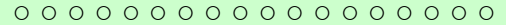


# Spatial Data Analysis Network



JULY 2011



**SPAN's mission is to achieve excellence in the application of innovative spatial analysis in support of research, education and community outreach**

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### Manager's Message

Welcome to the latest issue of SPAN's newsletter. Included in this edition are descriptions of some of the interesting and novel projects for which SPAN is providing assistance.

A notable project is the design and building of a high spatial resolution hyperspectral imaging system that will fly in a remotely controlled helicopter. This system is intended to research the ability of this technology to detect and identify weeds in crops and pastures.

There is also some information about the new research computer and server which is soon to be installed along with hardware upgrades to increase our data storage capacity. This equipment should prove very beneficial for projects that require intensive computation and/or processing of large data sets.

Next month the Australian Bureau of Statistics will be conducting the Census of Population and Housing. As a provider of data for projects, SPAN will be closely monitoring the progress of census data processing and release to ensure the latest data is available to CSU's researchers. The first release of the new data, including community profiles and some 'quick stats' is due in June 2012 followed by a second release in October.

Happy reading.

*Gail Fuller*

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SPAN is a research support unit within the Centre for Research and Graduate Training at Charles Sturt University. It has offices at Wagga Wagga and Thurgoona campuses to provide postgraduate and staff research support in three main areas: remote sensing, Geographic Information Systems (GIS) and spatial statistics.

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## Can SPAN help you?

SPAN might be able to assist your research in ways you do not anticipate. From simple data retrieval and map making to complex spatial and statistical data analysis, SPAN is available to enhance the quality of your research. If you are a researcher, academic or postgraduate student at Charles Sturt University and believe that some aspect of your research might be assisted by using our skills, do not hesitate to contact the Manager, Gail Fuller, on 32004 or [gfuller@csu.edu.au](mailto:gfuller@csu.edu.au) to discuss your project requirements.

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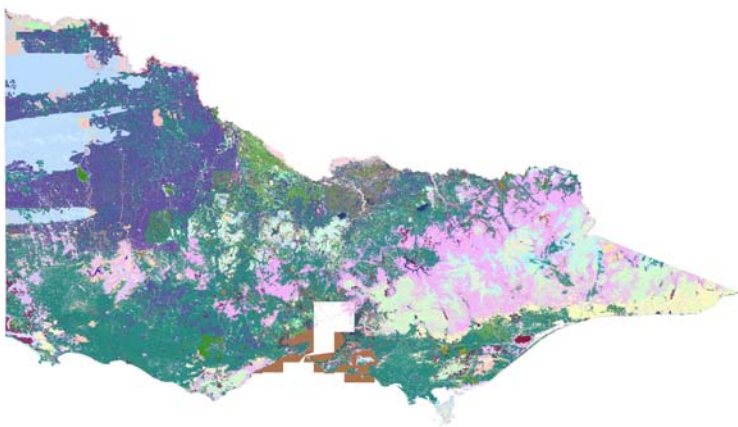
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**Want to know more? Visit [www.csu.edu.au/research/span/](http://www.csu.edu.au/research/span/)**

# Projects

## **Biodiversity conservation**

SPAN is assisting Associate Professor Gary Luck with a project examining the spatial congruence among locations that are important for biodiversity conservation and those that are important for the protection of ecosystem services. The work will be done at a catchment level throughout Victoria and is focused on ecosystem services such as carbon storage, timber production and water provision. The results of the project will have important implications for land management, aiming to protect both biodiversity and the services that ecosystems provide to people.



## **High spatial resolution hyperspectral imaging from a UAV**

SPAN is engaged in a project that aims to obtain very high spatial resolution (10cm or better) hyperspectral imagery from an instrument flown in an unmanned aerial vehicle (UAV) in order to detect weeds. Fixed-wing UAVs are unable to fly slow enough to achieve this high spatial and spectral resolution, so a helicopter with a good autopilot is being used as the platform. The project, funded by a grant from the Rural Industries Research and Development Corporation (RIRDC) and led by Dr Remy Dehaan, has purchased a modified Zealous 2, 2m rotor helicopter equipped with a jet turbine engine to reduce vibration. The helicopter will carry about 10kg and be able to fly for approximately one hour per fuel fill. The specifications of the Autopilot are impressive, with a communication range of up to 70km, RTK GPS accuracy to 1cm, pitch and roll to 0.01 degrees (3 sigma) and yaw to 0.05 degrees. The craft is currently being built in Western Australia and the expected delivery date is October/November.

SPAN's Gary McKenzie has spent several months evaluating two potential imaging spectrometers and several camera systems. This was a lengthy exercise, trying to model system performance without having any real ephemeris data available. Gary is now in the process of ordering equipment to build the data acquisition computer system and writing software. Remy and Gary are also working through the issues of how to geocorrect the imagery and are waiting to collect some ephemeris data from the helicopter.

Longer term collaboration and research opportunities may be broadened by the integration of CSU's existing multispectral imaging system with thermal and digital cameras for implementation into the UAV. If all goes to plan, testing of the systems will occur in late November and early December with a view to collecting data across a number of test sites soon after.

# Equipment

SPAN's current research computer and server, 'Tesla', will be replaced within the next month with a new machine which will be dubbed 'Curie'. This new machine will greatly increase processing capabilities and speed, having four x eight core processors and 256GB of RAM.

Attached to this computer will be a new RAID storage array, increasing data storage capacity to approximately 35TB. This, combined with the back up to tape each night, should be very helpful to researchers.

# Data

The 16th Census of Population and Housing will take place on the night of 9 August 2011. The 2011 Census also marks 100 years of national Census taking in Australia.

Conducted by the Australian Bureau of Statistics (ABS), the Census of Population and Housing aims to accurately count the number of people in Australia, their key characteristics, and information about the dwellings in which they live. It is conducted by the ABS once every five years.

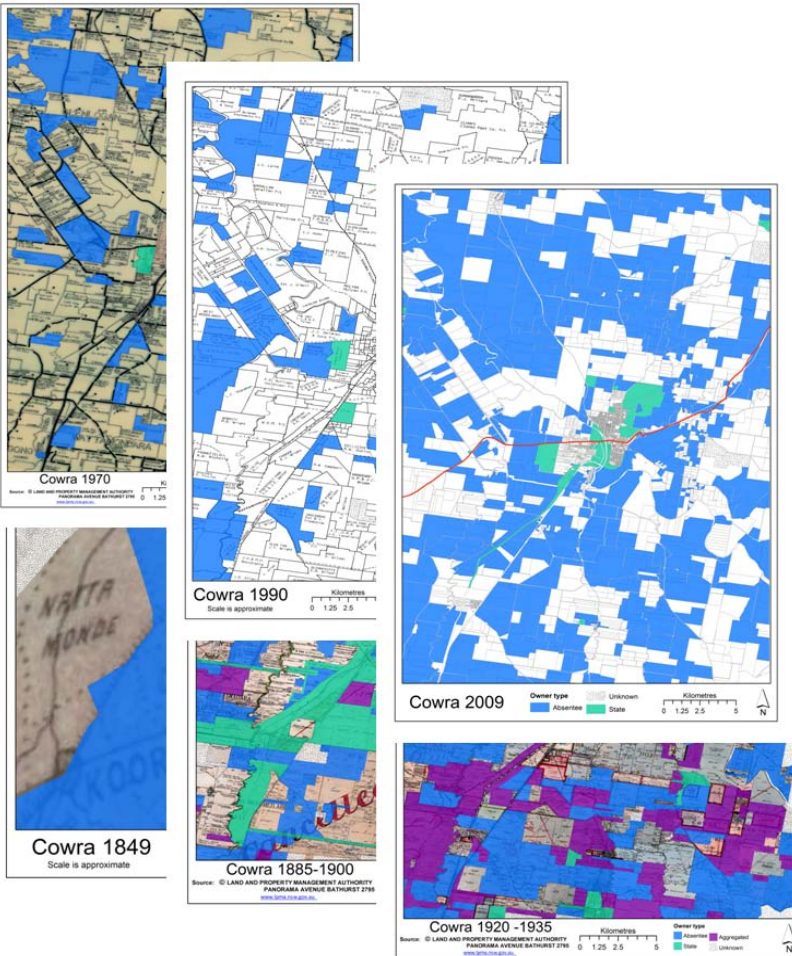
During the Census every household and person in the country is required to answer specific questions on the paper form or through eCensus online.

The ABS expects about 30% of the population to use eCensus this year as it is fast and easy, with online help available. It is also protected by the strongest encryption technologies, making it safe and keeping the information confidential.

# Projects

## Implications of 'drive-in drive out' farming

PhD candidate, Gina Lennox, is researching the trend toward 'drive-in drive-out' farming and the implications this has for families, communities and industries. With case study areas including the Bland/Weddin and Cowra Shires in NSW, the project is looking at historical land ownership in 1849, 1885-1900, 1920-1935, 1970, 1990 and 2009. Land ownership was determined through interviews with local community members, shire representatives and historical parish maps. SPAN is providing support for this project with GIS analysis, mapping and spatial statistics.



## Wine shows

Maame Blay, PhD student at the National Wine and Grape Industry Centre, has been researching the responses of attendees to wine shows and their wine tasting experiences. SPAN has provided maps showing the locations of wine shows across Australia and differentiating those that do or do not offer tasting days. We are also mapping the distances people are willing to travel to attend wine shows, both nationally and internationally. SPAN has given further assistance to the project by advising on the design of a survey to collect information from wine show attendees about their wine buying and drinking preferences and patterns, their wine knowledge and some demographic data.

# Conference

**TechNet 2011**  
NATIONAL CONFERENCE  
Charles Sturt University

The TechNet 2011 National Conference will be held at Bathurst campus on Wednesday 30<sup>th</sup> November to Friday 2<sup>nd</sup> December.

Formed in 2000, TechNet Australia is an organisation of technical staff from tertiary institutions across Australia, New Zealand and Fiji which aims to:

- Build a strong network of technical staff and to raise their profile and recognition;
- Offer support, assistance and advice to each other;
- Provide a forum for discussion;
- Promote ideas.

The main activity of the organisation is the TechNet Annual Conference which is organised by a different university each year. CSU last hosted the event in 2005.

As a member of the organising committee, SPAN manager, Gail Fuller, will be ensuring that some 'spatial' presentations, displays and trade representatives are incorporated into the program in order to demonstrate the range of applications in which this technology can be used in universities.

# Projects

## ***Sirex wood wasps and Ips bark beetles***

In collaboration with forest specialists based in Sydney, Canberra and Tasmania, CSU post doctoral fellow Catherine Gitau is working on a project funded by the Australian Research Council (ARC) and the National Sirex Coordinating Committee (NSCC). The project is looking at the Sirex wood wasp and the Ips bark beetle, both commercially important exotic pests that attack Pine trees. Major aims of the project are to undertake a detailed monitoring of Ips on selected pine trees, to quantify the magnitude of threat to the pines and to map the geographical regions where Ips is interfering with the control of the wood wasp. This will assist in developing suppression strategies and predicting the most suitable habitats for future pine plantations.

*Sirex noctilio*, the Sirex wood wasp, is an introduced pest of pine plantations in Australia, New Zealand, South Africa and South America. Female wasps are attracted to stressed or sick trees, into which they drill holes, lay eggs and deposit fungal spores and toxic mucous. The fungus and mucous act together - the mucous dries the tree tissues, providing the right conditions for the fungus to grow, killing the tree as it spreads. Wasp larvae then feed on the fungus in the wood.



Female Sirex wood wasp, showing large ovipositor used to drill into pine trees to lay eggs

Management of Sirex is achieved through the nematode *Beddingia siricidicola*. In a plantation compartment, 2-3 plots of 10 trees are selected to form 'trap trees' which are then weakened using a herbicide to slowly kill them so that they become attractive to ovipositing Sirex females. A few months following the herbicide application, nematodes are inoculated into these trees. The nematodes find their way into the ovaries of the female wasps, invading her eggs and thereby making her sterile. The female wasps then emerge to lay eggs filled with thousands of nematodes into fresh trees at the next generation, thereby spreading the nematodes and effectively lowering Sirex populations.

This management strategy has been effective until the recent, unprecedented occurrence of the exotic bark beetle, *Ips grandicollis*, or Fivespined Bark Beetle. *Ips* disrupts the Sirex biocontrol programme by attacking trap trees primed for nematode introduction. Studies to investigate this disruption are underway through postgraduate student, Fazila Yousuf, who is also involved in the project.

*Ips grandicollis* is well established in all of Australia's mainland pine growing regions. Although *Ips* is generally only considered a secondary pest, known to vector a blue stain fungus which can severely affect the aesthetic qualities of the milled timber, it is increasingly important to manage since it is also impacting on the Sirex biocontrol program.

There are also concerns about the effects of climate change and its associated increases in droughts and fires on this pest. Recently, in several state forests near Tumut and Tumbarumba in New South Wales, populations of *Ips* surged and were associated with large scale tree mortality of drought stressed pine trees.



*Ips grandicollis*, Fivespined bark beetle, is 4 - 6mm in length



Galleries made by *I. Grandicollis* can result in reduced quality of pine logs.

Image sources: [http://www.dpi.qld.gov.au/26\\_12421.htm](http://www.dpi.qld.gov.au/26_12421.htm) and <http://www.barkbeetles.org/ips/ips.html>