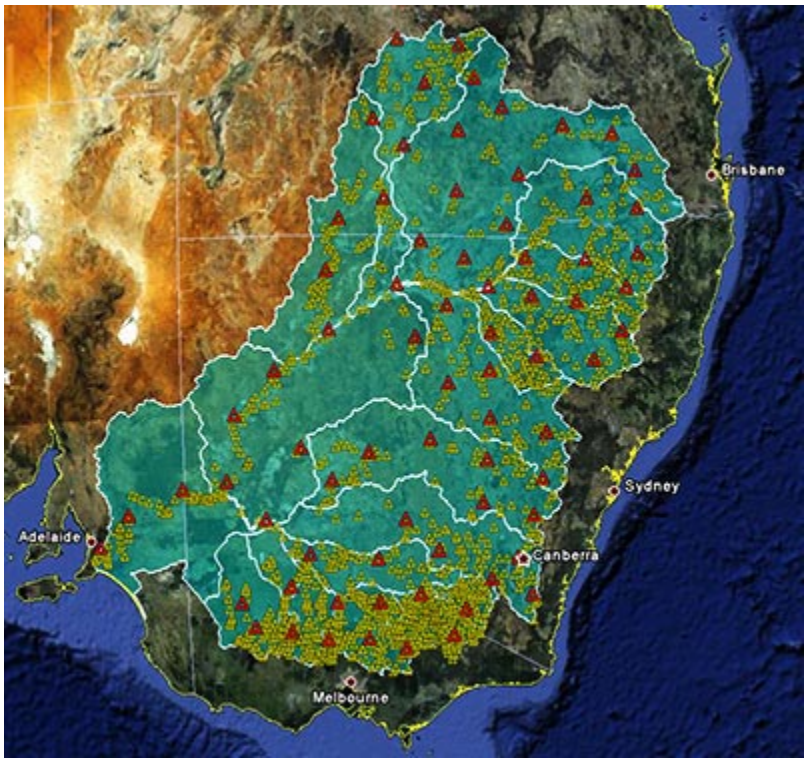
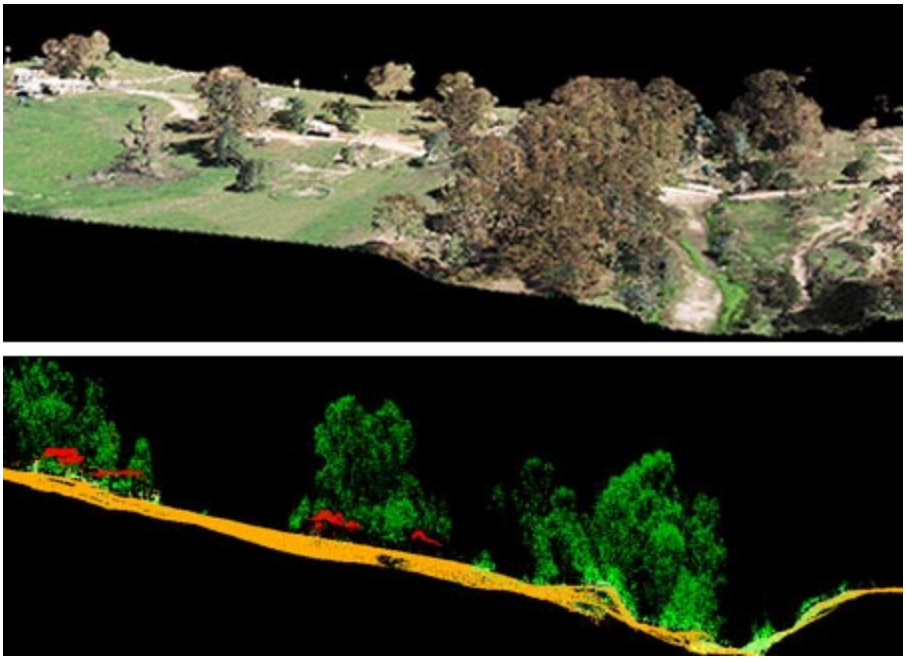
TNTmips Used in Monitoring River Health

The Murray-Darling River Basin covers 1,000,000 square kilometers in southeast Australia. The basin supports over one third of the country's total gross value of agricultural production and includes three quarters of its irrigated crops and pastures. The future of the economies and populations that are supported by this agriculture depend on the sustainable management of the basin's rivers and land systems. Terranean Mapping Technologies, a MicroImages reseller in Brisbane, Australia, recently completed an award-winning project with the Murray-Darling Basin Authority to use airborne LIDAR surveys to characterize river channel form and vegetation for the basin. TNTmips standard features and scripts written in the TNTmips Geospatial Scripting Language (SML) were used extensively to efficiently process and analyze the LIDAR data to produce stream and vegetation statistics. The automated workflows implemented via SML script were critical in implementing analytical procedures that could be undertaken by GIS operators with no training in geomorphology, yet produce robust, objective, and repeatable measures of river health.



Map showing the extent of the Murray-Darling River Basin (shaded) in southeast Australia. The study involved 1610 aerial survey sites (yellow triangles) and 109 control sites (red triangles). Each survey site encompasses a 1-kilometer stretch of river channel that was surveyed using airborne LIDAR and multispectral orthoimagery.

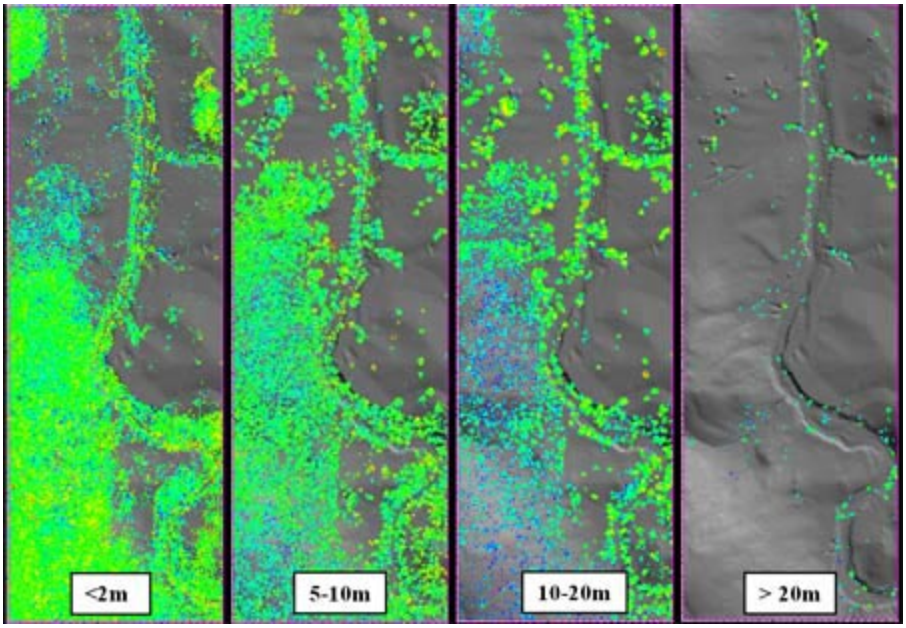
To measure the precise shape of river channels and the distribution of riparian vegetation foliage in three dimensions, the project performed airborne LIDAR surveys of 1610 channel sites in the basin. An automated batch process was implemented in TNTmips using an SML script to sort and name the LAS point cloud files for each site and process the points to generate terrain surfaces (with and without structures), vegetation height surface, foliage density, contours, and other primary datasets for each site. According to the project manager at Terranean, David Moore, "The TNTmips job queue manager proved highly effective in managing and optimising the computationally intensive processing of data across multiple networked computers to produce the large number of output files for all 1610 sites".



Top, a 3D perspective view of the natural color orthoimage collected for a channel site with LIDAR points added in the color extracted from this same image. Above, classified LIDAR points are shown in a vertical profile across a channel site using the TNTmips Point Profile Tool.

Geomorphic variables characterizing the channels and riparian features were extracted from the high-resolution LIDAR

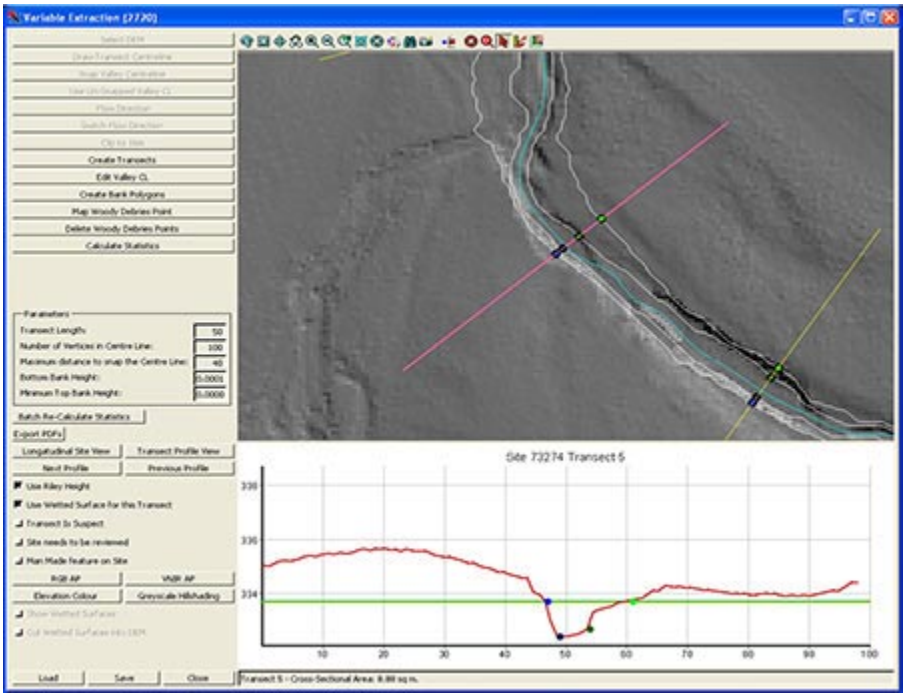
(over)



Vegetation density by height, displayed from surface rasters produced in TNTmips as part of the primary LIDAR point processing via an SML script.

DEMs using an interactive "Variable Extraction Toolkit" developed as an SML script. The toolkit's graphical user interface (shown below) presents a number of automated feature extraction tools organized into a simple workflow. GIS operators used the interactive toolkit to map the channel centerline and channel banks and to divide each site into various channel and riparian zones.

The final data generated for the project consisted of vegetation measurements that could be statistically analyzed to help determine the health of the river at each site. Spatial algorithms were developed in TNTmips to generate eighteen vegetation measurements for specified zones in and adjacent to the river channels. The measurements represent attributes such as vegetation height, shading of the channel, and foliage density. Click for technical details.



The Variable Extraction Toolkit, implemented in TNTmips as an interactive SML script, allowed GIS operators to quickly delineate the channel centerline, analyze automatically-generated transect lines to define channel banks, and map geomorphic zones along and adjacent to the channels.

The researchers concluded that TNTmips software proved to be an ideal platform for establishing automated workflows to produce consistent and repeatable GIS output data from classified LIDAR LAS files. The scripting capability in TNTmips SML also proved to be a "highly effective geospatial modelling environment for the development of the Variable Extraction Tool, due to its ability to integrate a wide range of data types and formats, including LiDAR LAS files, and its advanced geospatial analysis functions." Using TNTmips SML scripts also allowed implementation of automated procedures that minimized the need for user interaction, allowing variable extraction to be carried out by GIS operators with no training or experience in geomorphology or riparian ecology.

Terranean Mapping Technologies won the 2010 Queensland Spatial Excellence award in the Environment category for their design and execution of this complex project. The automated procedures designed and carried out in TNTmips allowed the project to be completed within budget in a period of less than 12 months.

More information on this project can be found at http://terranean.com.au/environment.htm#MDBA. A technical paper on the project, co-authored by Terranean Director David Moore, was presented at the 15th Australian Remote Sensing and Photogrammetry Conference in Alice Springs, Australia in September 2010.