# JRSRP Annual Report 2021 – 2023

Joint Remote Sensing Research Program

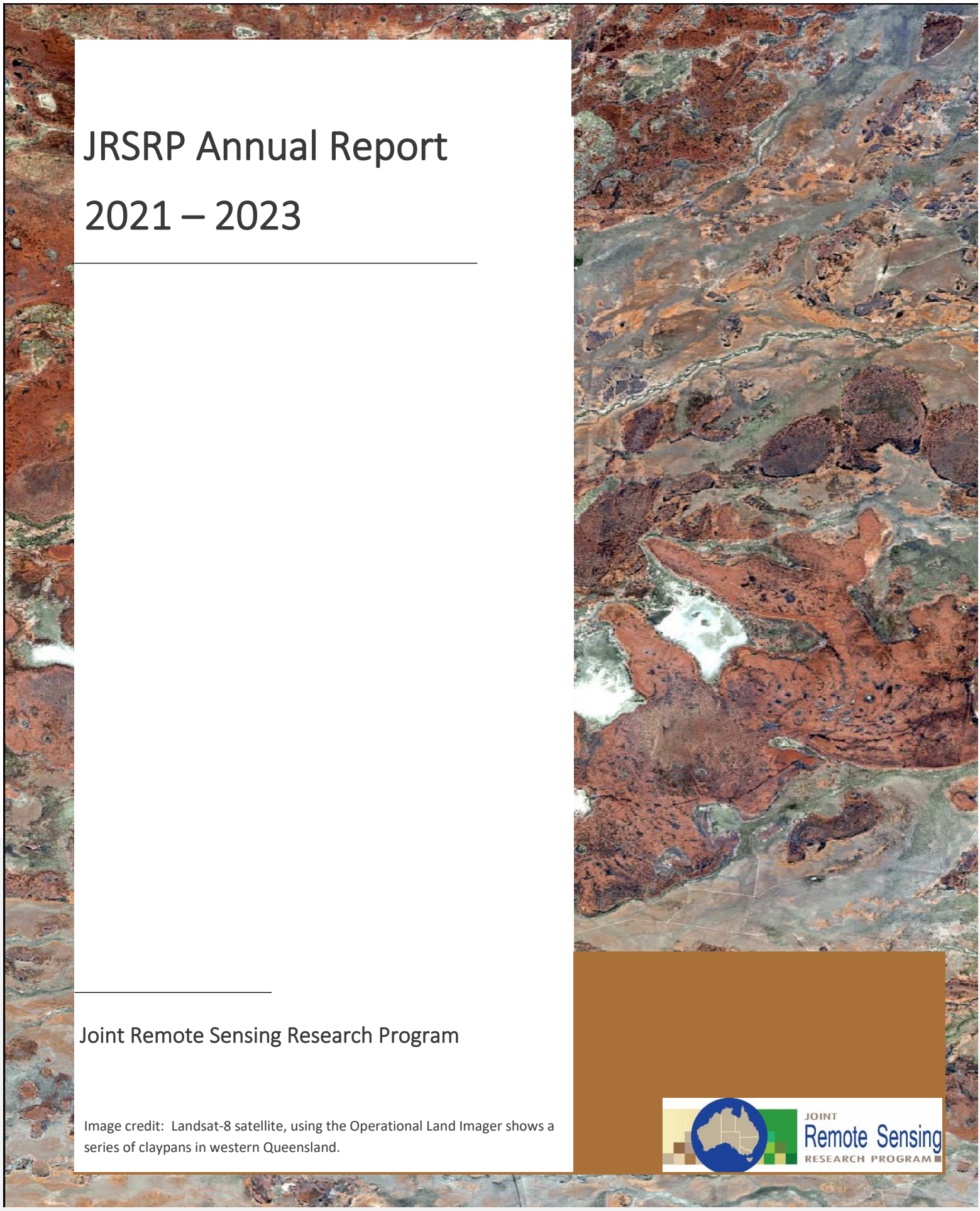

Image credit: Landsat-8 satellite, using the Operational Land Imager shows a series of claypans in western Queensland.

JOINT Remote Sensing RESEARCH PROGRAM

# Welcome

The period 2021–2023 has been a time of major change for the Joint Remote Sensing Research Program (JRSRP) on a number of levels including staff, research activities, and future planning. This year is the Program's 16th year of operations and we continue with our core partners in Queensland and New South Wales governments, and our university partners at Universities of New South Wales, New England and Queensland.

In terms of research to operations the following areas were a focus:

- Woody vegetation change and regrowth
- National Fractional cover version 3
- Fire extent and severity mapping
- Grazing and land-condition assessment
- Spatial BioCondition assessment
- New sensor and data stream assessments
- Collaboration and establishment of the Reef Catchment Science Program at UQ
- Communications and outreach

A number of working groups were established to facilitate communication and collaboration to progress the programs research priorities across the states and universities. Three working groups have been established in 2022:

- High Performance Computing Development Operations – developing and establishing procedures to manage the extensive software and hardware resources operating across two state governments, several universities and private industry infrastructure. This includes engaging with national and international Earth Observation (EO) data service providers.
- Lidar – creating and implementing imagery capture, processing and applications.
- Fire monitoring and mapping – development of methods to capture fire extent and severity, historically and into the future.

The "Reef Catchment Partnership Program" was established using the JRSRP legal and operations model between the University of Queensland and Queensland government. This builds on extensive use of JRSRP activities and products in Queensland's reef water quality monitoring and management programs.

There has been a rapidly changing global environment of commercial and government Earth Observation (EO) data sources in regard to new satellites and satellite constellations being launched, new EO data services and processing capabilities. The Program was and will remain stretched to recognise and assess the aforementioned for use in JRSRP activities. This over-extension includes national EO program engagement in Australia, directly through our roles in the Copernicus Australasia Regional Data Hub and in delivering and running Earth Observation Australia.

The degree of national support and engagement for EO as a national "space priority" has significantly reduced, and we are seeing a welcome focus towards accurate and quantitative environmental monitoring, especially for vegetation, that requires field and satellite data. This is an area we will focus on more in 2023–2026.

The program has reduced its number of senior research staff due to a departures and changes of funding priorities but has been able to maintain a core set of highly experienced, collaborative and supportive staff, along with a new position dedicated to communication and outreach.

We should recognise the critical role our Program Manager, Jo Edkins, continues to play in coordinating all our operations, finance, HR, legal and other activities! Our staff continue to play key collaborative roles in leading and participating in state-, national- and global-EO programs to develop and deliver accurate scientifically and legally defensible approaches for mapping and monitoring changes to vegetation. Often this is not visible in publications or reports, but is the basis for the high quality data, work-flows and services our group deliver - and on which we will continue to build on in the future!

Thank you again to the Queensland and New South Wales governments and University of Queensland for ongoing funding and operational resources to deliver JRSRP and special thanks to all our staff !

Professor Stuart Phinn, 10 May 2023

JRSRP Director

# Our work at a glance

Over the last 24 months, the Joint Remote Sensing Research Program (JRSRP) has continued to make significant progress despite the difficult times and some of the resourcing and capacity challenges our partners have experienced.

Our program has achieved several accomplishments that have advanced our mission of enhancing the value and use of remote sensing data in ecosystem monitoring and management.

These achievements are explored in more detail within the Research Highlights section below, but include:

- Fractional Cover Version 3 development and release
- High Performance Computing Modernisation
- Woody Regrowth Research
- BioCondition model development
- Airborne and terrestrial lidar products and research
- Phloc (aerial photo locator) development and implementation
- Non-woody vegetation disturbance mapping
- Seagrass Mapping
- Agricultural and Horticultural Remote Sensing Achievements

# Governance

The JRSRP is managed and coordinated by the Remote Sensing Research Centre (RSRC) at the School of Environment, The University of Queensland. Specific research activities are delivered through the program's partner facilities.

Governance is managed via the Steering Committee which has primary responsibility for the overall strategic direction, management, and performance of the JRSRP.  Each year an Operational Plan is developed by the Steering Committee, that outlines the programs policies and procedures and documents the current research priorities and funding.

*Steering committee from left to right. Front row: Stuart Phinn, Tom Celebrezze, Andy Clarke, Jo Edkins, Heidi Mawbey, Christina Jones, Dan Tindall. Back row: Tim Danaher, Mitch Lyons, Jim Watson, Robert Denham.*

## JRSRP partners are:

- Remote Sensing Research Centre (RSRC), School of Environment (SoE), The University of Queensland (UQ)
- Queensland Department of Environment & Science (DES)
- New South Wales Department of Planning and Environment (DPE)
- Victoria Department of Sustainability & Environment (DSE)
- University of New South Wales (UNSW)
- University of New England (UNE)

## Steering Committee members:

| NAME | POSITION | ORGANISATION |
|---|---|---|
| Stuart Phinn | Director | Remote Sensing Research Centre<br>School of Environment<br>The University of Queensland |
| Christina Jones | Director | Earth Observation and Social Sciences<br>Science Division<br>Queensland Dept of Environment & Science |
| Dan Tindall | Science Leader | Remote Sensing Sciences<br>Science Division<br>Queensland Dept of Environment & Science |
| Robert Denham | | Remote Sensing Sciences<br>Science Division<br>Queensland Dept of Environment & Science and<br>School of Environment<br>The University of Queensland |
| Tom Celebrezze | Director | Remote Sensing and Landscape Science<br>NSW Department of Planning and Environment |
| Heidi Mawbey | Senior team leader | Remote Sensing and Landscape Science<br>NSW Department of Planning and Environment |
| Tim Danaher | Principal scientist | Remote Sensing and Landscape Science<br>NSW Department of Planning and Environment |
| Adrian Fisher | Senior Lecturer in Remote Sensing | Centre for Ecosystem Science, and Earth and Sustainability Science Research Centre, School of Biological, Earth and Environmental Sciences, The University of New South Wales |
| Mitchell Lyons | Research Fellow | Centre for Ecosystem Science, University of New South Wales and School of Environment<br>The University of Queensland |
| Andrew Robson | Director | Applied Agricultural Remote Sensing Centre<br>University of New England |
| Jo Edkins | Research Program Manager | Remote Sensing Research Centre<br>School of Environment<br>The University of Queensland |

# Purpose and strategy

*"Unite state and national expertise in pure and applied remote sensing research"*

The Joint Remote Sensing Research Program (JRSRP) is a long standing and highly productive collaboration of skilled academic and government staff who have earned international reputations for innovation in remote sensing research.

Our goal is to increase Australia's capacity to conduct pure and applied remote sensing research to implement and assess environmental management policies at local, state and national scales

The program is focused on building the capability of government departments to monitor the environment using earth observation (e.g., satellite imaging), with scientifically credible and legally defensible methods.

With applications for government, advocacy groups, and industry, our research develops practical methods to track change in the environment over time, including mapping and monitoring;

- land use,
- vegetation extent and structure,
- tree health,
- crop condition and yields, and much more.

To continue achieving our purpose, we have developed a comprehensive strategy that is focused on the following key components:

1. *Partnership and Collaboration* - We believe that partnership and collaboration are essential to achieving our objectives. We will continue to foster partnerships and collaboration between private, government, and academic sectors to create the scale and focus necessary to achieve the best outcomes for each state and Australia.
2. *Technical and Human Resource* - We provide technical and human resources and knowledge to enable Australian government agencies to collect and use satellite image data on a sustainable basis. This allows us to produce accurate maps of Australian ecosystems that form the basis for understanding and managing our ecosystems. We provide the highest quality training to support current and future remote sensing and monitoring requirements to industry, private and government sectors.
3. *Awareness and Adoption* - We aim to increase awareness and the adoption of remote sensing technologies and industry standards. We believe that by improving awareness and adoption of

these technologies, we can increase the value and use of remote sensing data in ecosystem monitoring and management.

4. *Cost efficiency* - We aim to maximise benefit from available resources for ongoing research and development by collaborating and sharing capacity and expertise and reducing duplication across state and national agencies.
5. *Innovation* - We aim to continually develop our science and operational systems through strategic research and development and by maintaining high level expertise in our people. We want to inspire and attract new postgraduates to investigate new and streamlined applications and technology. We believe that innovation is essential to achieving our objectives and that by attracting new postgraduates, we can bring fresh ideas and perspectives to our program.

# Research overview

Our program's activities are of critical importance to the state governments of Queensland and New South Wales, who use the program's research and development outcomes to understand and inform policy decisions and implement legislated monitoring activities for:

- vegetation management
- catchment management
- land use planning and practices
- carbon stock assessment
- natural disaster management

We apply the highest quality science to build, implement, assess, and improve procedures so state governments, industry groups and other individuals and organisations (e.g. students, not-for-profits) can get the optimum benefit from remotely sensed data. Governments use the data to map, quantify and monitor changes to ecosystems, specifically vegetation composition, structure, and dynamics.

The JRSRP provides the scale and capability to produce standardised, calibrated and validated biophysical map products, often at meta-scale. We have invested considerable resources into the development of a range of time-series image correction and analysis tools to support our research efforts.

A major accomplishment for the program has been to process over 35 years of Landsat satellite imagery and more recently Sentinel 2, collected over Australia, for consistent environmental monitoring. This extensive archive has significantly improved our capabilities in studying changes and trends in land cover over time.

The integration of JRSRP research involving remote sensing data at different scales, including field data, airborne lidar and imagery, optical and radar satellite imagery is starting to provide new levels of capability.

# Research highlights 2022

## Agricultural and Horticultural Remote Sensing Achievements

The team at the University of New England's Applied Agricultural Remote Sensing (AARSC) are the primary capability in the JRSRP for agricultural remote sensing research, development applications, particularly for industry groups.
Over the past 12-24 months the team have achieved many successful outcomes. These achievements have significantly raised awareness of many agricultural and horticultural industries and delivered new learnings and methodologies which have initiated national change.
Achievements attained include:

- Mapping individual agricultural commodities at the national and international level
- Crop health, Yield forecasting via 'time series' and calibration tree methodologies including the development of the 'CropCount' minimum viable product
- Development of applied remote sensing short courses to increase awareness of the discipline to the next generation and to provide guidance on the use of freely available imagery sources and processing software
- Academic publication of new and novel methodologies
- Creation and dissemination of spatial remote sensing specific education material that inspires the next generation or enables the current one
- Initiating national and international collaboration for the improved utilisation of remote sensing products and technologies

## Airborne and terrestrial lidar products and research

Dr Adrian Fisher (UNSW) and Dr Nick Goodwin (UQ/QLD/NSW) are creating and refining operational code to process airborne and terrestrial lidar enabling the generation of downstream products. A focus is on having an automated process in place so all lidar products created can be readily available and identified through standard naming conventions. The process is being applied to Queensland and New South Wales data collections for Government and University access. Products and metrics may be made more widely available in the near future.

*Figure 1: Terrestrial lidar forest image*

Additionally, the team are undertaking research and development into best methods for field data collection of both the terrestrial laser scanner and drone equipped lidar sensors, with a focus on vegetation structure metrics, but also some other landscape attributes such as erosion features (e.g. gullies). This enables collection of data in standard approaches that enable effective calibration and validation of satellite-based products, but also as standalone monitoring. It also ensures the most efficient storage of data without compromising quality or coverage.

## Spatial BioCondition

Dr Lucia Morales (QLD) and Dr Leonardo Hardke (UQ/QLD), in collaboration with the Queensland Herbarium and Biodiversity Sciences have developed a framework for modelling and mapping vegetation condition for biodiversity. This is a requirement for the Queensland Government to support biodiversity management and ecosystem services, including natural capital programs. Importantly, the target product only requires Sentinel-2 data products which are generated by the JRSRP and available state-wide and easily repeatable.

The code that the team has created to support the framework relies on Queensland's Regional Ecosystem mapping and field data from the Queensland Government's BioCondition assessments. As the code and product conception have developed and evolved, field assessments have been completed to validate the accuracy and validity of each improvement, with positive results. The first map products are planned for release in 2023-24 financial year. These are for the Brigalow Belt and South-east Queensland bioregions.

The ongoing enhancements have included incorporation of fractional cover derivatives including temporal metrics for foliage projective cover and growing season parameters from the NDVI. This has enabled the model to be refined from the original thirty input datasets to twelve.

The first Spatial BioCondition data products are planned for public release in 2023-24 financial year. These are for the Brigalow Belt and South-east Queensland bioregions. The extensive code library which has been created through the development of the framework may become available through Git to assist other jurisdictions or researchers who may be interested in developing similar approaches.

## Fire Extent and Severity Mapping (FESM)

FESM is a remote sensing assessment of the loss or change in vegetation caused by fire. An operational system was launched in 2020, in collaboration with Rural Fire Service, and delivers fire extent and severity mapping in near real time with annual state-wide annual mosaics publicly available on SEED.

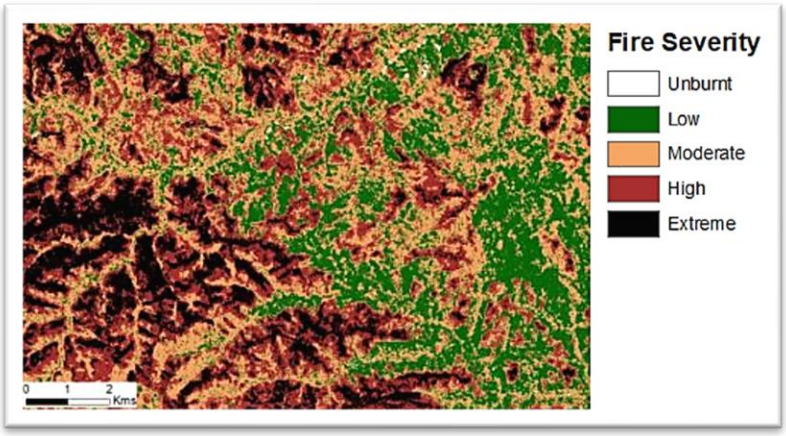


*Figure 2: Fire severity mapping example*

Applications for FESM include

- Historical fire severity mapping for priority and eventually all NPWS areas back to 1989
- Timeseries fire severity mapping for Fire Frequency data and Fire Seasonality for each severity class.
- Hazard reduction burn planning, via FireTools and a severity forecast modelling pilot project

In 2022, research and development continued to provide further field validation and refinement of the post-fire recovery monitoring system. Fire severity, post-fire recovery and landscape patterns of fire were synthesised to create decision support tools for NPWS, Applied Bushfire Science (ABS) Program and other fire and land managers.

Research and collaboration with Macquarie University and JRSRP, funded by Smartsat CRC, is looking at integration of radar and optical sensors to test capability to map structural change in post-fire recovery, and develop a new fire progression mapping method.

## Fractional Cover Version 3

Accuracy in the Fractional Cover (FC) data and products is important since they are foundational for many other downstream products. For example, FC underpins many state / territory and national archives including SLATS and spatial bio-condition, Reef Programs (especially P2R), fire management and planning, grazing land management (e.g., FORAGE, VegMachine, DCAP), and natural capital.

The v3 algorithm has been calibrated on a much greater pool of field data from the national program than v2 and can therefore be assumed to have greater confidence across a range of landscapes, where additional field sites have been included. It addresses some known misclassification issues and can be applied to Landsat or Sentinel-2 imagery.

This update was a major undertaking, and key products have been made publicly available through TERN and information delivery platforms including VegMachine and FORAGE.

## High Performance Computation Developments

Robert Denham (UQ/QLD) and the DES team have been implementing some new workflow and code management systems within the QLD partners High Performance Computing system to allow for greater flexibility, mobility of processing, sharing of information and a system readily adaptable to cloud based performance. This has been assisted by initiatives within DES's Science Division aimed at modernizing computing infrastructure to be more flexible and adaptive between on-premise hardware and software and off-premise facilities, such as commercial cloud platforms.

The changes and benefits to some parts of the DES systems include:

- Implementing for CI/CD– Continuous integration Continuous deployment.
- Cloud based preparation through trials of cloud and hybrid HPC-cloud approaches to processing
- Notebook compatibility for a more interactive way to access data and resources
- Sharing learning and resources more easily

The streamlined operation of the system is fundamental to all data analysis and processing for state-based reporting and production of some national products, as well as for more local and regional scale applications for specific government requirements. Optimal performance is paramount so informed, comprehensive evidence-based decisions can occur more efficiently, with transparency and accountability.

## Non-woody vegetation disturbance mapping

Vegetation management legislation in NSW applies to both woody vegetation and non-woody vegetation such as grasslands. Over recent years a Seasonal Cover Disturbance Index (SCDI) method was developed by a DPE and UQ research team. It's an index of disturbance based on a time series analysis of Landsat fractional cover data that is designed to highlight disturbance in non-woody vegetation.

This method was initially used in the development and maintenance of a Native Vegetation Regulatory Map and is now used by other DPE science groups in creating vegetation maps and condition models.

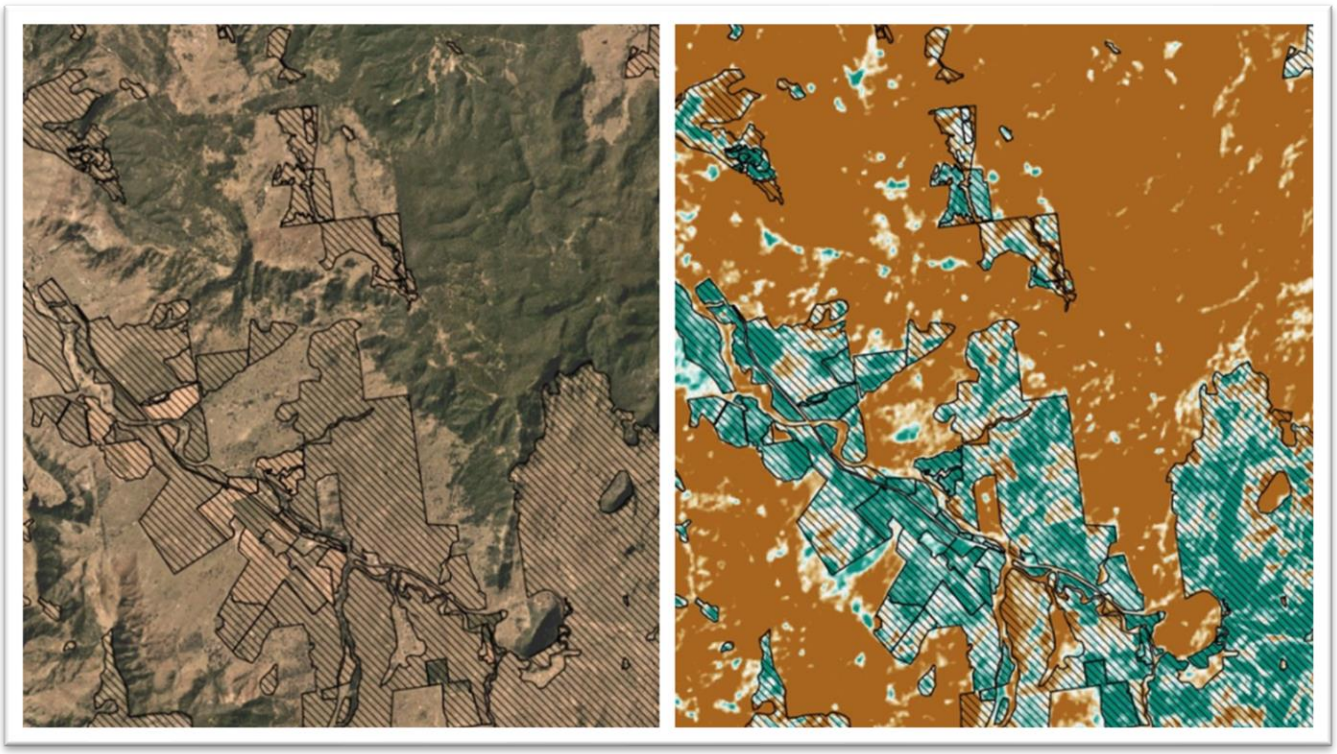

*Figure 3: Planet™ colour composite image (Left) and SCDIndex image based on 1987–2017 Landsat images (Right)*

## Phloc (Photo locator)

In NSW historical aerial photos are captured and recorded from approximately 1928-2007. Efforts to digitise these films are hampered by quirks of the pre-digital era, such as error-prone hand-written metadata, so rectified historical photos have typically been processed manually as needed. This means that current imagery services providing access to large collections of digitised historical photography is not always accurately rectified.
An algorithm developed by the JRSRP addresses these issues by

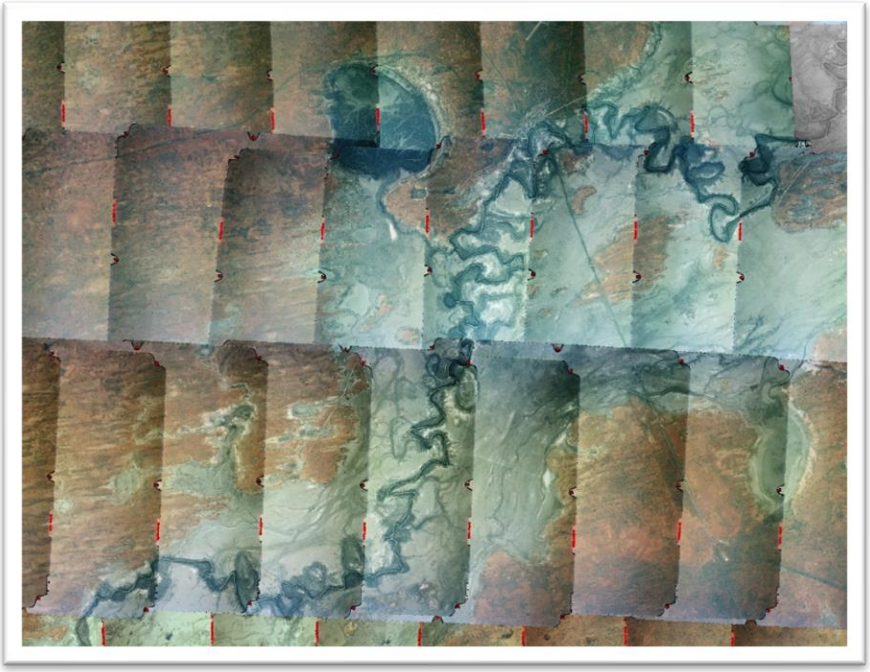

*Figure 4: Example of phloc aligning digital filmscans*

not relying on metadata. The method scales to state-wide operational processing of hundreds of thousands of images. This automated approach eliminates the need for extensive filmscan metadata.

The Phloc (Photo Locator) tool matches high-dimensional features between the photo imagery and existing rectified data. Available metadata is used to improve processing time by reducing the spatial search area. Phloc can handle unknown location, flight path, bearing and altitude, allowing photos with erroneous or missing metadata to be recovered for modern use.

## Woody Regrowth

JRSRP in partnership with NSW DPE and the University of Queensland is paving the way to create a process which accurately detects woody regrowth, resulting in a state-wide spatial product for NSW.

The woody regrowth project involves the integration of both radar and optically sensed data to measure biomass and identify the areas of increasing woody vegetation cover within NSW. This is done by using both active (radar and lidar) and passive (optical) sensors.

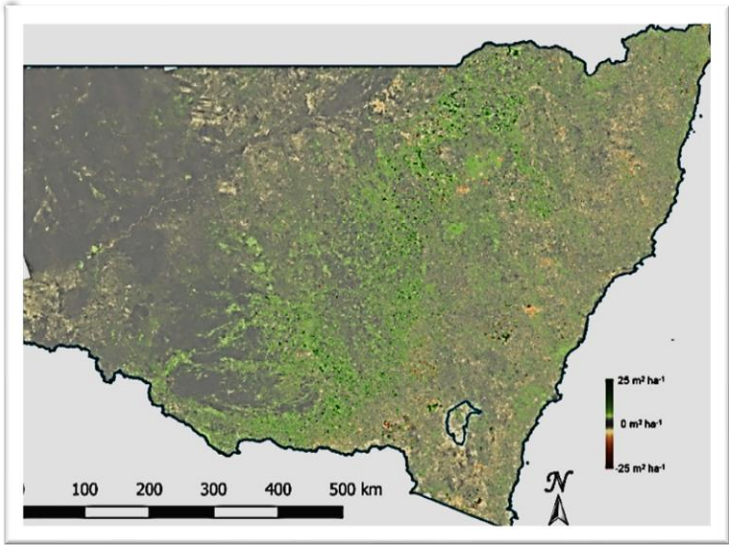


*Figure 5: 7-year change in live tree basal area (LTBA) calculated as the difference in ALOS and ALOS-2 averaged basal area*

To assist with this integrated approach, Dr Anthea Mitchell and Timothy Danaher are developing a new foliage projective cover (FPC) product based on Sentinel-2 imagery and airborne lidar calibration. Preliminary results from this research show a significant improvement in precision of FPC predictions compared to existing Sentinel 2 products based on field calibration data. A number of image corrections have been developed as part of this research to enable use of time series analysis methods.

It is anticipated that the final product will complement the existing SLATS data and form part of an integrated system for monitoring woody vegetation cover change across NSW and the methods may be transferrable to other states, especially Queensland.

## Seagrass Mapping

Dr Mitchell Lyons (JRSRP, UQ), A/Prof. Chris Roelfsema (UQ), Kat Markey (UQ), Robert Denham (JRSRP, DES) and Christian Witte (DES) are working on monitoring the health and extent of seagrass in the coastal marine environment.

The pilot research project occurring in the Morten Bay region is developing methods and processes to map seagrass extent and percentage cover. This will assist natural resource and environmental managers to report on condition and quality and develop management plans and policies based on reliable data.

Project status is on track with refinements being completed. The vision being to apply the process along the coastline of Qld potentially even Australia.

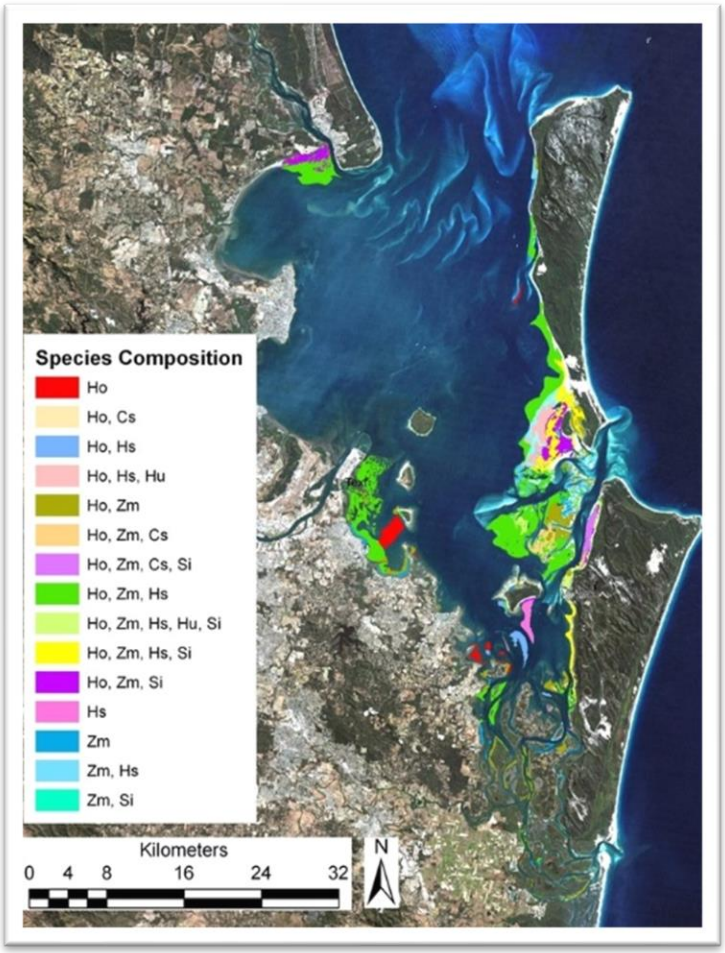


*Figure 6: Preliminary seagrass species composition output*

# Publications

2021

- Chamberlain, D.A.; **Phinn, S.R.**; Possingham, H.P. Mangrove Forest Cover and Phenology with Landsat Dense Time Series in Central Queensland, Australia. Remote Sens. 2021, 13, 3032. https://doi.org/10.3390/rs13153032
- **Fisher, A.G.**, Mills, C.H., Lyons, M. et al. Remote sensing of trophic cascades: multi‐temporal landsat imagery reveals vegetation change driven by the removal of an apex predator. Landscape Ecol 36, 1341–1358 (2021).https://doi.org/10.1007/s10980-021-01206-w

Report

- Department of Environment and Science (2021) Spatial BioCondition: Vegetation condition map for Queensland. Queensland Government, Brisbane.

Data

- Sentinel-2 Fire Scars - QLD DES algorithm - QLD Coverage
- SLATS 2019–2020 Report - Data
- Seasonal fractional cover - Landsat, JRSRP algorithm Version 3.0, Australia coverage

2022

- Sutton, A.; **Fisher, A.**; Metternicht, G. Assessing the Accuracy of Landsat Vegetation Fractional Cover for Monitoring Australian Drylands. Remote Sens. 2022, 14, 6322. https://doi.org/10.3390/rs14246322
- **Gibson, R.K.**, White, L.A., Hislop, S., Nolan, R.H. and Dorrough, J. (2022) The post-fire stability index; a new approach to monitoring post-fire recovery by satellite imagery Remote Sensing of Environment 280(113151), https://doi.org/10.1016/j.rse.2022.113151
- **Gibson, R.K.** and Hislop, S (2022) Signs of resilience in resprouting Eucalyptus forests, but areas of concern: 1 year of post-fire recovery from Australia's Black Summer of 2019-20, International Journal of Wildland Fire 31(5): 545-557 https://doi.org/10.1071/WF21089
- White, L.A. and **Gibson, R.K.** (2022) Comparing fire extent and severity mapping between Sentinel 2 and Landsat 8 satellite sensors Remote Sensing, 14(7), 1661; https://doi.org/10.3390/rs14071661
- Nolan, R.H., Collins, L., Gibson, R.K, Samson, S.A., Rolls, K.T., Milner, K., Medley, B.E., Price, O.F., Griebel, A., Choat, B., Jiang, M., Boer, M.M. (2022) The carbon cost of the 2019-20 Australian fires varies with fire severity and forest type, Global Ecology and Biogeography, 31(10), https://doi.org/10.1111/geb.13548
- Duncanson, L., Kellner, J.R., Armston, J.D., Dubayah, R., Minor, D.M., Hancock, S., Healey, S.P., Patterson, P.L., Saarela, S., Marselis, S., Silva, C.E., Bruening, J., Goetz, S.J., Tang, H., Hofton, M., Blair, J.B., Luthcke, S.B., Fatoyinbo, T., Abernethy, K., Andersen, H., Aplin, P., Baker, T.R., Barbier, N., Bastin, J.F., Boeckx, P., Biber, P., Bogaert, J., Boschetti, L., Boucher, P.B., Boyd, D.S.,

Burslem, D.F.R.P., Calvo-Rodriguez, S., Chave, J., Chazdon, R.L., Clark, D.B., Clark, D.A., Cohen, W.B., Coomes, D.A., Corona, P., Cushman, K.C., Cutler, M.E.J., Dalling, J.W., Dash, J., Dalponte, M., de-Miguel, S., Deng, S., Ellis, P.W., Erasmus, B., Falkowski, M., Fekety, P.A., Fernández-Landa, A., Ferraz, A., Fischer, R., **Fisher, A.G.**, García-Abril, A., Gobakken, T., Hacker, J.M., Heurich, M., Hill, R.A., Hopkinson, C., Huang, H., Hubbell, S.P., Hudak, A.T., Huth, A., Imbach, B., Jeffery, K., Katoh, M., Kearsley, E., Knapp, N., Král, K., Krůček, M., Labrière, N., Lewis, S.L., Longo, M., Lucas, R.M., Main, R., Manzanera, J.A., Martínez, R.V., Mendoza, A.M., Mathieu, R., Memiaghe, H., Meyer, V., Monerris, A., Montesano, P., Morsdorf, F., Næsset, E., Naidoo, L., Nilus, R., O'Brien, M.J., Orwig, D.A., Papathanassiou, K., Parker, G., Philipson, C., Phillips, O.L., Pisek, J., Poulsen, J.R., Rüdiger, C., Saatchi, S., Sanchez-Azofeifa, A., Sanchez-Lopez, N., Scholes, B., Simard, M., Skidmore, A.K., Stereńczak, K., Tanase, M., Torresan, C., Valbuena, R., Verbeeck, H., Vrska, T., Wessels, K., White, J.C., Zgraggen, C., Pretzsch, H., Alonso, A., Kenfack, D., White, L.J.T., Zahabu, E., (2022) Development of aboveground biomass density models for the Global Ecosystem Dynamics Investigation (GEDI) lidar mission. Remote Sensing of Environment, 270, 112845 - 112845, https://doi.org/10.1016/j.rse.2021.112845

- Cunliffe, A. M., Anderson, K., …, **Fisher, A.G.**, …, Lyons M.B., …, & Wojcikiewicz, R. (2022). Global application of an unoccupied aerial vehicle photogrammetry protocol for predicting aboveground biomass in non-forest ecosystems. Remote Sensing in Ecology and Conservation, 8(1), 57-71. https://doi.org/10.1002/rse2.228
- JRSRP Technical Report - Under review (April 2022) **Watson, J., Danaher, T.** The impact of switching the NSW SLATS program from SPOT-5 to Sentinel-2 satellite imagery
- Williams, M.L., **Mitchell, A.L.**, Milne, A.K., Danaher, T., **Horn, G.** (2022). Addressing critical influences on L-band radar backscatter for improved estimates of basal area and change. Remote Sensing of Environment, 272, 112933, https://doi.org//10.1016/j.rse.2022.112933

Report

- DPE (2022) Fire Extent and Severity Mapping: Report for the 2021-22 fire year, NSW Department of Planning and Environment, Paramatta NSW. https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Native-vegetation/fire-extent-and-severity-mapping-report-for-2021-22-fire-year-220509.pdf
- JRSRP (July 2022) Applications of imaging radar in support of Joint Remote Sensing Research Program (JRSRP) core activities

Data Release

- DPE (2022) Fire Extent and Severity Mapping 2021-22 dataset, SEED data portal, https://datasets.seed.nsw.gov.au/dataset/fire-extent-and-severity-mapping-fesm-2020-21-6f70

# Workshop

The JRSRP Annual Research Meet Up was in June 2022. The event was held in UQ Global Change Institute and brought members together after a prolonged period of restrictions so in person collaboration was a definite highlight and the enthusiasm at the workshop evident.
The primary objective of the workshop was to build a shared understanding of current and planned JRSRP partner research activities, and to then identify opportunities for additional future directions, collaboration and a significantly improved program for student engagement.

Topics included

- Research priorities
- Governmental trends
- Working group presentations
- Dev Ops - Systems Development-Operations
- Fire (pre -, during-, and post-fire)
- Vegetation Structure - Various sensors incl. LIDAR/TLS
- Student optimization - Engaging with undergraduate and postgraduate coursework and research students
- Introduction and discussion of “publishing and sharing” JRSRP
- Feedback on working group implementation and ways to improve
- Discussion around new working groups to deliver research priorities
- Attracting building and maintaining skilled staff in the JRSRP

The one-day event provided great insights around working group focus and direction moving forward. There was the continued spotlight on enhancing communications about the JRSRP and preemptive evaluation of governmental needs and priorities and how to best focus work effort. There was also discussions on future research requirements and considerations relating to people, data equipment and funding to enable the continuation of essential research-based outcomes being delivered by the JRSRP.

# Looking forward

Moving forward the JRSRP will continue to operate in alignment with our purpose and strategy. Synergetic relationships with current partners and collaborators within state government, universities and external agencies will be fostered and enhanced enhanced where required and possible.

Technical and human resources within the JRSRP will focus on accurate and quantitative environmental monitoring, especially for vegetation.

Current and ongoing projects include

- Fractional cover v3
- Woody regrowth
- Improvements to vegetation change monitoring for clearing and regrowth, integrating Sentinel 2 imagery and lidar calibration
- Spatial BioCondition
- Airborne and terrestrial lidar research and workflow development
- Seagrass mapping
- Field technology development
- Innovation in computing technologies for processing and workflow management

The JRSRP will continue to orientate and assess ways to provide more efficient and accurate methods of landscape and marine assessment. For example, Terrestrial Laser Scanner and airborne lidar and drone capabilities are providing more detailed vegetation measurements to assist development and refinement of current product. This will set up the basis for ongoing monitoring and calibration and validation capabilities into the future. Further development of vegetation site monitoring is being established in NSW in 2023.

In 2023 there will be a continued focus on promoting and communicating the valuable work being completed within the JRSRP through a range of materials including the release of the remodeled website. This will assist to increase awareness and opportunities within the JRSRP, allow for easy sharing of the current and past research and projects, and provide avenues for interested, postgraduate students or potential employees to get in touch. The program strives to engage new students and believes their innovative and fresh ideas are an essential component to maintaining the programs longevity and positive reputation.

# External collaboration's

We continue to foster partnerships and collaboration between academic sectors, and all levels of government. With a national focus we actively encourage coordination and collaboration across all of Australia.

The Program continues to recognize the importance and show appreciation to all collaborators and is looking forward to another successful year ahead.

Agencies the JRSRP collaborates with are listed below.

- QLD Department of Environment and Science (including Queensland Herbarium and Biodiversity Sciences, Office of the Great Barrier Reef and World Heritage and QPWS)
- QLD Department of Resources
- QLD Department of Agriculture and Fisheries
- QLD Fire and Emergency Services
- NSW Rural Fire Service
- NSW National Parks and Wildlife Service
- Geoscience Australia
- TERN
- NT Government
- TAS Government
- University of Tasmania
- Copernicus Australasia Regional Data Hub
- University of Maryland
- Reef Catchments Science Partnership
- Australian Collaborative Land Use and Management Program & National Committee for Land Use and Management Information
- CSIRO
- Bush Heritage Australia
- Nature Foundation

# Financial Statement

## 1 July 2021 to 30 June 2022

| | | |
|---|---|---|
| **Revenue** | | |
| Carried forward* | 1,483,381 | |
| Research funding | 1,114,025 | |
| **Net revenue** | | $ 2,597,406 |
| | | |
| **Expenditure** | | |
| AEO Forum 2022 coordination contribution | 1,211 | |
| Web services | 3,527 | |
| Travel, training, and conferences | 1,228 | |
| Salaries | 841,425 | |
| **Total Expenses** | | $ 847,391 |
| | | |
| **Net Operating Income AUD$ (GST exclusive)** | | $ 1,750,015 |

## 1 July 2022 to 30 June 2023

| | |
|---|---|
| **Revenue** | |
| Carried forward* | 1,737,087 |
| Research funding | 1,260,023 |
| **Net revenue** | $ 2,997,110 |
| | |
| **Expenditure** | |
| AEO Forum 2022 coordination contribution | 12,564 |
| Web services | 4,540 |
| Equipment and maintenance | 2,775 |
| Travel, training, and conferences | 15,310 |
| Salaries | 944,105 |
| General operating expenses | 79 |
| **Total Expenses** | $ 979,373 |
| | |
| **Net Operating Income AUD$ (GST exclusive)** | $ 2,017,737 |

* Carried forward denotes balance for forward committed for salaries and associated research expenses

# Glossary and acronyms

| | |
|---|---|
| CSIRO | The Commonwealth Scientific and Industrial Research Organisation |
| DES | Queensland Department of Environment and Science |
| DevOps | Development Operations |
| DPE | NSW Department of Planning and Environment |
| EO | Earth Observation |
| FPC | Foliage projective cover is the percentage of ground area occupied by the vertical projection of foliage |
| HPC | High Processing Computer |
| Landsat | The Landsat program is a series of Earth-observing satellite missions jointly managed by NASA and the U.S. Geological Survey |
| LiDAR | Light Detection and Ranging (LIDAR) is a technology that utilises lasers to determine the distance to an object or surface. |
| NPWS | NSW National Parks and Wildlife Service |
| Phloc | Aerial photo locator |
| Planet™ | Satellite imagery supplier since 2010. Satellite imagery sources are commonly known as SkySat, PlanetScope and RapidEye. |
| Python | Python is a computer programming language |
| RFS | NSW Rural Fire Service |
| RSRC | Remote Sensing Research Centre |
| SEED | Portal for Sharing and Enabling Environmental Data in NSW |
| SLATS | Queensland's and NSW's state-wide land-cover and trees study |
| SPOT | SPOT SPOT (Système Probatoire d'Observation de la Terre) is a high- resolution, optical imaging earth observation satellite system |
| UNSW | University of New South Wales |
| UNE | University of New England |