



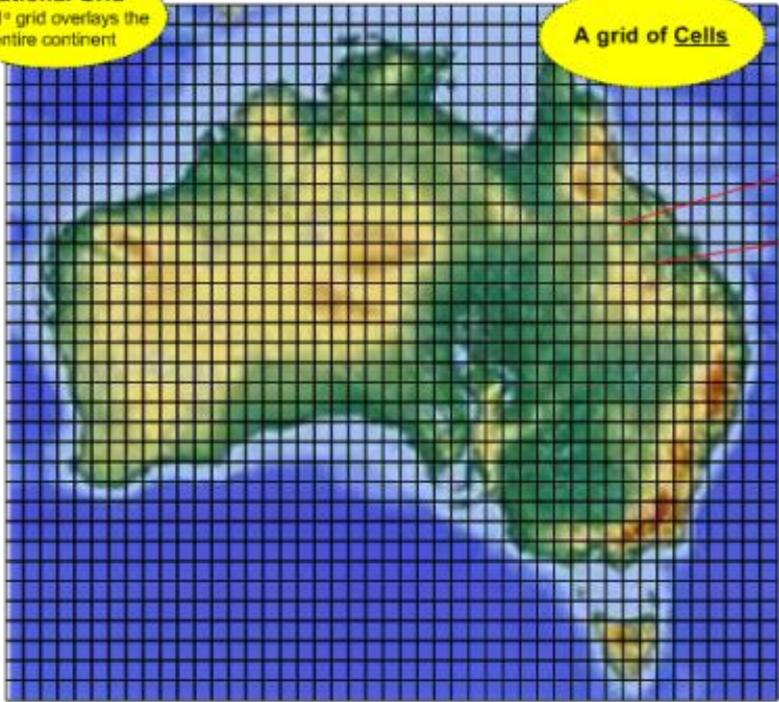
Australian Government
Geoscience Australia



Mapping continental scale multi-decadal dynamics of inland water quantity and quality using multiple Landsat sensors

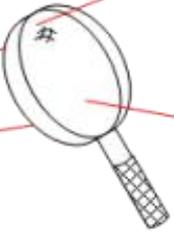
Leo Lymburner, Norman Mueller, Steven Ring, Elizabeth Botha, Erin Hestir, Arnold Dekker

National Grid
1° x 1° grid overlays the entire continent

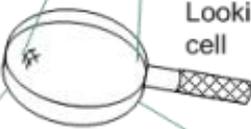


A grid of Cells

Grid of 1° x 1° cells

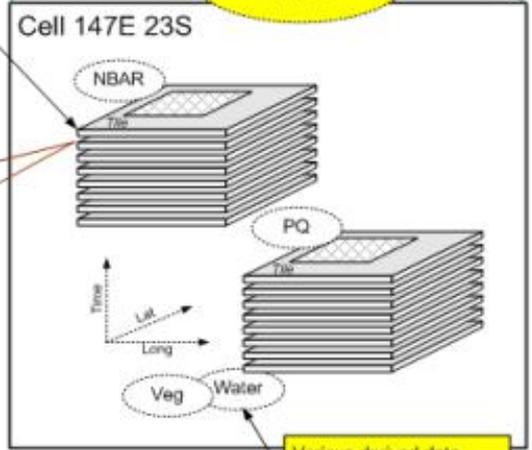


Cell 145E 21S	Cell 146E 21S	Cell 147E 21S
Cell 145E 22S	Cell 146E 22S	Cell 147E 22S
Cell 145E 23S	Cell 146E 23S	Cell 147E 23S



Looking at a single cell

A Cell contains Tiles



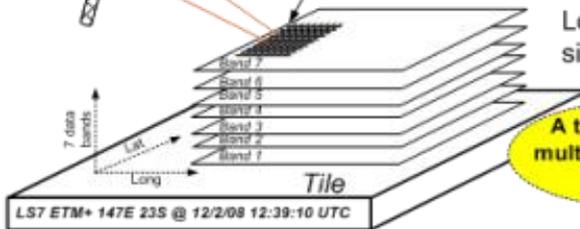
Each Tile comprises data collected from a single satellite pass. Tiles are stacked in time order

A tile may contain one or more data bands. Each data band is 4000 x 4000 pixels (a grid within a grid)



Looking at a single Tile

A tile contains multiple bands of data



Each pixel represents a 30m x 30m area on the Earth's surface

Looking at a single band



NBAR, Band 7 data values

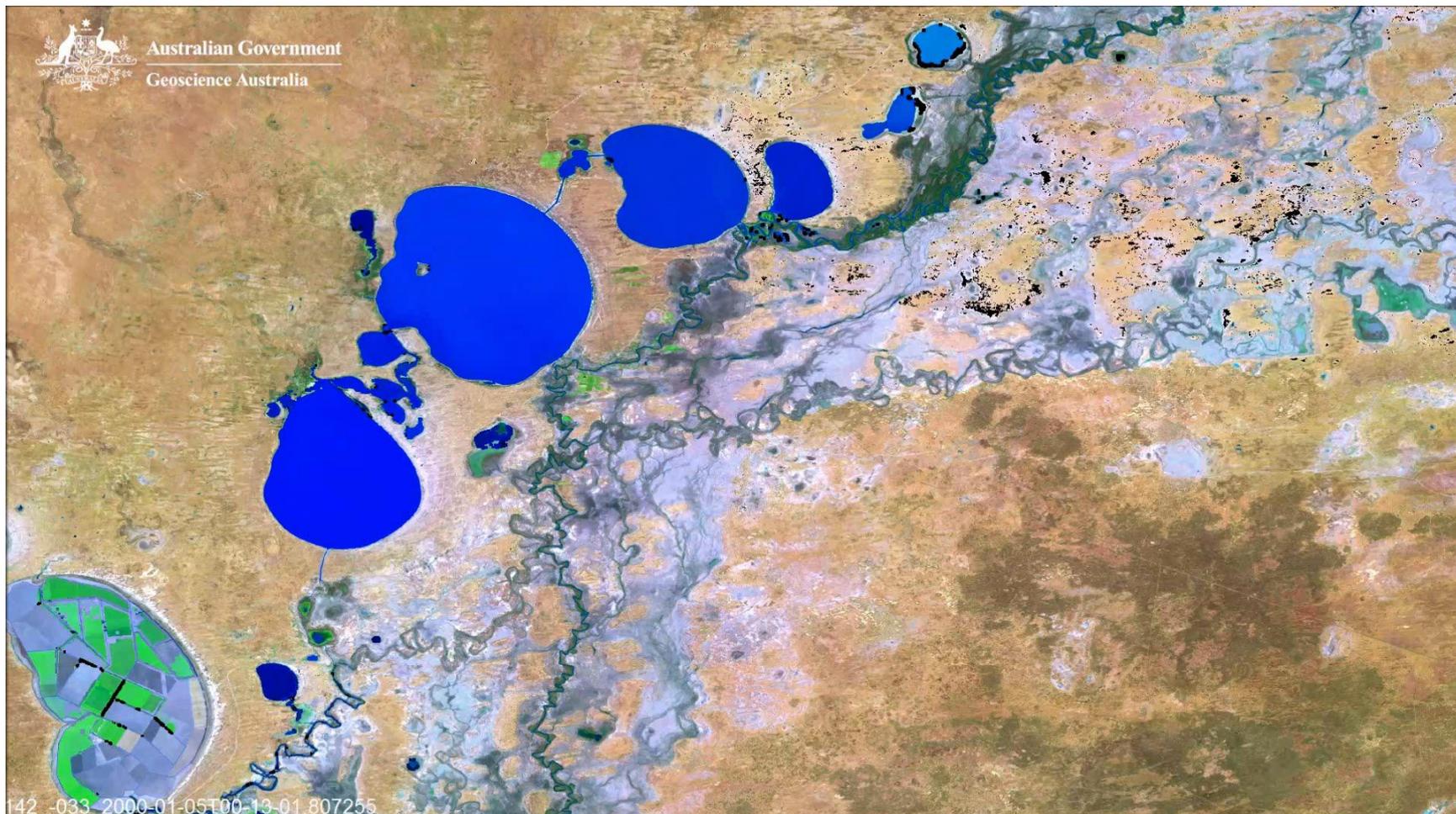
1.275	1.274	1.654
1.267	1.452	1.675
2.001	2.014	2.119

Various derived data "products" may be "cubed" (stored in the cube)





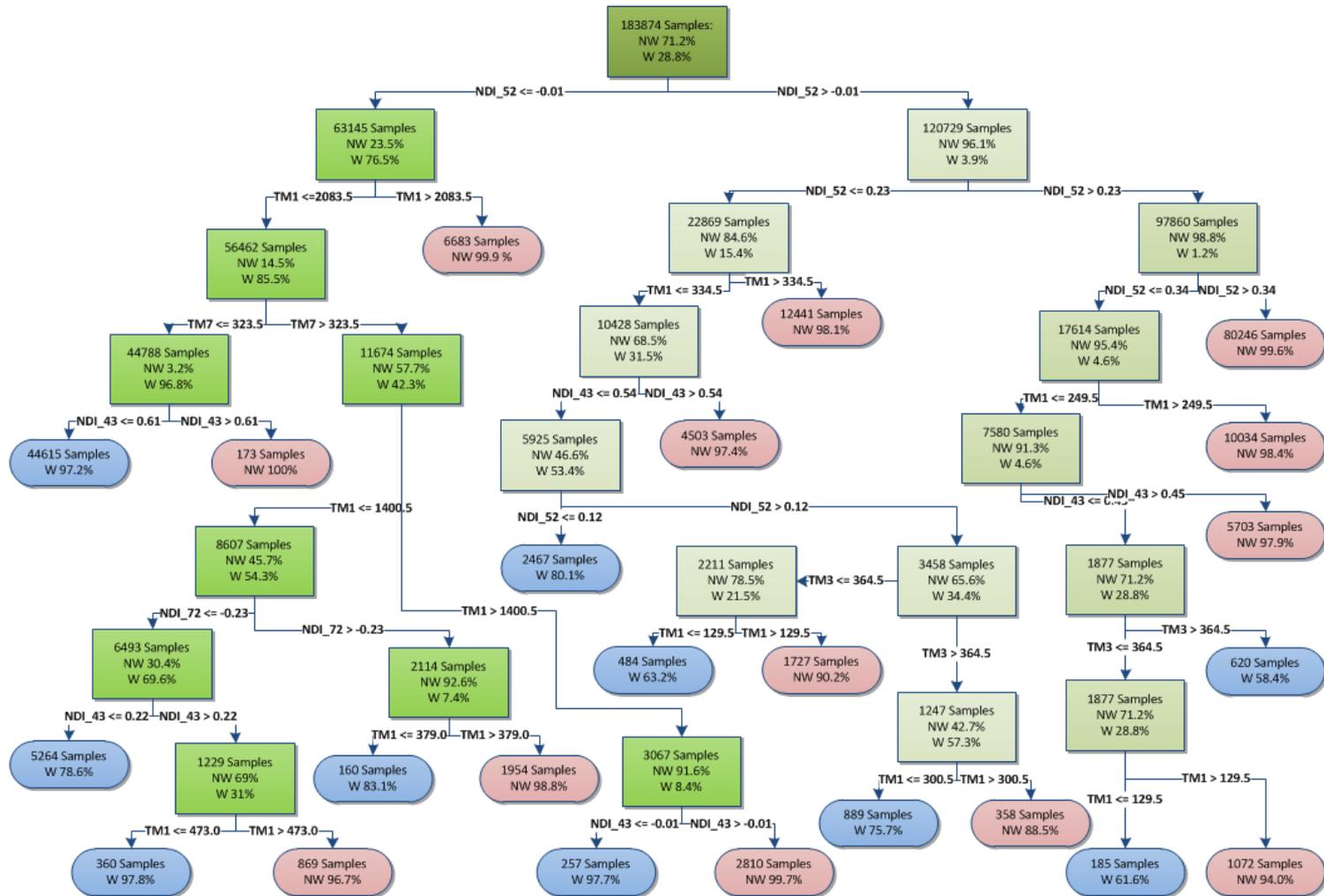
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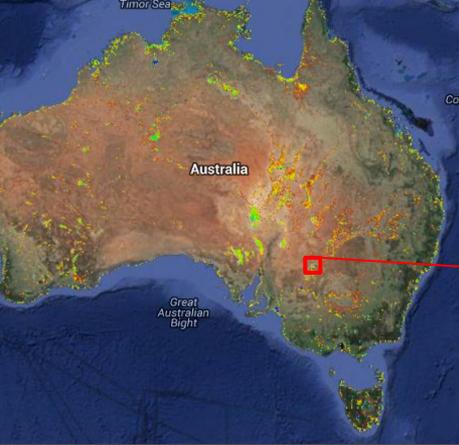


142_033_2000-01-05T00-13-01.807255



Decision tree to classify water/not water applied to every pixel within a 27 year continental archive





Summary of observed inundation 'Water Observations from Space'

Legend



Water not detected.



Water detected in 1% of observations
(includes flooding and misclassified shadows).

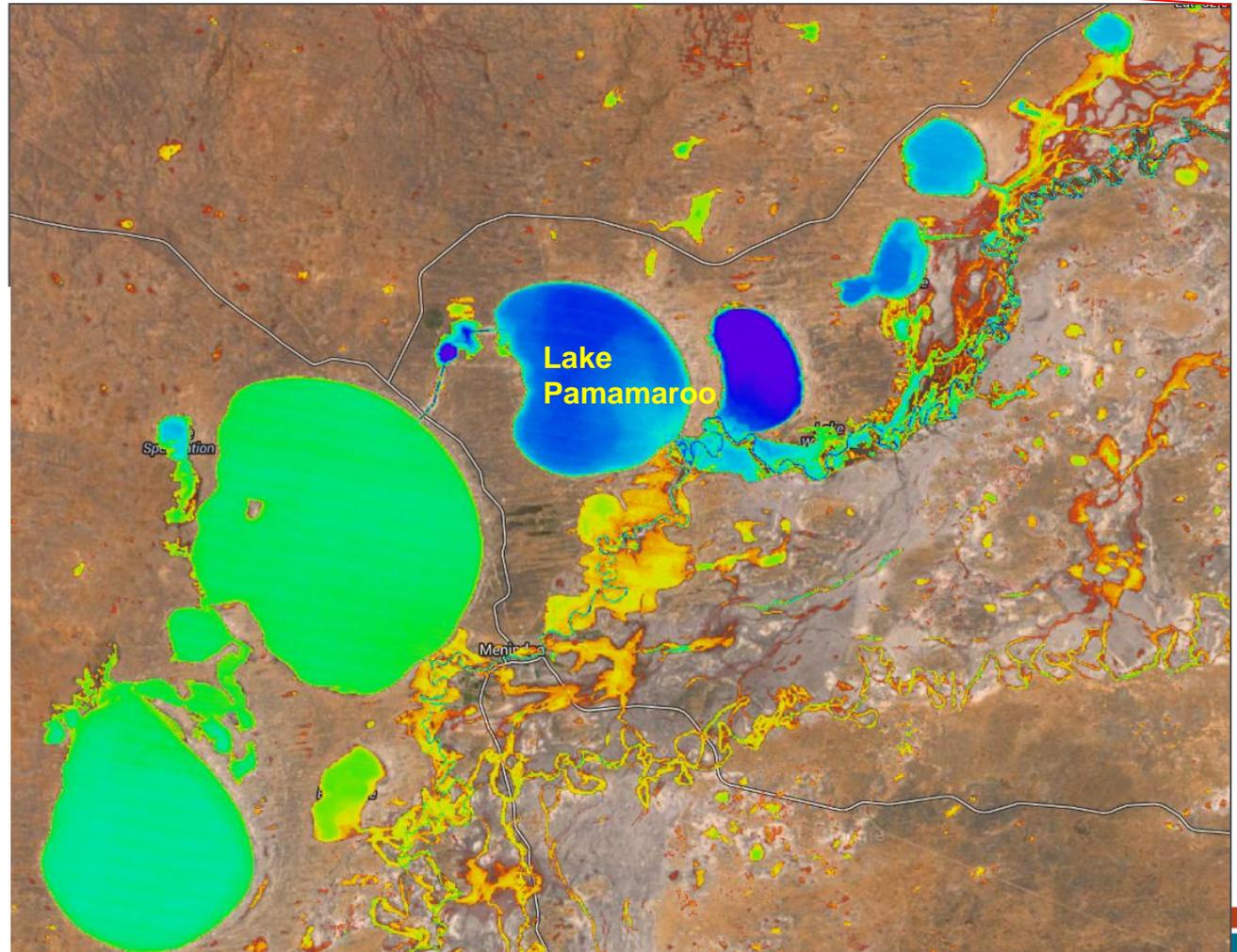
Water detected in 5% of observations
(includes intermittent water bodies).

Water detected in 20% of observations
(includes water bodies that often dry out).

Water detected in 50% of observations.

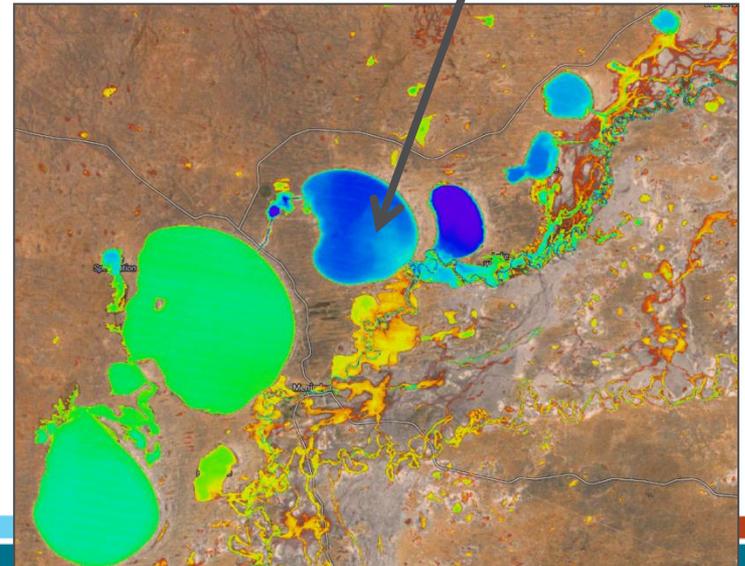
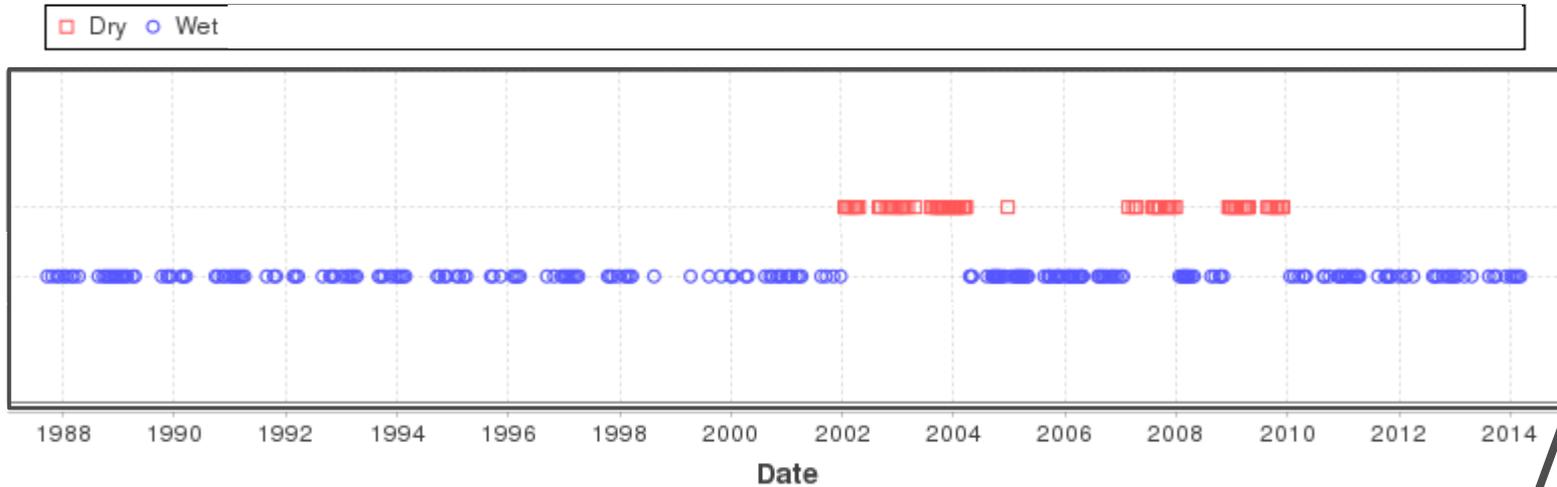
Water detected in 80% of observations
(permanent water bodies).

Water detected always.



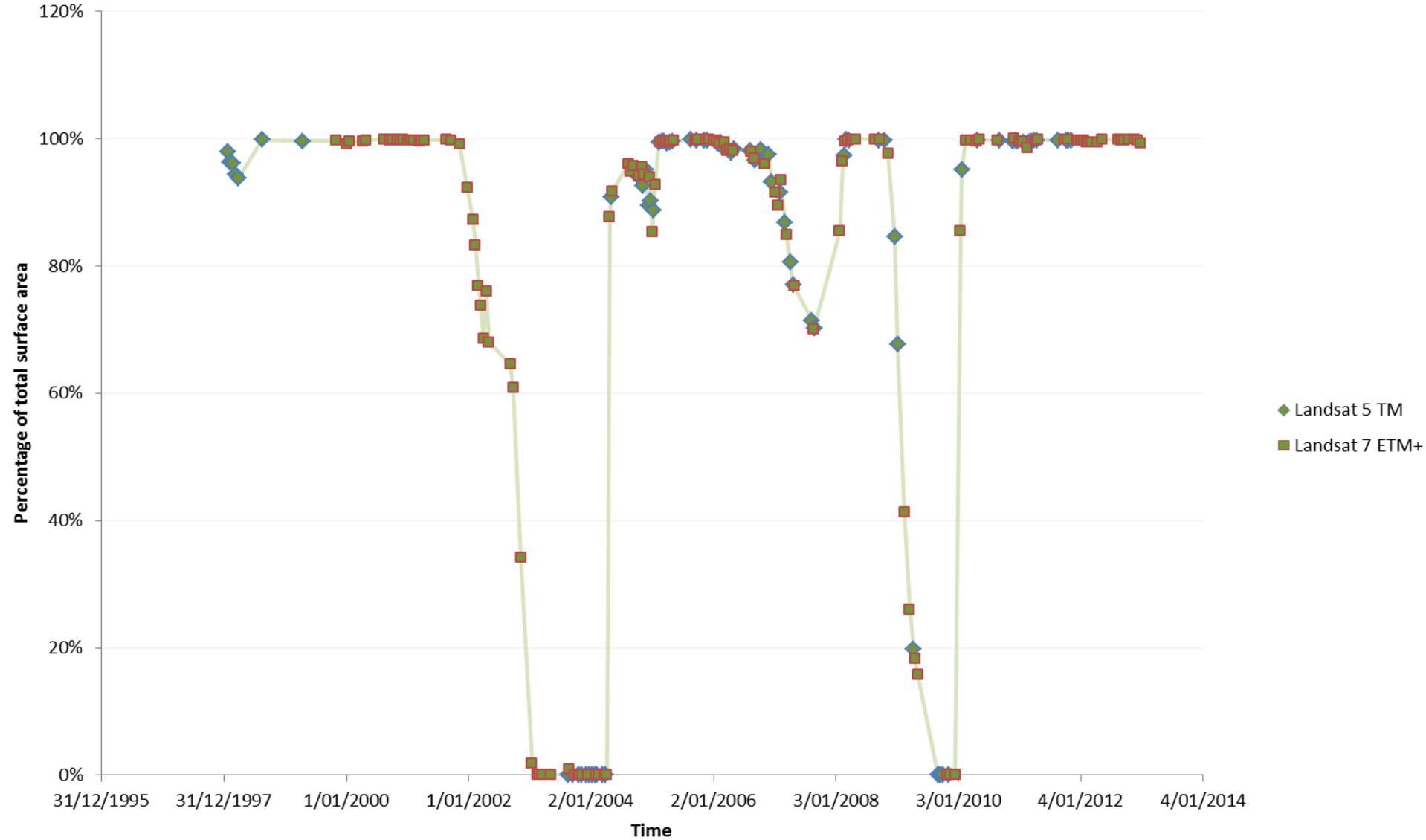
Temporal patterns of wetting and drying

WOfS Pixel Drill for (142.48863,-32.28854)



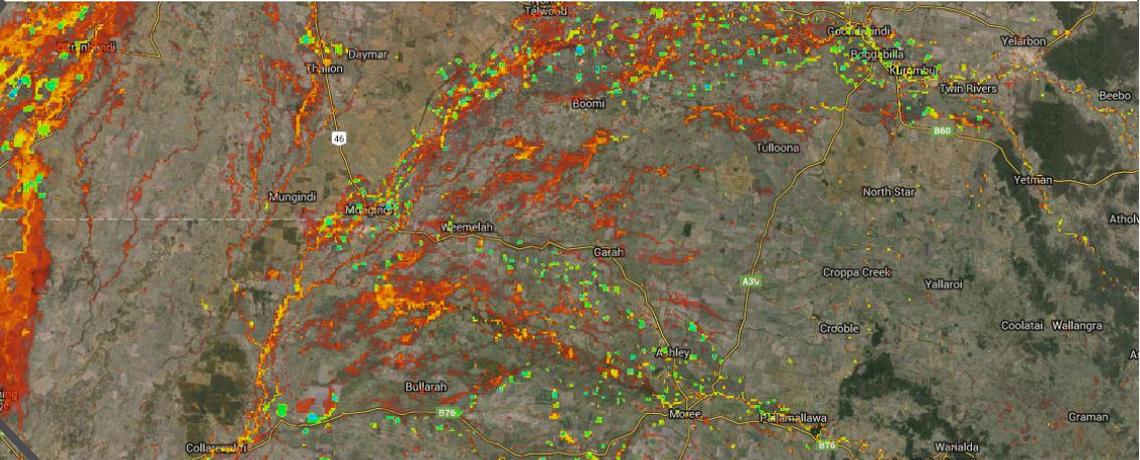
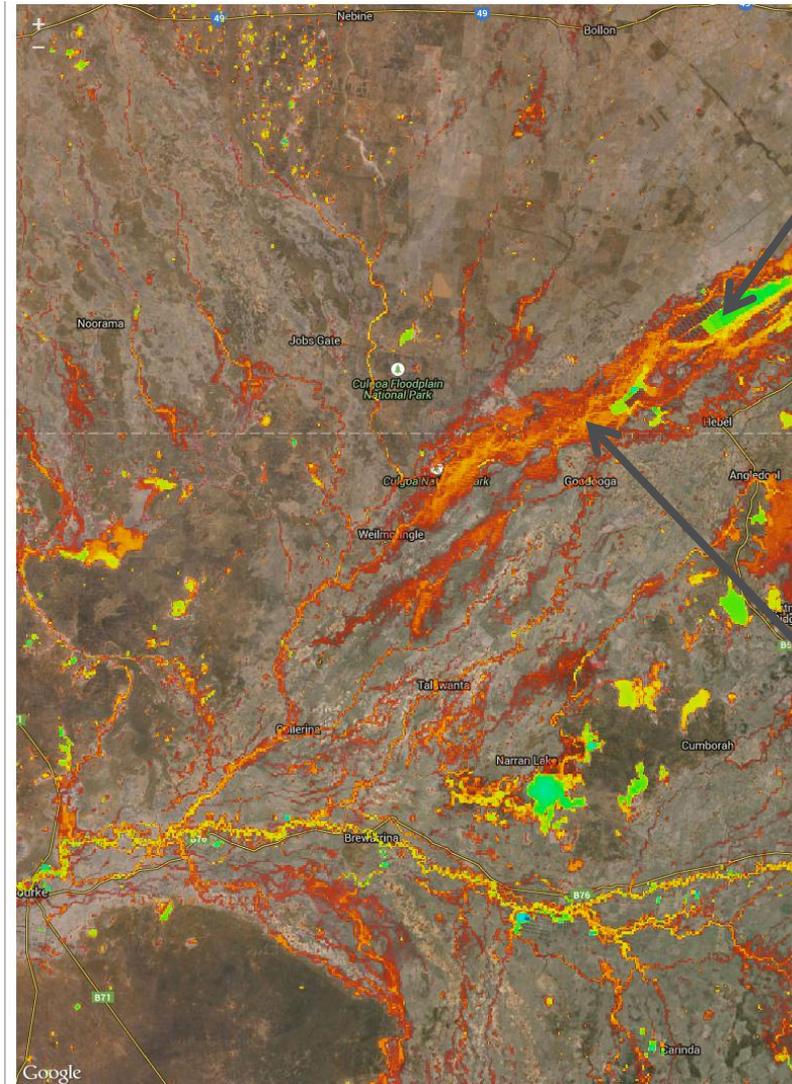
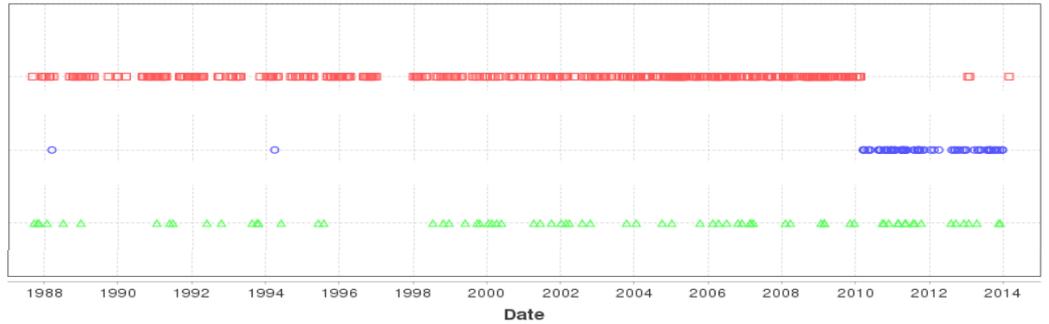
Summarising inundation characteristics for a water body

Surface water extent in Lake Pamamaroo



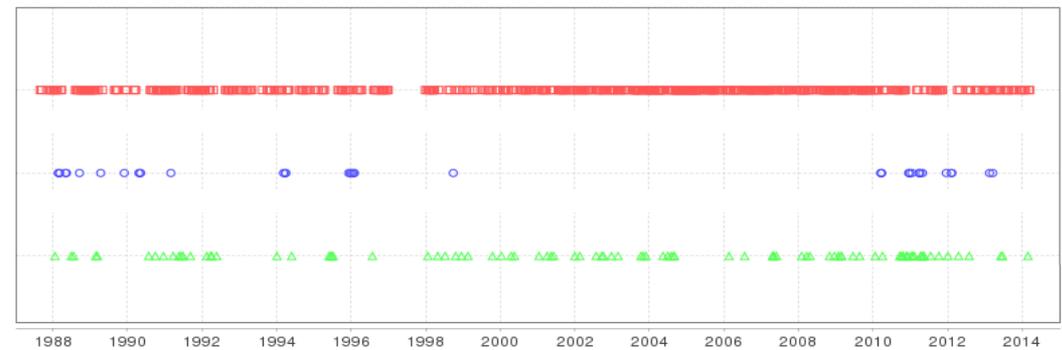
WOFS Pixel Drill for (147.76997,-28.74714)

■ Dry
 ● Wet
 ▲ Cloud
 ◆ Cloud Shadow
 ■ High Slope
 ▼ Terrain Shadow
 ○ Sea Water
 ▶ Saturation/Contiguity
 ■ No Data



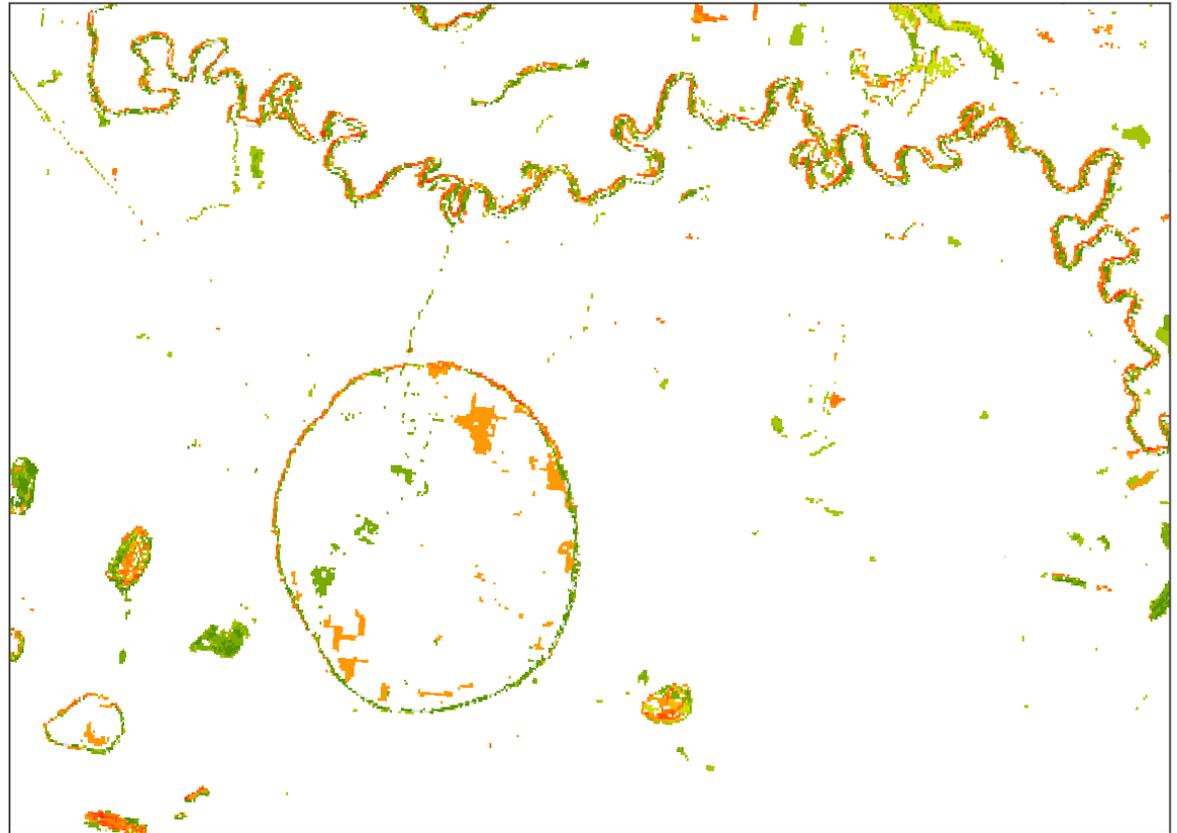
WOFS Pixel Drill for (147.4493,-28.95433)

■ Dry
 ● Wet
 ▲ Cloud
 ◆ Cloud Shadow
 ■ High Slope
 ▼ Terrain Shadow
 ○ Sea Water
 ▶ Saturation/Contiguity
 ■ No Data



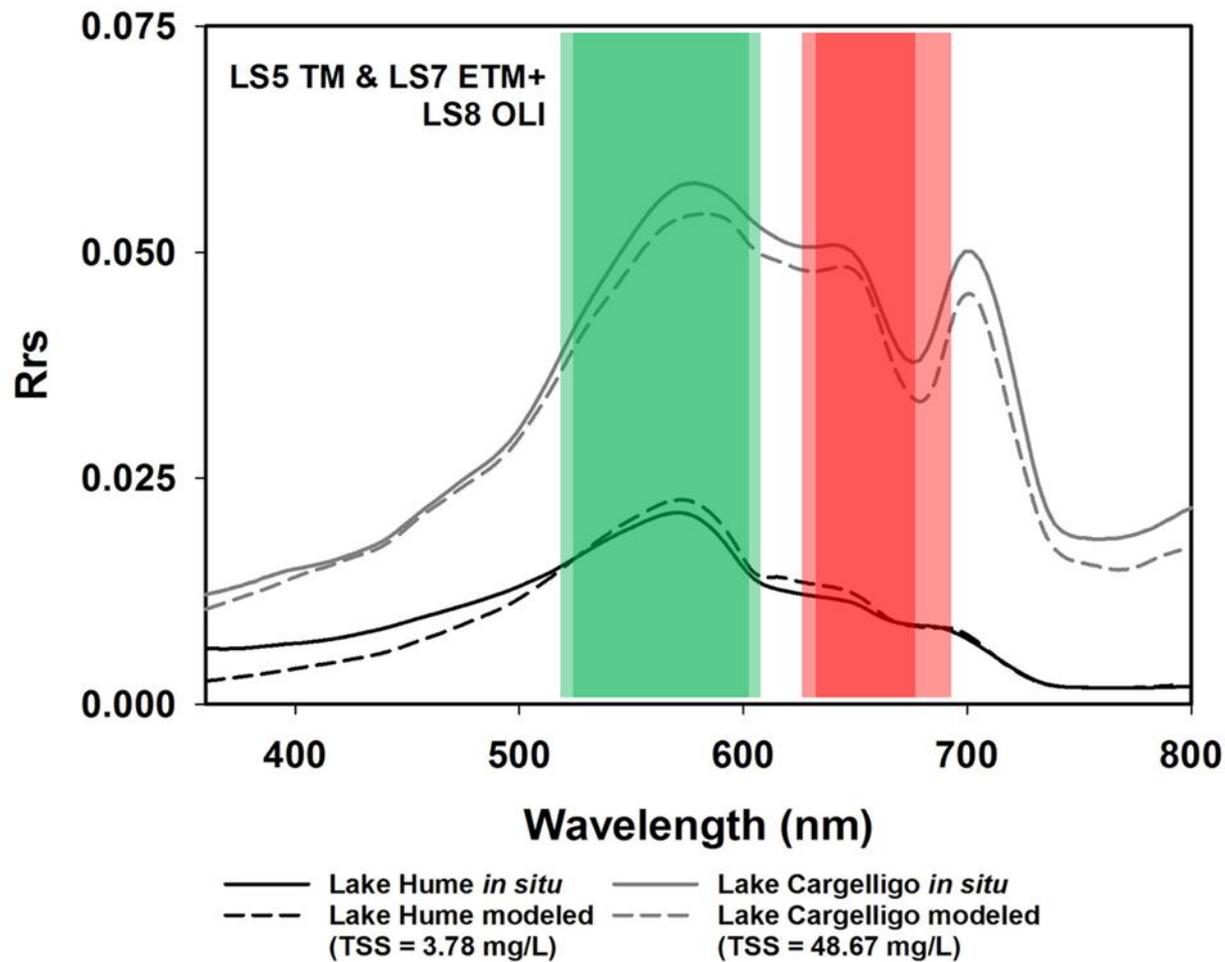
Red = OLI detects, Green = ETM+ detects

Water detected the same 12 month period from ETM+ and OLI



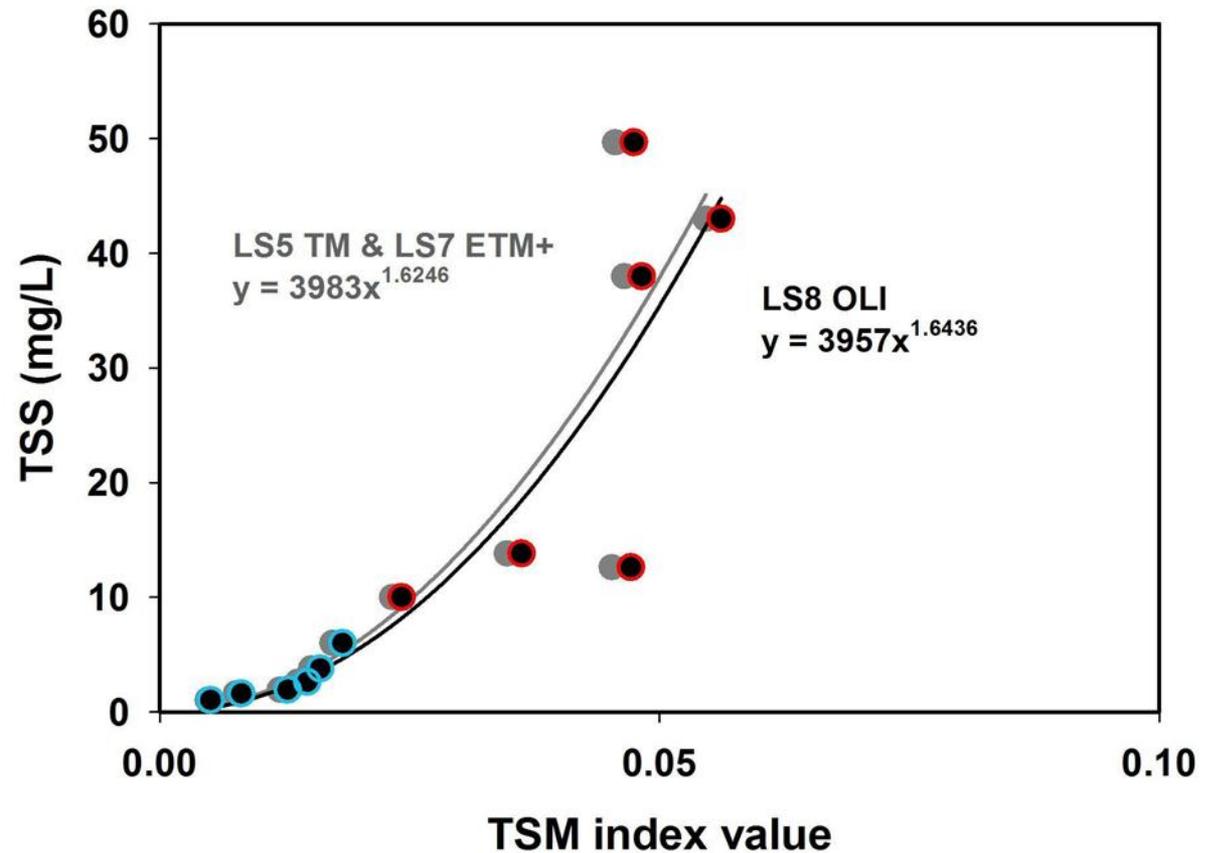
Currently investigating geometric registration of the ETM+ stack

From water quantity to water quality



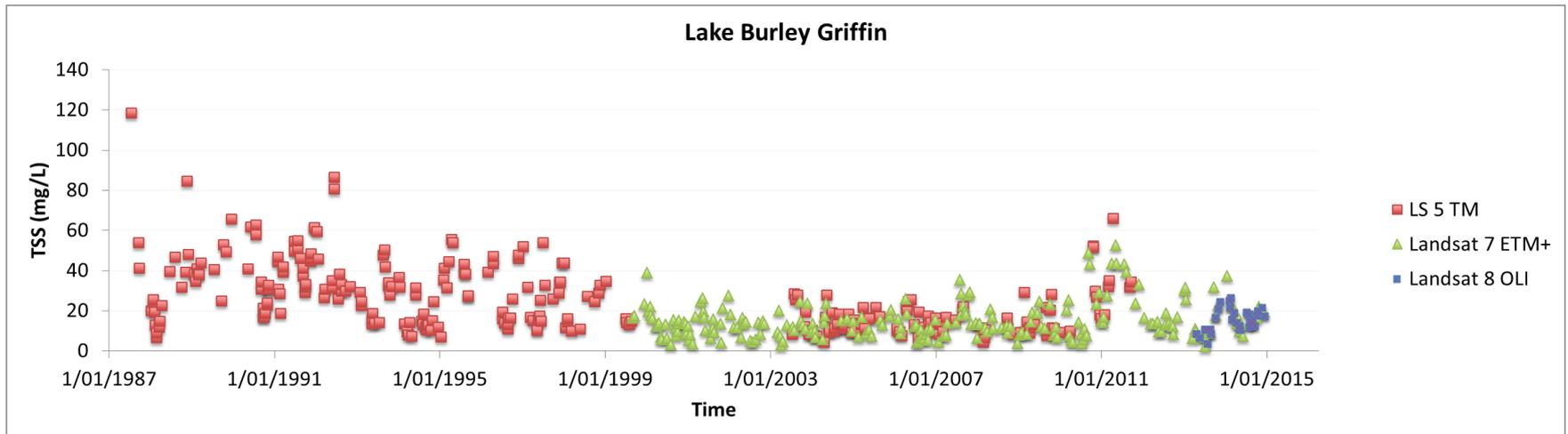
Conversion from TSS index to TSS concentration

Using Ecolight 5 forward modelling of water bodies with known TSS concentrations

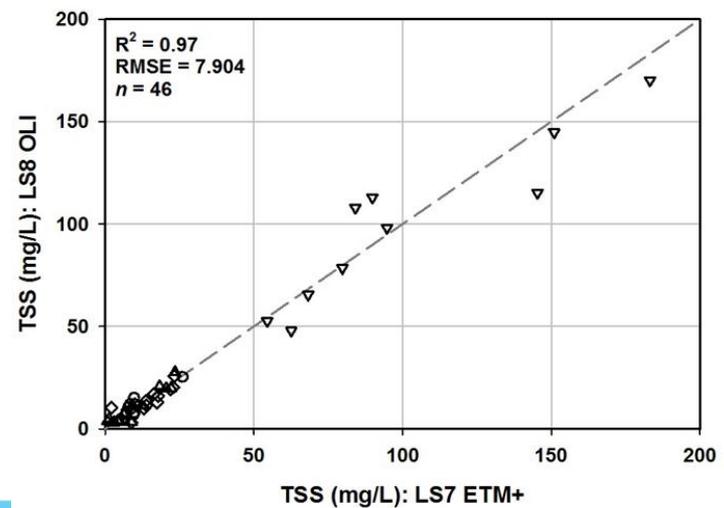
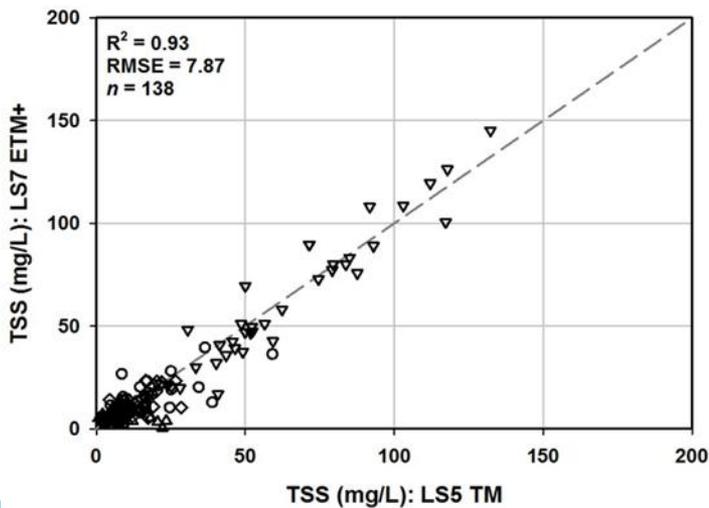


- LS5 TM & LS7 ETM+
- LS8 OLI
- deep, clear waterbodies
- turbid waterbodies

Multi-sensor time series from Lake Burley Griffin

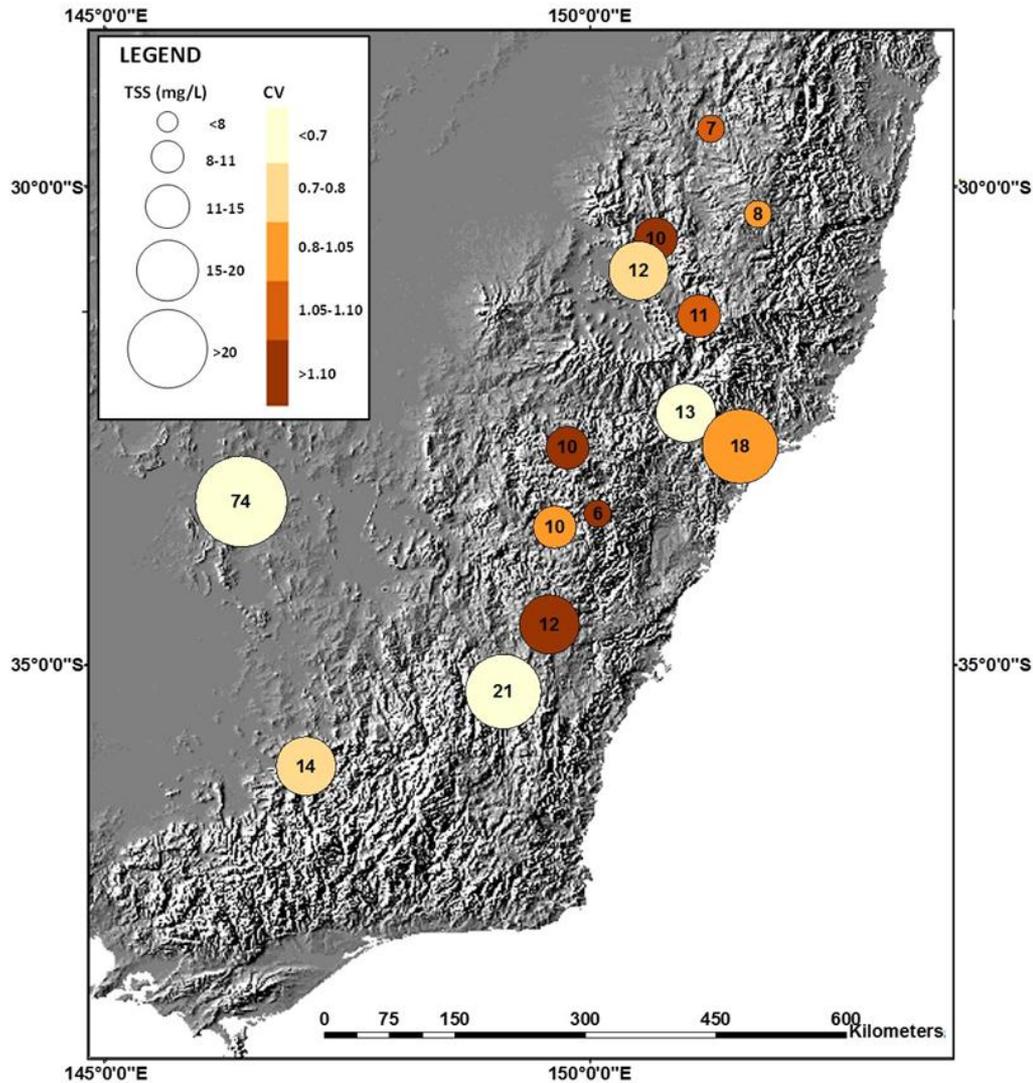


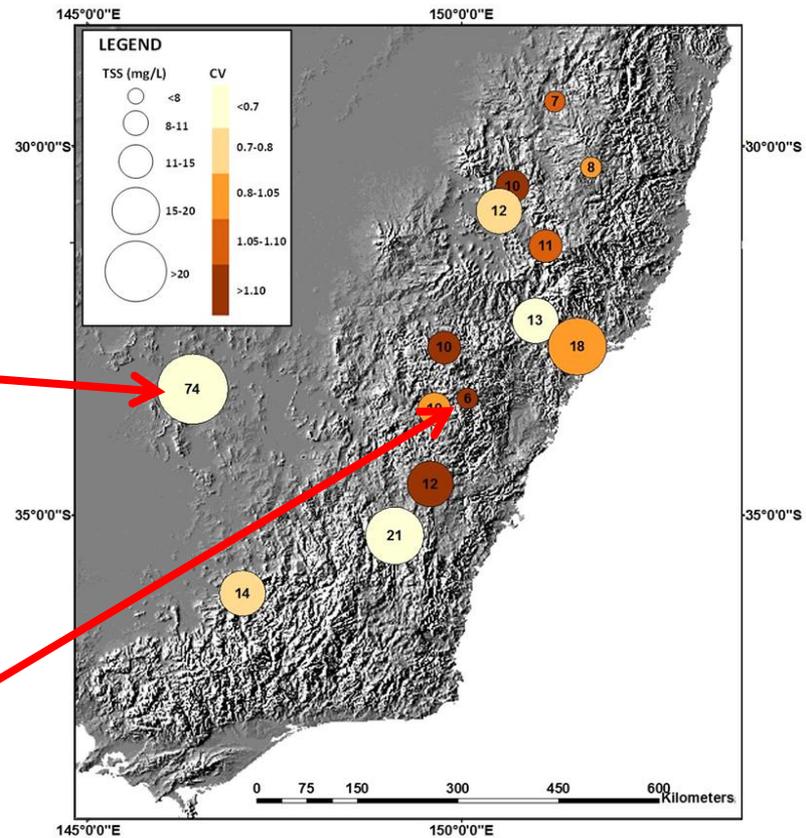
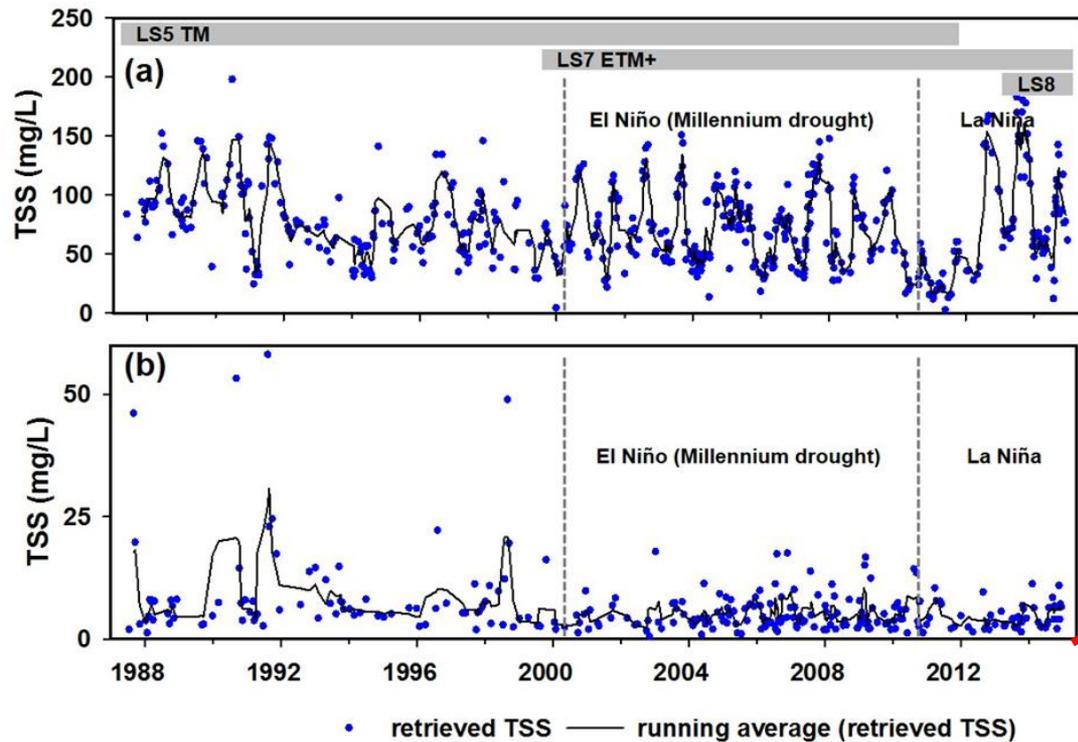
Lake Burley Griffin sits in the side lap between two passes – observations within 24 hours



○ LI ▲ MA ▼ CA ◇ BG

Mean TSS and cv of TSS across 27 years







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Geoscience Australia



Questions (and/or live demo of pixel drill)

http://eos-test.ga.gov.au/geoserver/www/remote_scripts/WOfS_v1.5.htm

Email: leo.lymburner@ga.gov.au

Surface water extent in Lake Pamamaroo

