An Object-based Approach to Vegetation Mapping in NSW

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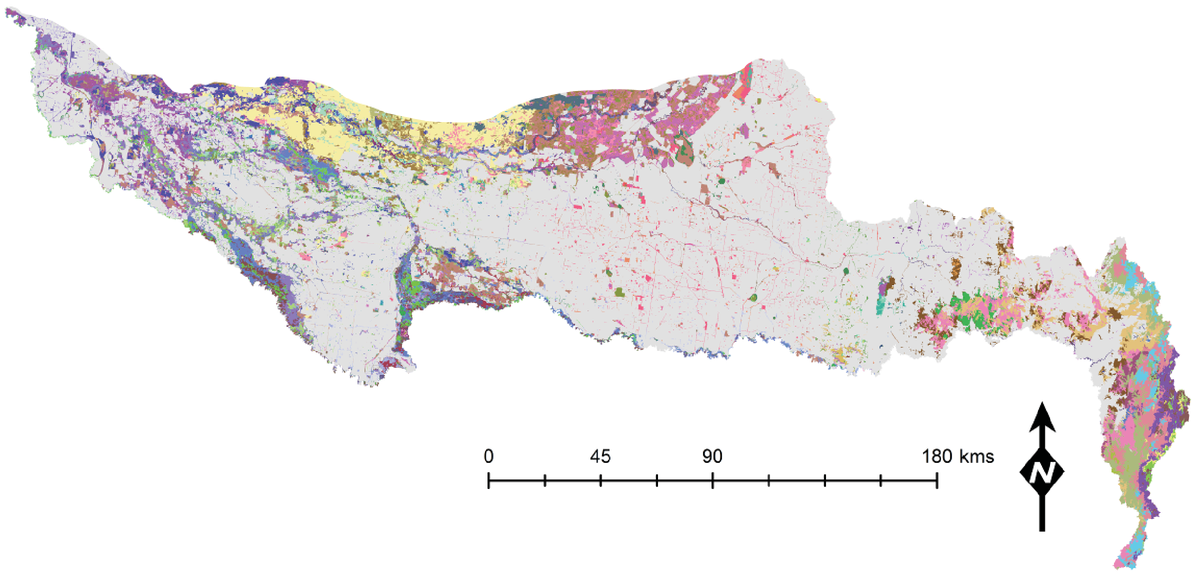
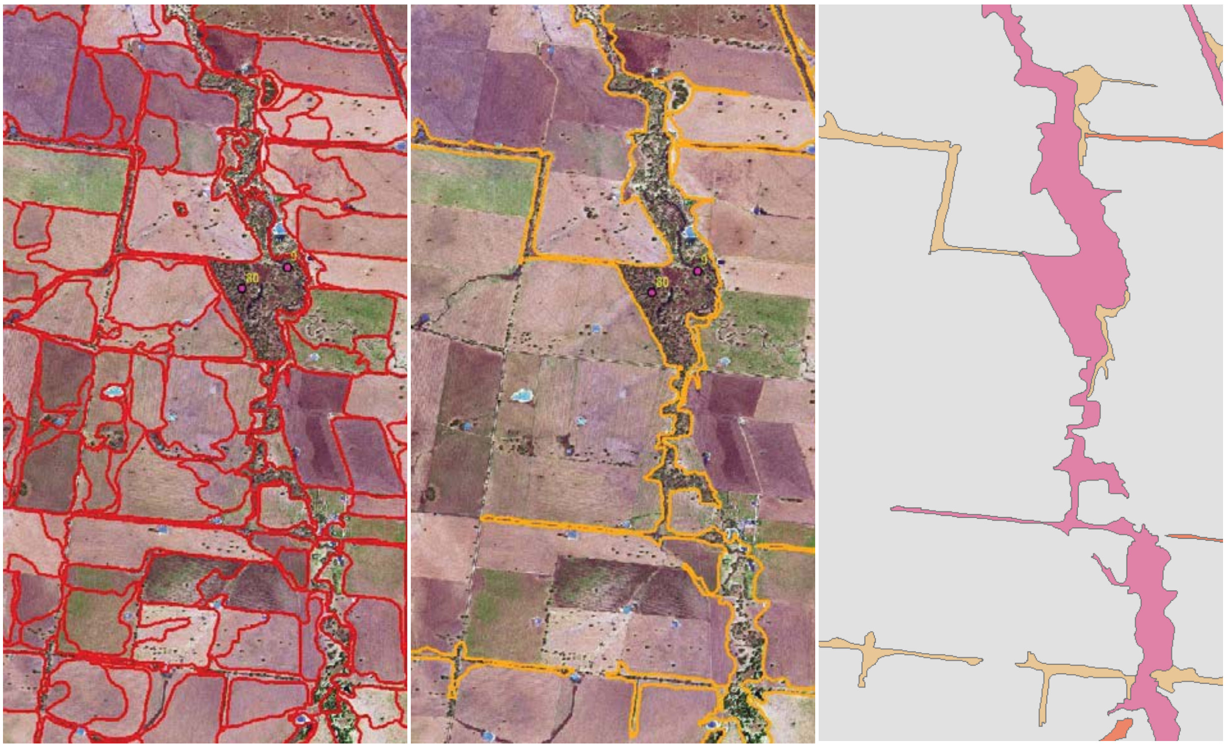
This presentation documents the creation of a vegetation map of the Murray Catchment and some work in progress in the Hunter Catchment. In the Murray Catchment, native vegetation was delineated into stands using feature recognition software. A hybrid classification method that combined spatial modelling and visual interpretation was used to combine the features and create a vegetation map.



Vegetation map from the 2010 MCMAA Vegetation Geodatabase Draft 5.0 (see Roff et al., 2010 for detail)

Spatial layers used in the classification included a Digital Elevation Model (DEM), Landsat reflectance data, radiometric data and soil and climate layers, all of which are available for the entire State. The SPOT 5 satellite imagery was used in the creation of image objects but could not be used in the classification of vegetation type. The spectral response of individual SPOT 5 scenes varied too widely across the catchment. Over 340 new full floristic surveys were commissioned and the results were combined with 900 existing survey records to create training areas for spatial modelling. Each survey site was assigned a New South Wales Vegetation Classification and Assessment (NSWVCA) vegetation type.

The relationship between survey sites and spatial layers was explored by using machine learning software and vegetation type was classified by using an object-based nearest neighbour approach. The catchment was divided into three discrete spatial models with separate training and validation survey sites. Model performance was assessed on the basis of the number of NSWVCA types mapped correctly in five classes of precision. The percentage of correctly modelled vegetation types ranged between 58% and 68%.



Segmentation of SPOT 5 at 1: 10 000 scale over pan-sharpened SPOT 5 imagery. The image objects created in segmentation (left) were masked by landcover manually (centre) and then merged based on their classification (right).

Several vegetation community types were not able to be modelled (e.g. chenopods) or were poorly modelled due to lack of sample data. These communities were added or amended based on the visual interpretation of remotely sensed data. The amended map was assessed against a limited subset of independent survey data. The percentage of correctly modelled vegetation types in five classes of precision ranged between 72% and 78%. The paucity of field data was the limiting factor in the accuracy and the detail of the vegetation mapping.

The use of feature recognition allowed for the rapid delineation of vegetation patterns. It produced a polygon layer that was flexible, enabling re-attribution and spatial edits. The project was constrained by software and hardware limitations in its early phase but was later aided by the grid-computing facilities of eCognition Server. Future projects can now be based on pan-sharpened SPOT 5 multispectral data and other high-resolution remote-sensing data, including lidar, at a catchment-wide scale. Further development is required to optimise the approach when using optical data in areas with high rainfall, in mountainous terrain and in open woodlands.

References

ROFF, A., SIVERTSEN, D., AND DENHOLM, B. 2010. The Native Vegetation of the Murray Catchment Management Authority Area, NSW Department of Environment, Climate Change and Water, Sydney, Australia.