

Progress Report SP 2018-072

Remote sensing monitoring

Remote Sensing and Spatial Analysis

Project Core Team

Supervising Scientist	Katherine Zdunic
Data Custodian	Katherine Zdunic
Site Custodian	

Project status as of June 9, 2020, 4:22 p.m.

Approved and active

Document endorsements and approvals as of June 9, 2020, 4:22 p.m.

Project Team	granted
Program Leader	granted
Directorate	granted

Remote sensing monitoring

J Chapman, B Huntley, G Loewenthal, K Murray, G Pitt, P Rampant, R Van Dongen, K Zdunic

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 refined and validated.
- A satellite based vegetation cover change assessment over the Yarraloola and Red Hill pastoral leases was completed for Rio Tinto.
- 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.
- Landsat satellite imagery for the period 1988 to 2018 was analysed to quantify changes in vegetation cover and its relationship to rainfall and fauna numbers on Bernier and Dorre Islands.
- An assessment of satellite based vegetation cover change and its relationship to rainfall and tammar wallaby numbers on the North Island of the Abrolhos Islands was undertaken.
- Innovative techniques and high resolution imagery products from the Urban Monitor project were used to create up to date land cover and land use mapping of the Swan and Canning rivers catchments to provide inputs into modelling being carried out by Rivers and Estuaries Branch and the Department of Water and Environmental Regulation (DWER).
- Imagery report on suspected illegal clearing for DWER was completed.
- A report on the vegetation cover change in the *Plant assemblages of the Inering System* threatened ecological community was prepared.
- Identification of pine wilding density in the Gngangara region using digital aerial photography products from the Urban Monitor project was commenced.
- A remote piloted aircraft imagery capture for remote sensing applications training course was developed and five staff were trained.
- Remote piloted aircraft captured 65 mangrove field sites in the North Kimberley Marine Park for development of satellite derived mangrove vegetation cover and monitoring products.
- The ESRI collector app for capturing marine habitat types was altered to be compatible with Marine Science Program's EcoPass (photo and video habitat assessment tool). The app has since been used in the Swan River and the North Kimberley Marine Park.
- Shark Bay seagrass extent mapping was extended to the World Heritage Area for 2002, 2014 and 2016 and an additional year 2010. Analysis of the seagrass extent was conducted in relation to sea surface temperature and the marine heatwave of 2011.

Management implications

- The land cover and land use maps are used as input in hydrological and nutrient modelling and could be used to help identify areas with negative impacts on river systems.
- The *Plant assemblages of the Inering System* threatened ecological community assessment provides a template for a desk-top assessment of condition. The same method can be applied to other communities to identify those at most risk.
- 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 south west plantations.
- The updated ESRI collector app for marine habitat types has increased opportunistic collection of field data to inform satellite image validation and management.
- 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.

Future directions

- Implement the stocking rate assessment for Forest Management Branch as a production system.
- Improve the connection with field information obtained by the regions and remote sensing analysis for Forest Management Plan reporting.
- Continue to explore and develop cloud processing options with Geoscience Australia.
- Complete pine wilding mapping and develop a repeatable monitoring system.
- Commence investigating the cause of change in forest condition in the eastern jarrah forest and develop metrics for the Forest Management Plan reporting.
- Develop and refine the use of remotely piloted aircraft imagery for vegetation monitoring and mapping.
- Continuous development of mangrove monitoring methodology incorporating recent advances in field data capture and satellite imagery calibration.