# Soil Moisture Data

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## Introduction

The Australian Landscape Water Balance is an interactive website which provides Australia-wide information on key landscape water balance components including soil moisture, run-off, evapotranspiration, deep drainage and precipitation in near real time (http://www.bom.gov.au/water/landscape/).

The data presented on Australian Landscape Water Balance is produced by the Bureau's operational Australian Water Resources Assessment (AWRA) Modelling System (AWRAMS).

## Data products

The data from this website needs to be downloaded manually. The data is available for various variables over a daily, monthly or annual time horizon. The Australian Landscape Water Balance provides a continental scale grid available either as:

- An ASCII grid for the currently selected map, or
- A NetCDF file containing multiple time steps in a single file

The website can also generate a time series for individual points or for whole catchments.

The data can be made available for automatic download upon request by the BoM for a fee.

## Problem Statement

This report visualises two data sets provided as an ASCII continental grid, focusing on the Coliban river catchment. This visualisation is developed in the R Language.

## Initialisation

Two functions prepare and visualise the ASCII continental grid data. The first six lines of these files contain metadata. The metadata is stripped to transform the ASCII grid into a suitable format. The centre point of the visualisation is Lauriston reservoir and the data is projected on a Google map.

```
# Libraries
library(tidyverse)
library(reshape2)
library(RColorBrewer)
library(ggmap)
library(gridExtra)

# Transformation function
trans <- function(raw_data) {
    header <- strsplit(raw_data[1:6], " ") %>%
        unlist()
```

```
    metadata <- as.numeric(header[c(2, 4, 6, 8, 10, 12)])
    names(metadata) <- header[c(1, 3, 5, 7, 9, 11)]
    moisture <- matrix(ncol = metadata["ncols"], nrow = metadata["nrows"])
    for (i in 7:length(raw_data)) {
        moisture[i - 6,] <- strsplit(raw_data[i], " ") %>%
            sapply(as.numeric)
    }
    colnames(moisture) <- seq(metadata["xllcorner"], by = metadata["cellsize"],
                              length.out = metadata["ncols"])
    rownames(moisture) <- rev(seq(metadata["yllcorner"], by = metadata["cellsize"],
                                  length.out = metadata["nrows"]))
    moisture <- moisture %>%
        melt(varnames = c("lat", "lon")) %>%
        subset(value != -999)
    return(moisture)
}

# Visualisation function
visual <- function(moisture, title) {
    map <- get_map("Lauriston Reservoir", zoom = 11)
    ggmap(map) +
        geom_tile(data = moisture, aes(x = lon, y = lat, fill =value), alpha = .5) +
        scale_fill_gradientn(colors = brewer.pal(7, "RdYlBu")) +
        ggtitle(title)
}
```

### Load and visualise the data

This example uses the relative moisture data for the upper and lower levels for 2 August 2017. These files were manually downloaded from the website.

```
# Upper oil Moisture (relative)
upper <- readLines("s0_pct_Relative_2017082.txt", warn = FALSE)
# Lower Soil Moiture (relative)
lower <- readLines("ss_pct_Relative_2017082.txt", warn = FALSE)

p1 <- trans(upper) %>%
    visual("Relative upper soil moisture")
p2 <- trans(lower) %>%
    visual("Relative lower soil moisture")
grid.arrange(p1, p2, ncol = 2)
```

```
ggsave("moisture_map.pdf")
```

## Production

The code presented in this report can be used to visualise any ASCII grid provided by the Bureau of Meteorology.

If these maps need to be created on a regular basis than it is advisable to obtain a subscription from BoM and develop a script to create layers in the GIS or use Reporting Services to visualise the information.

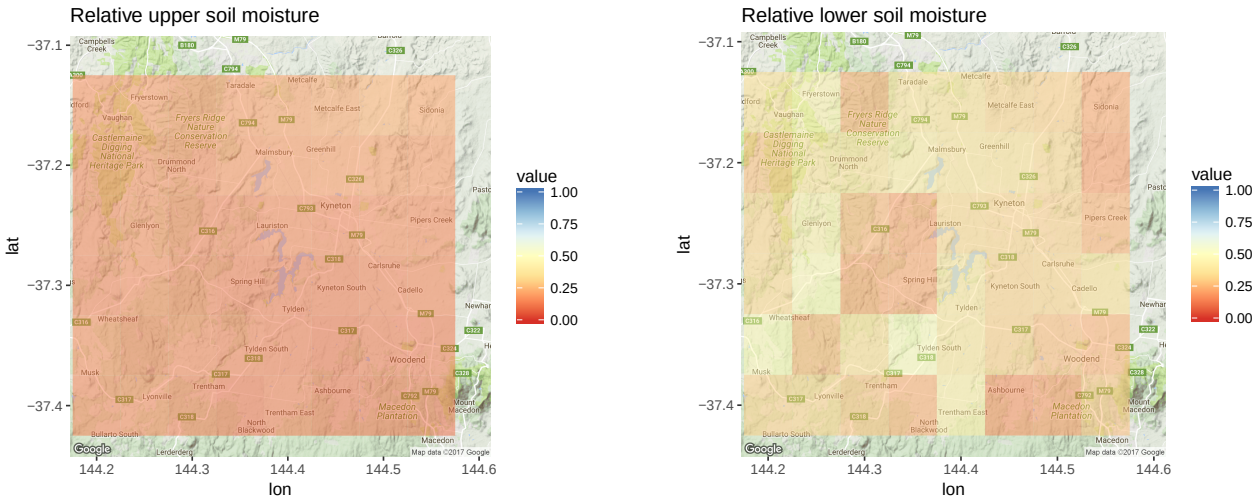


Figure 1: Relative moisture levels at 2 August 2017 (Source: Bureau of Meteorology)