
Aus-Env Documentation

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wenfo.org

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A data exploration website, showing the state of Australia's natural environment.

`aus-env` is a javascript (angular+leaflet) frontend to selected data from the [NCI Thredds server](#), using the WMS protocol and some custom magic.

It's a work in progress!

Contents:

This page describes the dependencies of the project, and how to perform some common tasks. Add to it as required!

1.1 Build & development

Run `grunt` for building and `grunt serve` for preview.

After you have cloned git to your local location, you may need to do some of the following:

1. Install Ruby (for sass stuff).
2. Run `install bower` from the `aus-env` root folder.
3. Run `gem install compass` (reboot suggested)

The `.travis.yml` file contains a complete set of installation commands for Linux, as the tests and build wouldn't run otherwise.

1.2 Testing

Running `grunt test` will run the unit tests with karma.

Travis CI is set up to automatically test commits pushed to GitHub, and can automatically deploy the build if tests pass. Check locally with `grunt test` & `grunt build`

1.3 Documentation

Documentation is built with Sphinx, the Python documentation tool. It takes `.rst` files - text files with some Markdown-like formatting (google 'ReStructured text') - and can convert them to a variety of formats. See the `make-` file, or visit <http://aus-env.rtd.org>

We don't want or need detailed documentation of the code (comments + good structure is enough), but we *do* want to document:

- goals of the project
- the basic design of the website
- the high-level decisions about why we did certain things
- what the data is and where it's from

But this will all remain a work-in-progress, and change as progress is made.

Scoping the Aus-Env website

Australia's Environment in 2015

2.1 Background

In March/April (probably latter) of 2015, Albert and some of his group intend to give a seminar (series) presenting their best assessment of the condition of Australia's Environment in 2015. This would be a good opportunity to focus some web development.

The document outlining a ToC for the seminar can be found elsewhere in this folder. Essentially, it will seek to summarise the main changes in the environment in terms of:

1. land use / land cover change
2. bushfire
3. weather and water
4. rivers and wetlands
5. agricultural land
6. natural ecosystems
7. the carbon balance

For each of this themes, one or a few national-scale headline indicators will be calculated to express the main environmental changes in 2015. Examples could be, e.g., (a) the amount of natural forest lost or gained; (b) the number of wetlands receiving above average water; etc. Specific indicators will be determined at a later stage based on the type and quality of data available and the meaningfulness and robustness of the interpretation. Some relevant examples could be Australia's [Sustainability Indicators](#) or the [trial environmental accounts](#) by the Wentworth Group.

Underpinning these indicators will be spatio-temporal data summarised in tabulated environmental accounts, in which the spatial and temporal data are aggregated to suitable

- temporal scales (probably mainly annual)

- spatial units - probably by statistical area, bioregion, catchment and environmental asset (e.g. national park, Ramsar site)
- spatial subunits (e.g. land cover/use categories)

2.2 Web delivery

We envisage a data exploration web site, where people having heard the seminar or its summary can go and explore the interpreted data for themselves. For example, they:

- may be particularly interested in a particular region or location, and want to see some mapping or tabulated numbers for it
- may wish to take their time and explore national mapping of particular variables (e.g. land cover change, flooding, etc)
- Investigate how certain headline indicators were calculated, i.e., on the basis of what data or by what method.
- May wish to download a data layer or table for further analysis or comparison.

2.3 Possible site structure

A promising web site structure could be to have a landing page with a set of headline indicators that summarise 2015 at a glance. This could involve up/down arrows with simple stats next to them, for example, or other infographics-type visualisations. There could be a clickable national map that allows headline indicators to be shown by region.

At this level, one might:

1. click one of the headline indicators shown, which would take you to a theme page (e.g., natural ecosystems, or fire) where you can browse through a small number of national maps of different variables.
2. click on one of the regions (SLAs, catchments, bioregions, assets etc.) or search for it in a list, and be shown the headline indicators for that region. This could then allow you to click through to get the detail on those headline indicators for that region (i.e. a similar map as (a) but zooming in on that region).

2.4 Components required

These are likely to include:

1. Grid mapping (WMS, DAP)
2. Displaying headline indicators (with some type of simple visualisation)
3. Presenting tabular data
 1. as maps
 2. as tables
1. graphing (in a panel or as popups) showing
 1. time series
 2. bar chart
 3. pie chart

2.5 Data sources

Likely to include the following:

- OzWALD model-data system input and output files (0.05 degree daily).
- Tree cover (change) mapping (1/4000 degree, one map for 2015)
- Inundation mapping (0.005 degree, 8-daily maps)

In each of these cases, we can produce 2015 summary maps (mean, min, max, anomaly, etc) as required.

Headlines for Seminar

Below a possible structure for a seminar. The idea is that it brings together what we can find out about the trajectory of Australia's environment in 2015, focusing on a few categories. Good timing for it would be March or April, to hopefully give ourselves enough time to put it all together yet not be too far into 2016 yet. It could be about an hour, and we could do it at several places (e.g., Fenner, ABS, Dept. Environment, GA, Bureau of Meteorology, etc). In general I (Albert) propose to use the MODIS era (2000-2015) as reference period as several of our data sets are based on that.

Under each Theme there will be a few 'headline indicators' that summarise the data in insightful terms. In general these will be expressed relative to the full period available, which usually will be 2000-2015 for OzWALD or MODIS derived data, and longer for Landsat tree cover (LTC) mapping derived data. The expression of the value for 2015 could be

- Percent above/below the average year
- The rank of 2015 among years
- Units (e.g., hectares) above/below the average year.

Which of these is the more insightful may vary - perhaps in some cases all 3 can be shown.

3.1 Continental view

Guiding question: How did 2015 rank continentally in terms of landscape health, environmental condition and carbon balance?

Headline indicators:

1. Area of forest loss - LTC
2. Area of forest gain - LTC
3. Area burnt - MODIS
4. Continental Carbon Uptake (GPP) - OzWALD
5. Total leaf area (as a measure of biomass) - OzWALD

6. Area in drought (say, the area with the worst drought since 2000) - OzWALD
7. Total river flows (in GL) - OzWALD

3.2 Land use and land cover change

Guiding question: How have we changed Australia's environment in 2015?

Headline indicators

- Area of mature (>40 y) forest lost - TCM
- Area of plantation forest cleared/gained - TCM
- Greatest land cover/use category changes - DLCVv2? Is that even available for 2015? Probably not. Perhaps we can do something ourselves there?

Questions/topics to explore:

- Summarise by region and identify main drivers.
- Urban sprawl - maybe look at forest cover change within buffer of urban centres
- Plantation forestry
- Some information on Direct Action tender - how many ha trees and where?

3.3 Protected natural ecosystems

Guiding question: How did native ecosystems respond to natural and human impacts in 2015?

Headline indicators:

- Area of protected forest lost/gained (TCM)
- Area of protected areas burnt (TCM)
- Number of protected areas with above average GPP (OzWALD)

Topics to explore:

- major events (e.g., Kakadu fire, old-growth logging, Qld clearing) and show some Landsat images

3.4 Rivers and Wetlands

Guiding question: What flood or drought events occurred that impacted our environment in 2015?

Headline indicators

- River flows - length of river with above average flows (OzWALD)
- Wetland flooding - number of Ramsar wetlands with above average maximum water extent (Landsat)
- Area of floodplain forest lost/gained
- Maximum Lower Murray flows
- Lake Eyre extent

Topics to be explored:

- Max and min flow situation in nation's rivers (from routed OzWALD flows).
- Major flood events. Show some Landsat imagery.
- Storage and flow situation in Murray and Darling rivers (from MDBA)
- show Landsat before and after for MDB wetlands that were watered

3.5 Managed forests

Guiding question: How did forestry fare in 2015 and how sustainable is it?

Headline indicators

- Natural forest loss/gain (LTC)
- Plantation forest loss/gain (LTC)
- Mean plantation forest age? (from LTC)
- Managed forest growth (OzWALD GPP)

3.6 Agricultural land

Guiding question: How did agricultural production fare in 2015 and how sustainable is it?

Headline indicators

- Total pasture growth (OzWALD GPP)
- Total crop growth (OzWALD GPP)
- Pasture health : mean percentage bare soil (from Fractional Cover Data)

Topics to explore:

- Show agricultural production numbers from ABS
- show irrigated areas from Landsat
- land degradation: show 2015 bare soil fraction anomaly for grazing lands from MODIS fractional cover

3.7 Remaining data analysis steps to get there

1. Unmix MODIS up to 2015 (David)
2. Run OzWALD up to 2015 (Albert)
3. Analyse MODIS hotspots and burnt area (Marta)
4. Create (anomaly) maps from MODIS and OzWALD data
5. Intersect MODIS and OzWALD data with land use data to get irrigation, cropping, grazing etc totals (David)
6. Intersect MODIS and OzWALD data with environmental assets GIS (Parks, Ramsar) (David)
7. Extracting selected example images from Landsat (Albert)

Summary of THREDDS data for AusEnv Project

All data can be found in the /au/ subdirectory of our THREDDS drive. In principle they should be largely self described, but a bit of summary below.

You can find the following data collections:

4.1 /au/treecover

Landsat scale (25m) mapping of forest extent for each year as well as a file showing the change in forest area between 2013-2015. These are large files, opening them in their entirety is not recommended and will freeze e.g. Panoply.

Functionality required: to select a year and data type (i.e. forest cover or change) and look continentally or zooming in to any area.

4.2 /au/owl/

Inundated area mapping for 8-day periods based on MODIS 500m, collected in annual files. The date provided is the start date of the 8-day period.

/au/OzWALD/owl/ is the same data, upsampled to 0.05 degree resolution.

Functionality required: to select a date and look continentally or zooming in to any area. I also added annual summary data for annual maximum, mean and minimum extent. These also need to be mapped.

4.3 /au/Ramsar/

This has numbered files, each of which represents a so-called “Ramsar” (i.e. ecologically important) wetland or part thereof. The file has maximum water extent for a series of years derived from Landsat mapping, as well as layers showing the Last year pixels were inundated and dry, resp.

Functionality required: to first select a Ramsar wetland from a map with symbols, which will automatically zoom in on the geographic data extent. Select a data type (i.e. max water extent for a particular year or the last year since..).

4.4 /au/OzWALD/daily/

This has annual files each with a different variable at daily time step and 0.05 degree resolution.

Functionality required: select data and variable and get it visualised. (similar to www.bom.gov.au/water/landscape/) Among these, the data `AWRA.daily.GPP.*` have the highest priority.

Note: I will also be generating a file with monthly and annual average values and annual average anomalies from mean. Similar functionality will be required.
