Progress Report SP 2018-072

Remote sensing monitoring

Remote Sensing and Spatial Analysis

Project Core Team

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Update requested

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Project Team	required
Program Leader	required
Directorate	required

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; 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 the department can use for reporting on the State of the Environment, managing the conservation estate and assess the threats to biodiversity.

Aims

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

Progress

- 30 year mangrove time-series products have been processed using analysis ready Landsat and Sentinel 2 satellite imagery for Lalang-garram Marine Park reporting.
- Statistics and maps were provided to aid selection of monitoring sites in banksia and wandoo woodland.
- Millstream Chichester National Park riparian vegetation monitoring was continued.
- Developed a method for detecting exposed intertidal seagrass extent from remotely piloted aircraft ground truthing in collaboration with Yawuru Traditional Owners using 2020 Sentinel 2 satellite imagery.
- Shark Bay seagrass data sets and associated habitat mapping and R scripts for creating sea surface temperature metrics, were packaged up with metadata and made publicly available.
- Wetland inundation and hydroperiod analysis for various wetlands throughout the state was undertaken utilising satellite imagery.
- South west wetland monitoring program data reanalysis is underway, including application of a novel method for handling gaps in Landsat 7 data.
- Real-time kinematic remote piloted aircraft image processing workflow for Ramsar and other wetland fringing vegetation is under development.
- Benger swamps remote piloted aircraft data capture and analysis commenced for bittern habitat.
- Undertook survey and remote piloted aircraft data capture of known populations of critically endangered *Grevillea acropogon* in the Warren District.
- Undertook remote piloted imagery capture of known locations vegetation decline in the Fitzgerald River National Park and satellite imagery analysis.

Management implications

- An exposed intertidal seagrass extent product will facilitate annual reporting on intertidal seagrass for the first time in the Kimberley.
- Wetland inundation and hydroperiod analysis provides information to understand the status and conservation significance of wetlands especially those remotely located.
- Evaluation of wetland characteristics informing locations of suitable habitat for threatened species. Consistent production and attribution of monthly fire scar mapping have 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.
- Real-time kinematic remote piloted aircraft image processing workflows will enable repeatable analysis and the development of a framework for vegetation monitoring.
- Vegetation monitoring across various environments including mangroves, riparian zones, rangelands and forests, provides quantitative information for assessing vegetation changes and informs management actions.

Future directions

- Provide inputs to Forest Management Plan reporting, including whole of forest condition and threatened ecological community statistics.
- Continue research into forest condition with a focus on the effect of silviculture treatments on resilience.
- Develop and implement a vegetation monitoring and reporting program for Lake Bryde.
- Continue to explore and develop cloud processing options with Geoscience Australia.
- Develop and refine the use of remotely piloted aircraft imagery for vegetation monitoring and mapping.
- Apply mangrove monitoring methodology through remote piloted aircraft ground truthing and satellite imagery upscaling in Roebuck Bay/Yawuru and 80 Mile Beach Marine Parks, and test the accuracy of the products developed for Lalang-garram Marine Park.
- Apply exposed intertidal seagrass methods to Sentinel 2 imagery from 2017 to 2021 at Roebuck Bay/ Yawuru for annual reporting.
- Develop wetland habitat modelling application for bitterns in Benger Swamp.