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Remote sensing and spatial analysis for fire management

Remote Sensing and Spatial Analysis

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Project Team	granted
Program Leader	granted
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Context

The department's fire management, monitoring and reporting functions require knowledge of fire events that are effectively derived through fire scar mapping. The imagery used for this analysis is predominantly satellite imagery but also includes optical and thermal imagery from airborne platforms. Research areas include historical mapping that utilise the extensive archive record of satellite imagery and occasionally aerial imagery to build a fire history (or fuel age) for a location or to reconstruct the spread for major bushfire. This activity also includes monthly mapping during the prescribed burn season. The project also plays a key role in fire research and development, through research into fuel growth, fire spread and fire risk models. Internal and collaborative activities are carried out to further streamline and automate mapping techniques. General imagery support is also provided to Fire Management Services Branch and Regional staff. This includes roles such as incident mapping and predictions as required and advice in imagery and systems development.

Aims

- Improve processes of fire scar identification to enable historical fire regimes to be understood for safety and ecological applications.
- Improve burn security through the development of methodology to detect and communicate hotspot locations.
- Develop techniques to provide inputs for fire behaviour models to enable desktop assessments.
- Provide remotely-sensed spatial and temporal data streams to assist with bushfire investigations and reporting.

Progress

- Fire scar information for the Pilbara region, Goldfields region, Kanyirninpa Jukurrpa and Desert Support Services was supplied on a monthly and annual basis to inform and report on prescribed burning activities in the Western Desert and Pilbara region.
- Collaborative project with the Great Victoria Desert Biodiversity Trust resulted in fire history and analysis over the Great Victoria Desert over the years 1995 to 2019.
- Support was provided for the operational use of thermal camera to detect hotspots for burn security.
- Provided data to Fire Management Services Branch to inform fire recovery, fire chronology and new satellite technology/availability.
- Training in fire chronology was undertaken.
- Development of processing scripts in R to effectively process the DBCA fire history data.
- A journal article describing the relationship between spinifex fuel cover measured by remote piloted aircraft imagery and Landsat satellite imagery has been published in the *International Journal of Remote Sensing*.

Management implications

- The information provided for fire management is designed to significantly increase the accuracy of reporting and decrease the risks of fire management activities. Delivering fire scar mapping and information allows practitioners to make informed decisions that lead to more efficient fuel reduction activities and successful completion of burn prescriptions.
- Effectively processing the DBCA fire history provides quantitative and current statistics on fire frequency, number of repeat fires and fire interval.
- Developments in remotely piloted vehicle application together with satellite imagery will enable fire managers to more efficiently and accurately map fuel characteristics at a range of scales, greatly enhancing their ability to forecast fire danger and to predict fire behaviour without having to carry out costly ground-based field measurements.

- Consistent production and attribution of monthly fire scar mapping has resulted in the compilation of an annual fire scar mapping product with improved date, area and cause attribution. This product is suitable to analyse and provide spatial metrics that will aid in assessing the effectiveness of the fire management program over Millstream Chichester and Karijini National Parks.
- Security of burns is improved by the delivery of thermal imagery hotspots to on-ground staff.

Future directions

- Continued development and automation of fire scar detection methodology.
- Investigation and development of new data sources including new satellite data and aerial capture.
- Implementation and development of the spatial analysis of fire patterns and fuel loads.
- Further development of spinifex fuel cover from satellite imagery with greater field data inputs across the State.