Progress Report SP 2018-072

Remote sensing monitoring

Remote Sensing and Spatial Analysis

Project Core Team

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Project Team	granted
Program Leader	granted
Directorate	granted

Remote sensing monitoring

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Context

The measurement and analysis of change across terrestrial, wetland and marine environments using remote sensing provides essential historical and current information that can be used to understand the effects of management actions and natural events. The imagery used is predominantly satellite imagery, but also includes optical imagery from handheld and airborne platforms and LiDAR data. Field observations provide essential ground truth and calibration of remotely sensed data. Analysis techniques include an increasing number of sophisticated time series analysis tools and object orientated image classification. This work is underpinned by efficient and statistically rigorous analysis and batch processing techniques in the R programming environment. This function relies on repeatable and consistent source imagery and developing methods to produce reliable spatial and statistical products that can be used by the department for reporting on the state of the environment, managing the conservation estate and assessing threats to biodiversity.

Aims

- Undertake remote sensing monitoring and research projects at a range of temporal and spatial scales using technologies which include satellite imagery, digital cameras, remotely piloted aircraft and LiDAR data.

Progress

- A system to assess plantation stocking rates for Forest Management Branch was implemented and stocking rates over 120 plantations were assessed.
- A draft paper on monitoring revegetation of *Banksia* woodlands using satellite imagery has been prepared.
- Vegetation cover change maps over 194 covenants in the south-west were created. The maps identify areas of cover loss between the registration date and 2020.
- Analysis of vegetation cover change identified in the Forest Management Plan was carried out. The analysis focused on the northern third of the northern jarrah forest and investigated at changes in rainfall, fire intervals and the effects of thinning.
- The Millstream Chichester National Park riparian vegetation monitoring was continued.
- Input was provided to the Land Monitor project to develop satellite based rangeland vegetation monitoring.
- Imagery report on suspected illegal clearing for the Department of Water and Environmental Regulation was completed.
- A report on the vegetation cover change in the 'Koolanooka System' threatened ecological community was prepared.
- Identification of pine wilding density in the Gnangara region using digital aerial photography products from the Urban Monitor project continued.
- Remote piloted aircraft (RPA) captured 79 mangrove field sites in the proposed Dampier Marine Park area for development of satellite derived mangrove vegetation cover and monitoring products.
- RPA captured field sites for proposed Dampier Marine Park and North Kimberley Marine Park have been processed to provide vegetation cover metrics. These metrics have been used to develop regional mangrove time-series products using Analysis Ready Sentinel 2 Satellite Imagery for the Pilbara and Kimberley Regions.
- Shark Bay seagrass extent mapping was extended to the World Heritage Area for 2002, 2010, 2014 and 2016 and completed. Analysis of the seagrass extent was conducted in relation to sea surface temperature and the marine heatwave of 2011. This work has now been published in *Global Change Biology*.
- Wetland inundation and hydroperiod analysis for various wetlands throughout the state was undertaken utilising satellite imagery.

Management implications

- The pine wilding mapping is required to ensure a pre-determined stocking rate is maintained. This stocking rate has implications on food availability and population viability of the Carnaby's black cockatoo.
- Stocking rate assessments for Forest Management Branch provide a cost effective and comprehensive process to assess stocking rates in plantations.
- The vegetation monitoring paper outlines cost effective methods to monitor and assess completion criteria of revegetation projects.
- The Forest Management Plan vegetation change analysis provides information on the potential impacts of climate change and the sustainable use of our forests.
- The improvements made to the mangrove extent, density and trend timeseries products using RPAs and Analysis Ready Data has provided more reliable, realistic and robust timeseries products for the Pilbara and Kimberley Regions, that will make future timeseries updates quick deliver.
- Comprehensive information on the dynamics of seagrass extent in response to marine heat waves in the Shark Bay World Heritage area will inform management responses to the loss of habitat.
- Wetland inundation and hydroperiod analysis provides information to understand the status and conservation significance of wetlands especially those remotely located.

Future directions

- Improve the plantation stocking rate assessment system to handle plantation variability and move to the assessment of native forests.
- Complete assessment of covenants using imagery from the registration date to 2020 and implement an analysis from 2016 to 2021 using higher resolution imagery.
- Expand Forest Management Plan cover change analysis from north eastern jarrah forest to Collie region.
- Continue to explore and develop cloud processing options with Geoscience Australia.
- Complete pine wilding mapping and develop a repeatable monitoring system.
- Develop and refine the use of remotely piloted aircraft imagery for vegetation monitoring and mapping.
- Further develop mangrove monitoring methodology through RPA validation to test the accuracy of the products and incorporating recent advances satellite imagery calibration.
- Package the Shark Bay seagrass data sets and associated habitat mapping, and R scripts for creating sea surface temperature metrics, and make publicly available.