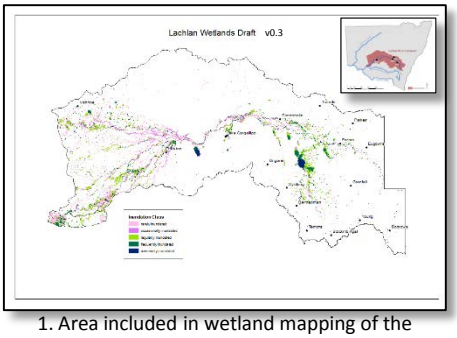
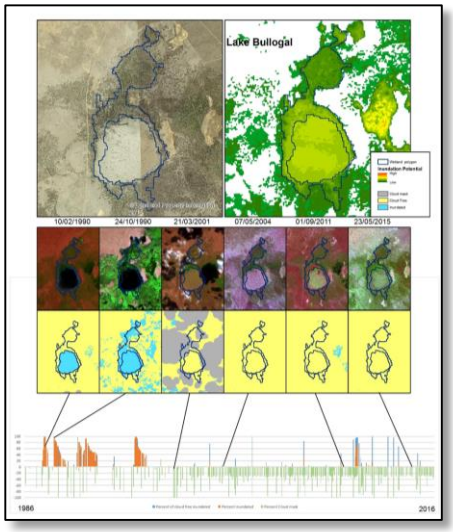
NSW Office of Environment and Heritage (OEH)

Building a NSW Wetland Inventory

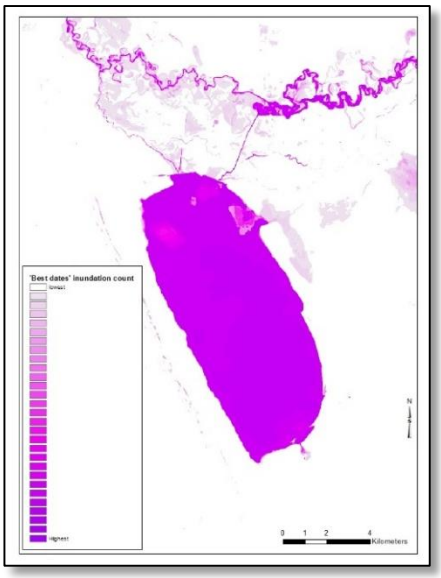
July 2017



1. Area included in wetland mapping of the Lachlan River Catchment



2. Percent inundated data for Lake Bullogal.

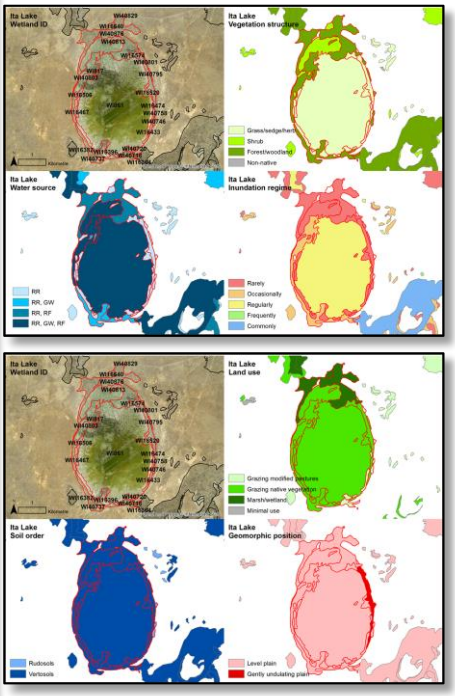


3. Counts of inundated pixels over time at Lake Brewster.

2015-17 Lachlan River Catchment wetlands: KEY OUTCOMES

- Overall, the project developed the TOOLS for mapping and classification of wetlands in a semi-arid inland catchment (see overleaf).
- Methods were developed for **rapidly mapping arid and semi-arid areas** that can be extended across the state.
- A comprehensive **map of Lachlan** wetlands was produced (Fig. 1).
- Wetland boundaries were identified using remote sensing water-indexing techniques to rapidly generate **inundation histories** (a key-driver for wetlands) over large areas for each Landsat capture (Fig. 2 and 3).
- A **preliminary typology (wetland type classes)** for Lachlan River Catchment wetlands, that is consistent with the Australian National Aquatic Ecosystem framework and the NSW Vegetation Classification, was attributed on the basis of wetland identification number, soil, water source, geomorphic position, vegetation structure, inundation regime, and land use (Fig. 4 and 5).
- **Recommendations** for building and extending mapping and classification of wetlands across NSW were made.
- An effective **governance** framework increased key **stakeholder understanding**, and commenced the development of the **project 'logic'** or 'roadmap'.

Building a reliable source of information to support better managed wetlands in NSW



4. An example the final product for Lake Ita highlighting the following attributes: soil, water source, geomorphic position, vegetation structure, inundation regime, and land use .

5. Profiles including ANAE attributes and NSW Plant Community Types were developed for Lachlan wetlands

TOOLKIT developed for building a wetland inventory

Through the two-year pilot project in the Lachlan River catchment and along the NSW coast (Lake Macquarie and Central Coast), TOOLS to BUILD an inventory of wetlands were developed. The toolkit includes frameworks, method guidelines for mapping and classification of wetlands, a wetland map for the Lachlan and Central Coast/Lake Macquarie (preliminary), and a wetland plant indicator database (preliminary).

1. **Frameworks**
   - Wetland Mapping and Classification
   - Communication
   - Project Logic
   - Governance
   - Web Delivery
2. **Methods and result reports**. This included:
   - Principles for wetland mapping and classification in NSW
   - Methods and results using semi-automated methods for semi-arid wetlands
   - Preliminary methods and results for mapping coastal wetlands
   - Methods and results reports for developing a typology of wetlands in the Lachlan River catchment.
3. **Maps, data and information**
   (see Lachlan examples overleaf)
4. **Wetland Plant Indicator List** - Wetland plant indicator codes were allocated into 5 classes by 15 experts for over 400 potential wetland species ~~of~~ occurring in the Lachlan River catchment (1-wetland to 5-non wetland species). This will be developed further for all NSW wetland plants in 2017-18.

June 2016 workshop survey highlights

- 70 people attended the workshop. 45% external to OEH.
- 66% of attendees completed the pre-workshop survey; 37% of attendees completed the post-workshop survey.
- From the post-workshop survey:
  - Over 80% '*Learnt something new*" or had a "*Better understanding*' of the project after the workshop.
  - 94% understood "*How you or your agency can benefit from the products of the project*".
  - Over 90% understood "*How their agency's data has been/can be integrated and considered in the project*" and "*How their agency can contribute to ensure that the project will address their needs*".
  - 76% identified that "*In general, they were satisfied with the project development and direction, and potential for the project to add value to their agency's priorities*".

Application: Case studies

Examples of case study applications are provided in the next pages:

- For Ramsar updates to the Ramsar Information Sheets (RIS)
- To better inform ecosystem health using inundation fingerprints in Millewa Forest
- Mock-up of visual presentation of wetland boundaries to better inform coastal wetland mapping

Where to next?

This project has developed and tested the tools to BUILD a wetland inventory for inland NSW. Testing and development of a methodology for coastal wetlands in the Central Coast and Lake Macquarie local government areas is still in its preliminary stage, but has highlighted both complexities and opportunities for coastal regional wetland mapping. When funding is available, the project will be further progressed to build on the tools developed from 2015-17.

The potential uses for a NSW Wetland Inventory are extensive. Examples range from identification of environmental assets, through monitoring and evaluation of wetlands over time, to comparing similar wetland types for priority protection through Ramsar. State-wide management of wetlands will benefit from consistent and comprehensive mapping of wetland locations, extents and types across the state.

How can you find out more?

Do you want more details on the products of the project, or copies of the reports? Then please don't hesitate to contact us for more details.

Do you want these tested methods applied to your region? Contact us, so we can discuss how we can meet your requirements.

Contact

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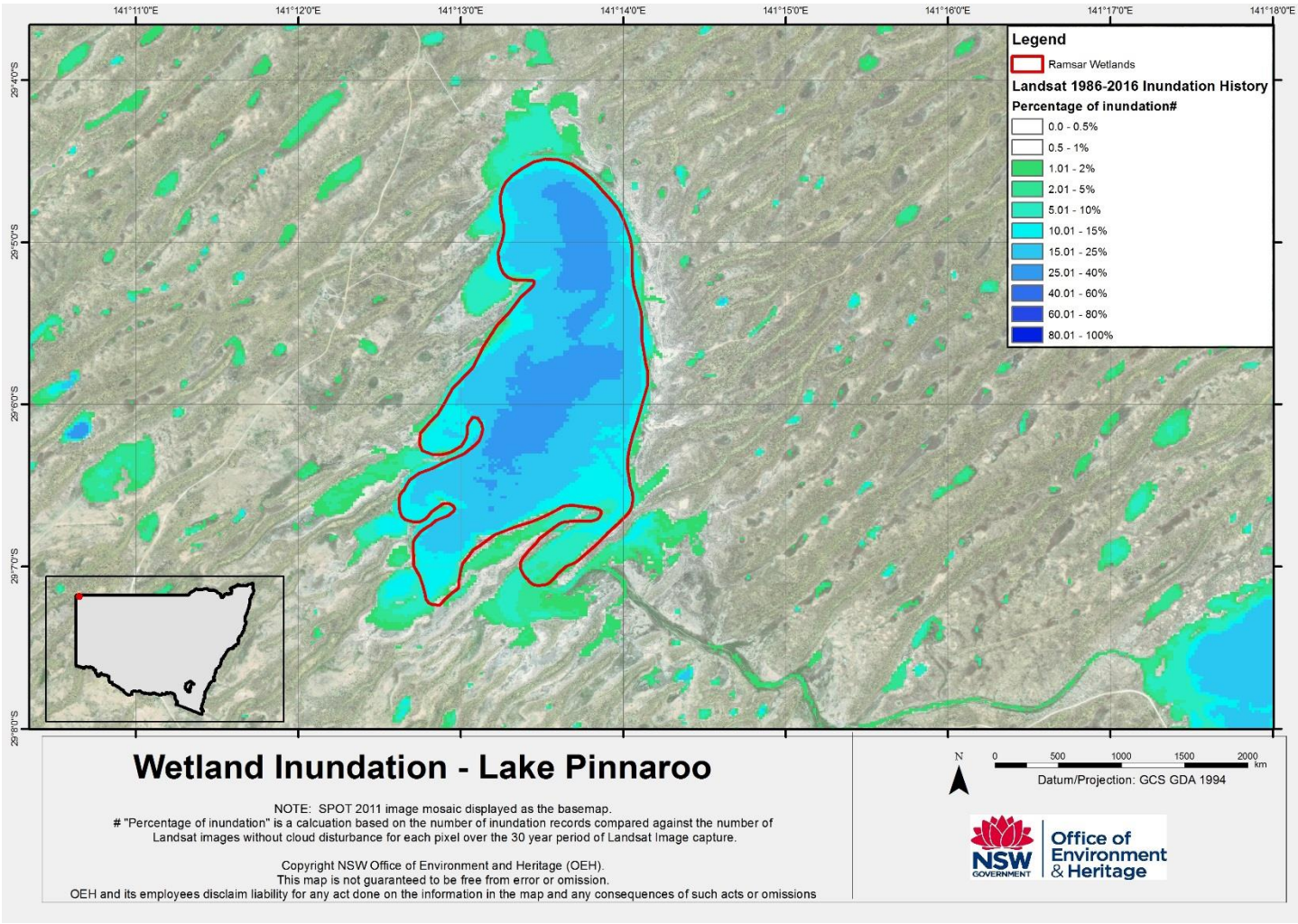
Surface water area analysis (inundation history) for the Ramsar Information Sheet (RIS) for Lake Pinaroo.



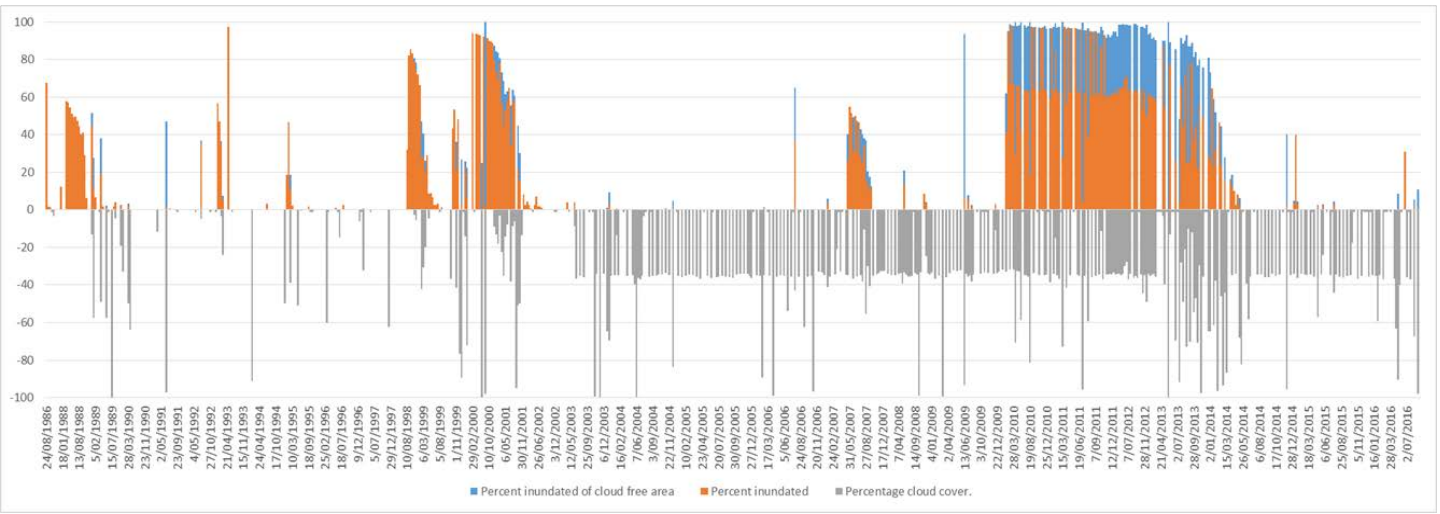
This map shows the location and Ramsar boundary for Lake Pinaroo NSW, as well as inundation count information from the archive of Landsat images. Percentage of inundation as shown in the map is calculated as:

> *Percentage of inundation = (number of inundated observations/the total number of cloud unaffected oberservations) * 100.*

The observation period is 1986 to 2016. The blue colours indicate where higher counts of inundation have been recorded. Green areas indicate lower counts of inundation over the period of analysis.

The pattern suggests Lake Pinaroo has a core wetter area, and that inundation expands and contracts around this core area.

Percentage of area of Lake Pinaroo inundated 1986 to 2016



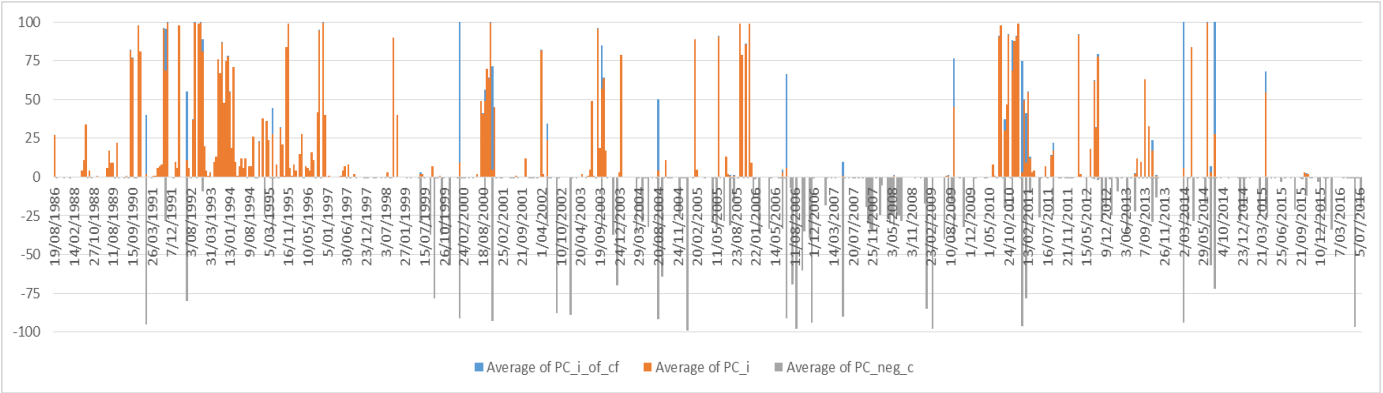
This graph shows inundation trends from the history of Landsat observations. The percentage of the area of Lake Pinaroo (Ramsar boundary) identified as inundated in each Landsat observation is shown in orange. The presence of cloud and other errors associated with some Landsat sensors means we cannot determine if affected pixels are inundated or not. A masking technique is used to identify cloud and error affected pixels and this is recorded as a 'no data' value for that pixel at that time. This means that percentage of inundated area may be an underestimate of the true inundated extent as we can't 'see' the whole wetland. For this reason we have also provided the percentage of inundated area from the error free area of the wetland. That is, the blue bars in the graph show the percent area that is inundated from the 'valid' area that is not cloud affected and not affected by other errors.

The grey bars below the line show the 'percentage cloud cover'. This is the area of Lake Pinaroo that was cloud affected or otherwise identified as poor quality data at the time of the Landsat observation. The estimates of inundated area (shown above the line) are more likely to be correct when there is no grey bar below the line. Longer grey lines indicate a less reliable assessment of inundated area.

An additional limitation is that dense vegetation can obscure inundation and result in underestimates of the true area of inundation. We have not investigated or corrected for this factor in this analysis. Also note that distance on the x-axis in a non-linear representation of time. Some years have more observations than other years and the distance along the axis represents only the number of Landsat images, not the time between images.

Overall the graph suggests Lake Pinaroo has transitioned through wetter and drier phases between 1986 and 2016. Longer wetter phases occurred in 1998, 1998-99, 1999-2001, 2007, and 2010-14. There may have been several additional inundation events through the drier phases as shown by the spikes in inundation values such as between October 1992 and April 1993. Lake Pinaroo appears to have been in a drier phase since 2014, although inundation events may have occurred at late 2014 - early 2015, and again at March to July 2016.

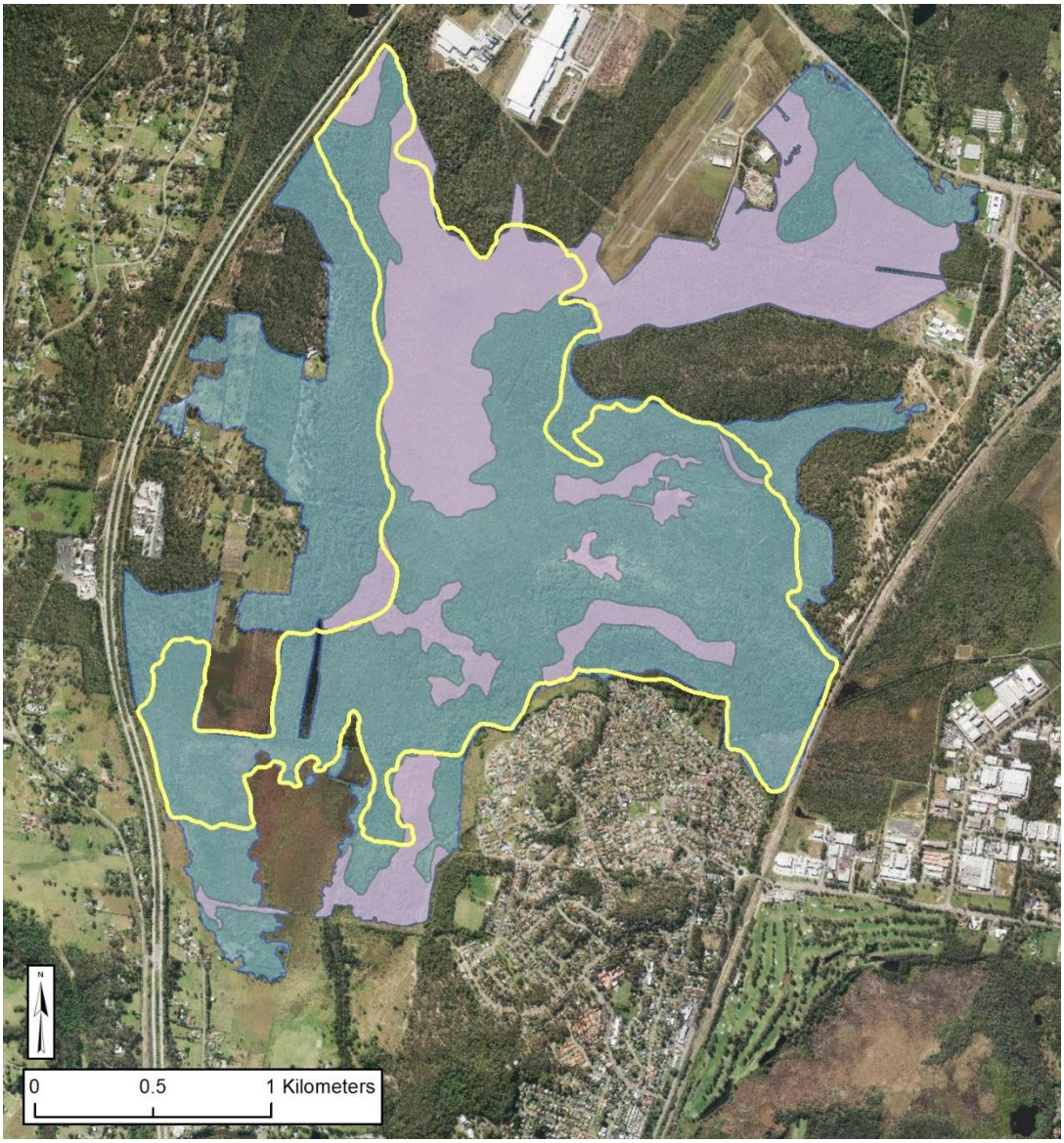
Inundation fingerprints of plot data to better inform results for river red gum tree health - Millewa Forest Ecothinning project



For more information on research into Ecothinning trials
http://www.environment.nsw.gov.au/newparks/riverredgums/rrgresearch.htm

What would a wetland inventory look like?
Mock-up of potential datasets and formats for a coastal wetland.

Name: Porter's Creek		
Inventory ID: WIXXXXXX	River Catchment: Wyong	IBRA Region: Sydney Basin



Coastal Wetlands SEPP Mapping Improvement Program draft boundary

Wetland Area Consistent with NSW Biodiversity information sytems and SEPP 14 inclusion criteria*

Wetland area consistent with NSW Wetland Policy definition and OEH biodiversity information systems

*wet heath and eucalypt dominated vegetation communites are excluded

ANAE wetland type: Palustrine Temperate Coastal

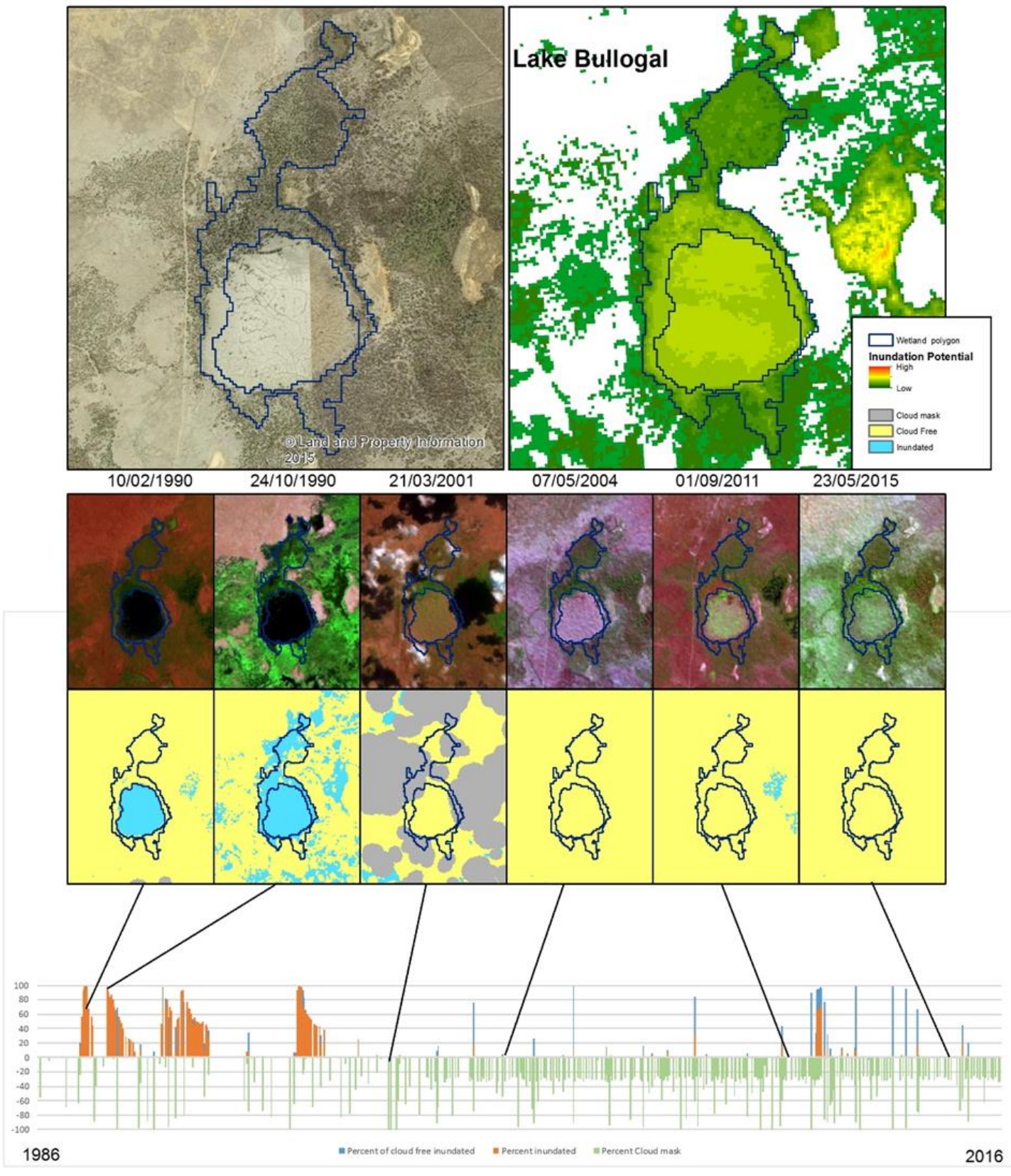
Dominant water source: river/rainfall

Water regime class: mostly inundated

Hydrological Modifiers: roads, urban

Vegetation Communities: (Sourced from Central Coast Council)

Vegetation Map Unit Name	EEC equivalence	NSW PCT ID



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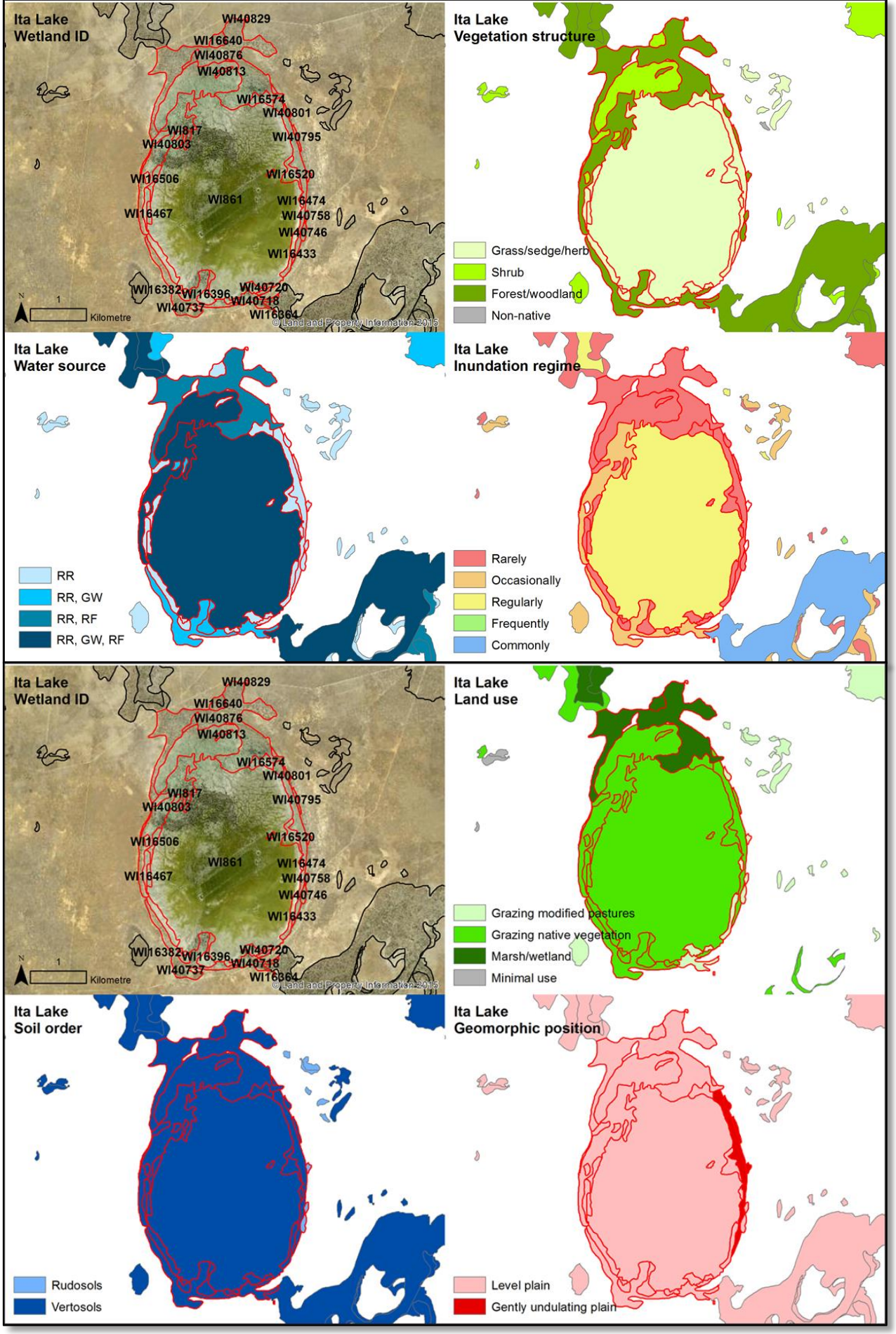

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