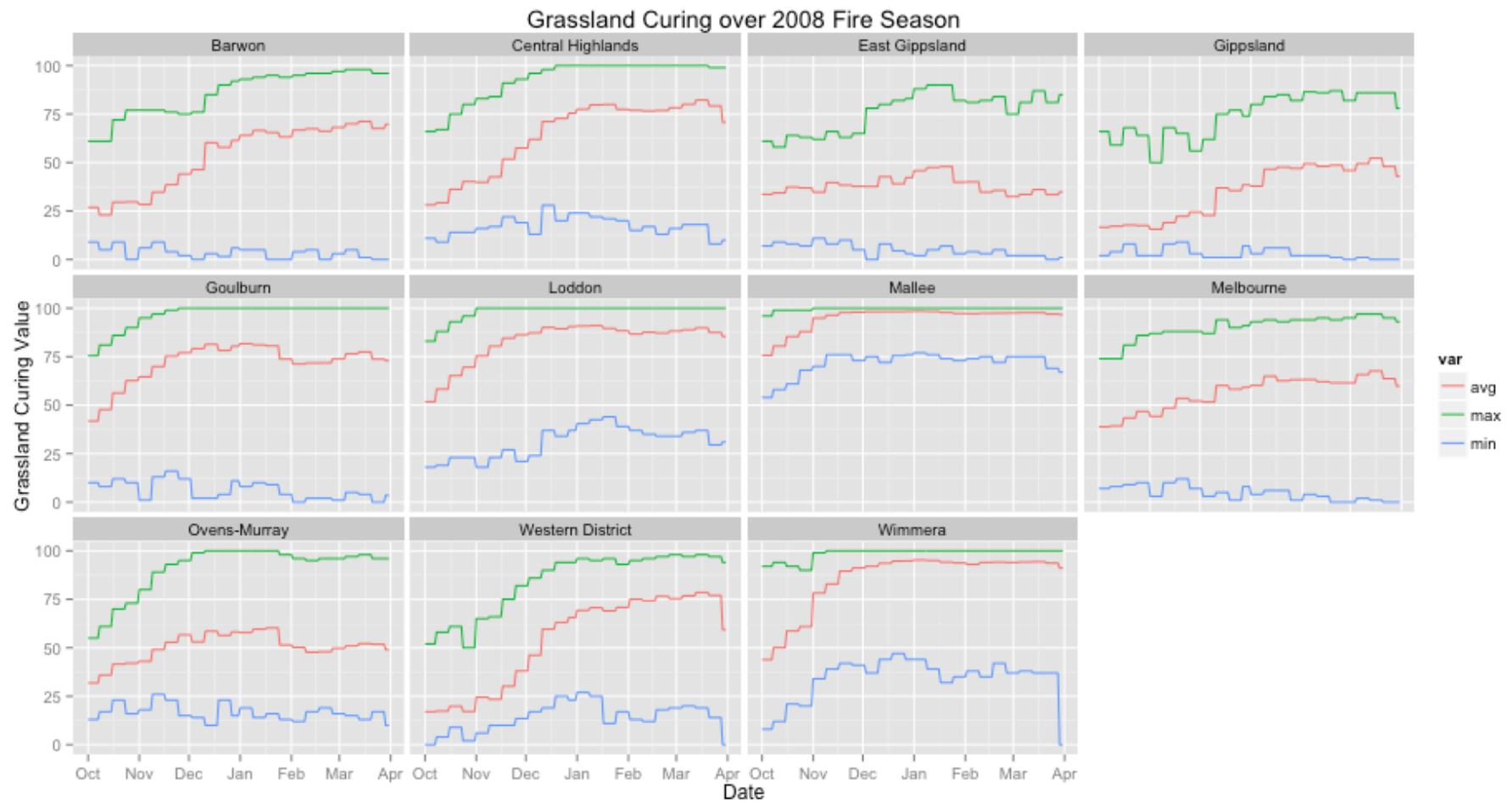
Fire Map



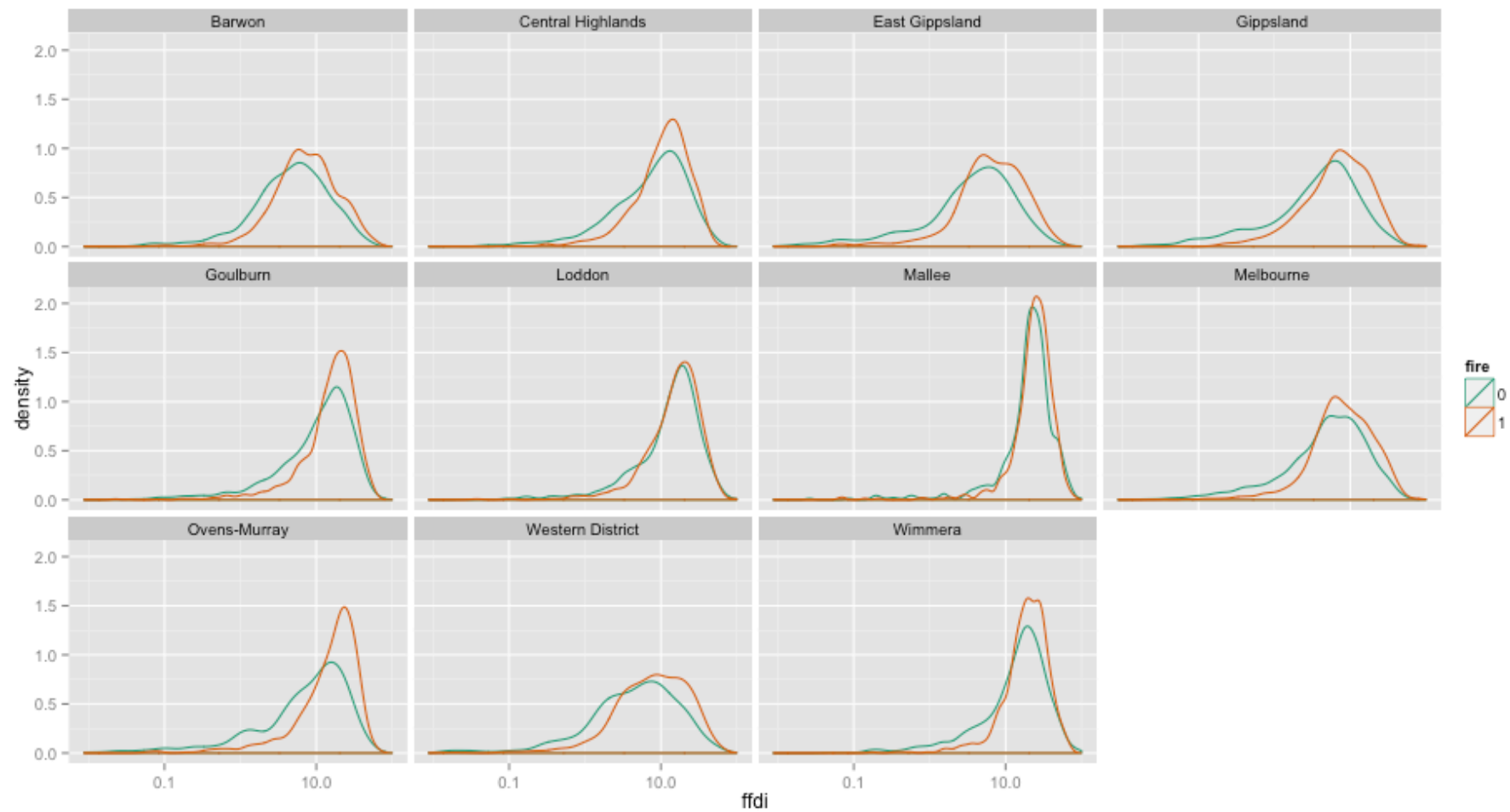
Grassland Curing & Vapour Pressure



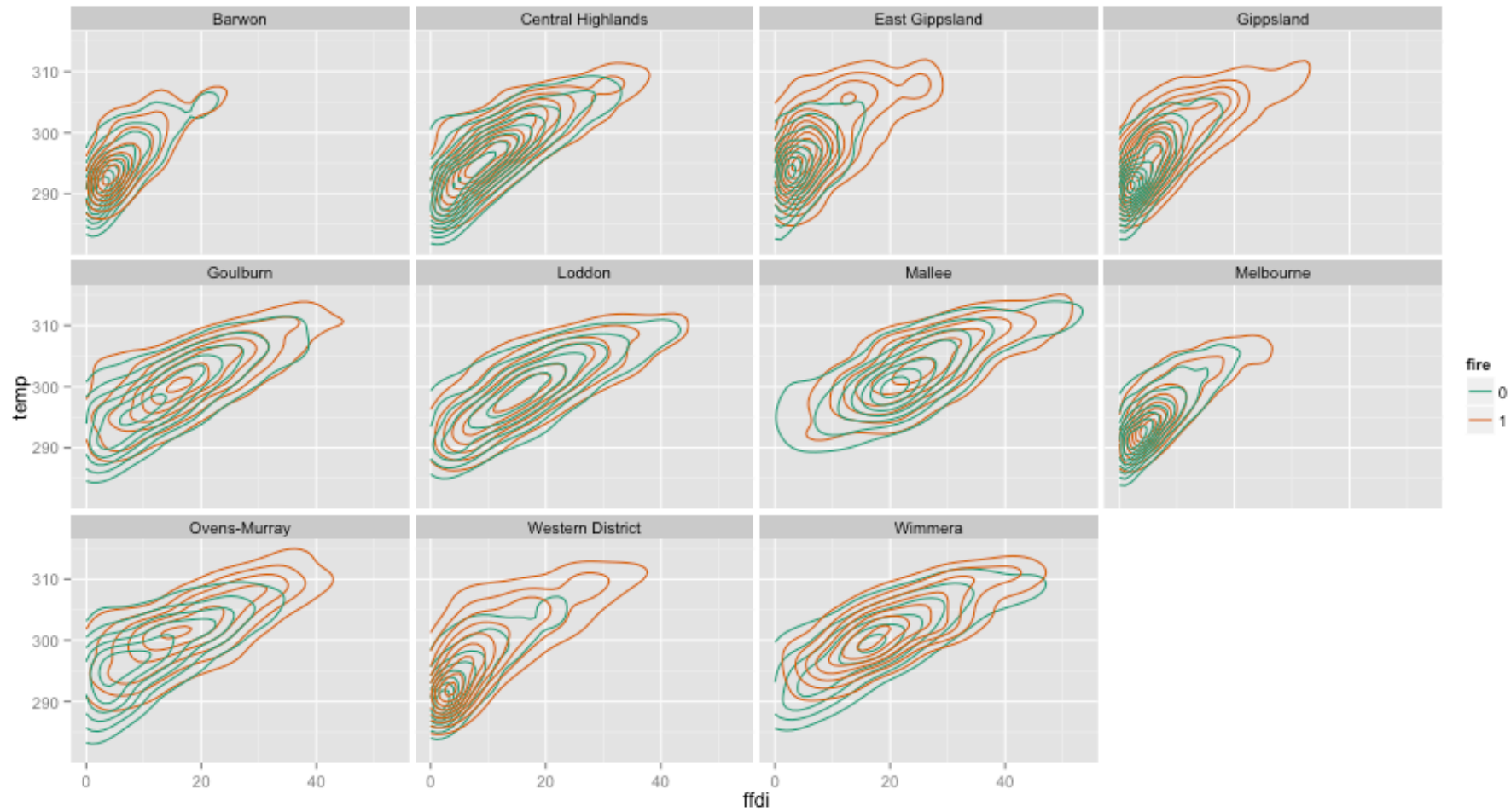
Grassland Curing Evolution



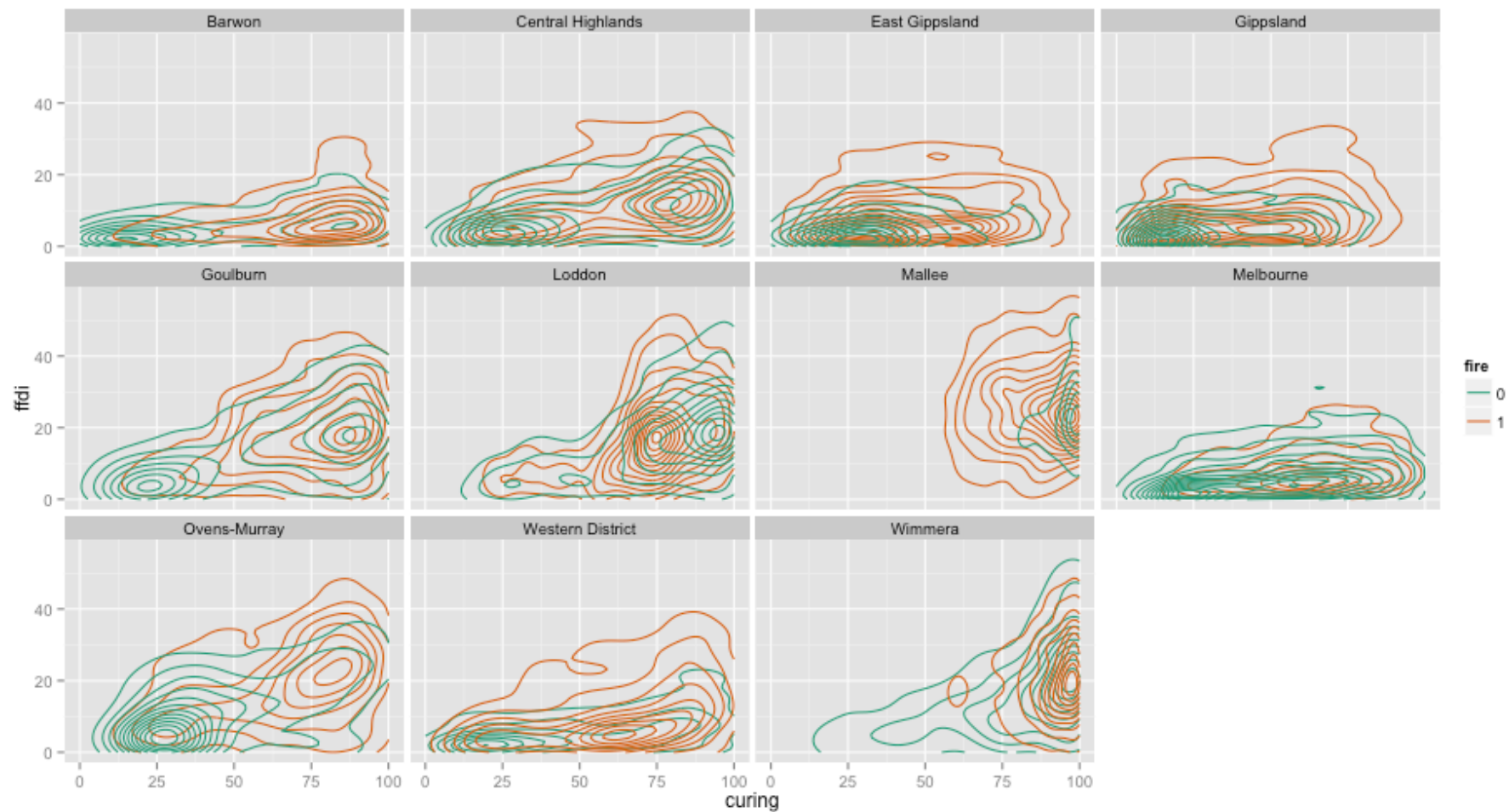
The Fire Danger Index and Fire Occurrence



The Fire Danger Index and Temperature



The Fire Danger Index and Grassland Curing



Data sets

- WRF Model
- CFA Fire & Incident Reporting Database
- CFA Grassland Curing
- BOM Vapour Pressure & Precipitation

Key R Packages

- dplyr & tidyr
- rvest
- NCDF
- raster
- sp
- rgdal