

NSW water count and water prevalence

Water is one of the world's most important resources as it's critical for human consumption, agriculture, the persistence of flora and fauna species and other ecosystem services. Information about the spatial distribution and prevalence of water is necessary for a range of business, modelling, monitoring, risk assessment, and conservation activities. For example, one of the necessary steps in the NSW State-wide Landcover and Trees Study (SLATS), which monitors vegetation change and is used in the production of vegetation maps, involves removing non-vegetative features such as water bodies through water masking.

Water index & water mask

The water index is developed by detecting water and non-water signatures from Landsat satellite imagery for a single date. The water mask is derived from the water index, based on research of an optimal threshold of water discrimination (Danaher & Collett 2006). The water count is represented as a binary count of water presence/absence for each 30m Landsat pixel. This is the primary product used to develop the water count and water prevalence products, which are based on the Landsat time series (1 Jan 1988 to 31 Dec 2012).

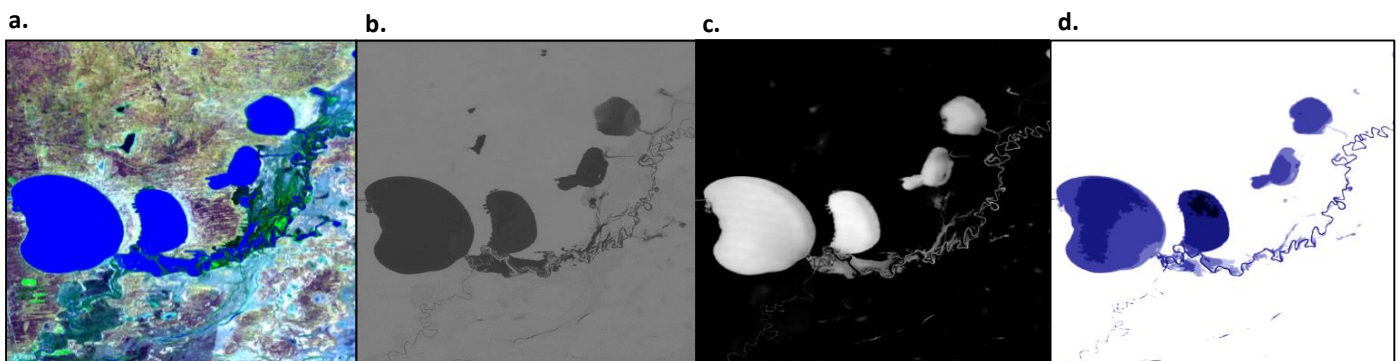
Water count

The water count product is calculated, per pixel, as the sum of number of observations with water present across the Landsat time series as a fraction of total number of possible observations in the 25yr period (1 Jan 1988 to 31 Dec 2012). The product has two bands where band 1 is the number of times water was present across the time series, and band 2 is the count of unobscured (i.e. non-null) input pixels, or number of total observations for that pixel. Cloud, cloud-shadow, steep slopes and topographic shadow can obscure the ability to count water presence.

Water Prevalence

The water prevalence product is extracted from the water count product and classified by proportions of observations with water present. This provides a measure of the relative persistence of water in the landscape (e.g. from always present to rarely and never present). There are 12 classes representing the percentage of time a pixel has had water present out of the total number of observations for that pixel (i.e. Band 1/Band 2 of the water count product). Water prevalence mapping provides information for multiple, wide-reaching applications. For example, distance to locations of persistent water bodies can be modelled as a contributing indicator of potential biodiversity refugia.

Figure 1 a. Landsat satellite base imagery, b. water index/water mask, c. water count (across all observations), d. water prevalence (classification, light to dark blue represents increasing water prevalence)



What can the maps be used for?

The maps are intended for rural landscapes and are suited to many applications including:

- property planning
- local government planning
- flood risk assessment and management
- habitat identification and mapping
- analyses of potential biodiversity refugia
- analyses of landscape change and resilience

Additional Information

Known Issues

- Map accuracy - the water mask classified training data with 1.4% misclassification.
- Artificial striping in Landsat 7 imagery, associated with the edges of flight paths.
- Ghosting - where a single date of poorly rectified Landsat images causes an offset in the water mask by some distance to the rest of the time series. This is particularly apparent for permanent water bodies such as wide river channels and large dams.

Image details

Data type: Raster

Pixel size: 30 m

Base imagery: Landsat 5 TM, Landsat 7 ETM+ (1988-2012)

Image pixel values

Water count (dd7): Band 1 - 001 to ~600 (number of times water was present)
Band 2 - 001 to ~600 (number of unobscured observations of the pixel)

Water prevalence (ddh):
class 1 = 0%
class 2 = 0% to <10%
class 3 = 10% to <20%
class 4 = 20% to <30%
class 5 = 30% to <40%
class 6 = 40% to <50%
class 7 = 50% to <60%
class 8 = 60% to <70%
class 9 = 70% to <80%
class 10 = 80% to <90%
class 11 = 90% to <100%
class 12 = 100% (persistent water)
0 = null

What maps are available?

Two products are available for every Landsat scene, and state-wide mosaics:

- Water Count derived from Landsat 5 TM and Landsat 7 ETM+ images (1988 - 2012). Single date binary masks of water count are also available.
- Water prevalence derived from water count product, classified by percentage of unobscured observations a pixel had water present (water count, Band 1/Band 2).

Acknowledgement

Thanks to the following organisations:

- Landsat data courtesy of the U.S. Geological Survey
- Staff from the Joint Remote Sensing Research Program.

Data access

The maps may be requested through the Office of Environment and Heritage's Spatial Data Online catalogue:

<http://mapdata.environment.nsw.gov.au>

Or by direct download from TERN-auscover:

<ftp://qld.auscover.org.au/landsat/water/nsw/>

Contact

Contact the data broker for data access and product information: data.broker@environment.nsw.gov.au

References

Danaher T. & Collett L. (2006) Development, optimisation, and multi-temporal application of a simple Landsat based water index. In: 13th Australasian Remote Sensing and Photogrammetry Conference, Canberra, Australia

Fisher, A., N. Flood, and T. Danaher. (2016) Comparing Landsat Water Index Methods for Automated Water Classification in Eastern Australia. Remote Sensing of Environment.