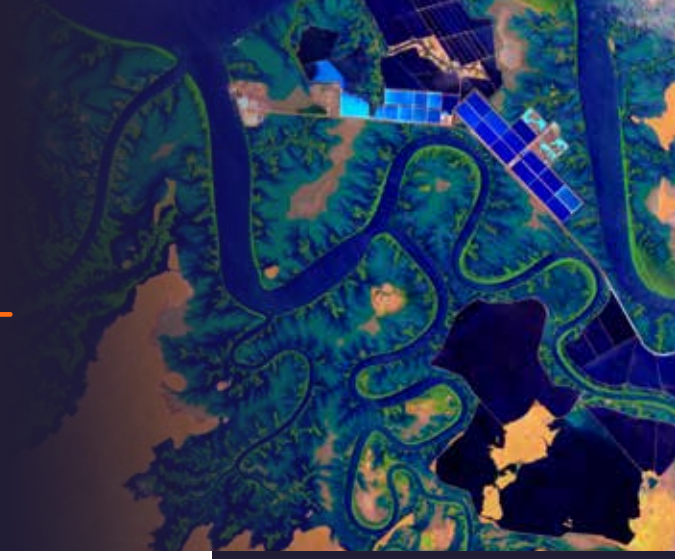
FRONTIER SI

CAPABILITY STATEMENT
ENVIRONMENT



WHO WE ARE

We harness the power of collaboration and our extensive networks to build top-tier teams dedicated to solving significant problems. As a leading social enterprise, we focus our deep spatial expertise on developing and implementing solutions to meet challenges across multiple sectors.

With a deep commitment to supporting environmental stewardship, we leverage cutting-edge technologies and spatial data to deliver accurate and reliable data insights and solutions that contribute to the preservation and sustainable management of our environment and natural resources.

Few technologies can match the profound impact that spatial technology offers and few companies can match the deep expertise, extensive network and track record of FrontierSI.

THE IMPERATIVE

Climate change, pollution, and biodiversity loss are global planetary challenges that affect nearly every aspect of Australian society. Spatial information and services help address these challenges by providing substantial efficiencies and cost savings through applying smart models, artificial intelligence (AI) and machine learning (ML) techniques to the wealth of data now available from satellites and other key sources.

ADDRESSING ENVIRONMENTAL PRIORITIES

FrontierSI is committed to providing innovative spatial solutions to manage biodiversity decline, support environmental monitoring & reporting and provide insights to address climate change impacts more effectively.

Using advanced remote sensing techniques and imagery analysis, we can detect and monitor changes in the environment over time, enabling precise tracking of ecosystem health, land use changes, habitat dynamics and climate change impacts.

Data & Decision Support
Biodiversity Decline

Measure & Monitoring
Environmental Reporting

Risk Identification & Analysis
Climate Change Impacts

OUR CAPABILITIES

Analytics & Insights – Tailored Solutions using Earth Observation (EO)

FrontierSI's data science team specialises in developing fit-for-purpose solutions that leverage satellite imagery, aerial photography, UAV imagery and lidar data with state-of-the-art machine learning (ML) and artificial intelligence (AI) and lidar algorithms. Our expertise in this area has been applied to extracting, mapping, and modelling vegetation extent, density, species, health and change; hydrology features including rivers, waterbodies and coastlines; bushfire and smoke plume extents; farm-scale natural capital such as soil, pasture and crops; and land and sea surface features. Using needs-based co-design and adapting methods for efficient operational use, our team excels at co-developing practical solutions that ensure trustworthy and client-oriented outcomes.

Rapid Prototyping and Technology Development to support decision making

Our solutions team bring a wealth of experience in developing technical solutions including rapidly prototyping new ideas to explore feasibility, product design, full-stack development, testing, and software engineering across commercial and open-source solutions. FrontierSI developed significant components of Geoscience Australia's AusSeabed Data Hub including the Survey Coordination Tool (SCT) and several quality assurance check tools such as QAX and Mate. We have led pilot projects deploying satellite telecommunications Internet of Things-enabled sensors for aquaculture in Western Australia and automatic groundwater collection in South Australia. With a consortium of partners, we delivered the Van KIRAP Climate Information Services portal empowering the Vanuatu government with actionable climate impact assessments.

OUR SERVICES

We offer a range of services including customised solutions to meet client needs underpinned by our expertise. A selection of these services is provided below.

- Environmental Impact Assessments
- Mapping Vegetation & Land Use Changes
- Fauna and Flora Species Distribution Models
- Tailored Data Science Models for Reporting and Monitoring
- Environmental monitoring tools
- Custom reporting dashboards
- Climate Modelling & Scenario Analysis
- Risk Identification & Vulnerability Assessments
- Natural Hazards Monitoring

SUPPORTING SERVICES

- Advisory Services
- Model Development
- Applied Research and Research Translation
- Case Study Development
- Innovation Programs & Technology Testbeds
- Technology Development
- Stakeholder Engagement
- Complex Project Management

CASE STUDIES

Measuring and Monitoring for Environmental Reporting with real-time change

Project: ENVestigator

Client: Roy Hill, BHP, Rio Tinto, Atlas Iron, Fortescue, Mineral Resources

Project Partners: Department of Water and Environment Regulation (DWER), and the Department of Biodiversity Conservation & Attractions

Mining activity that facilitates resource extraction inevitably impacts on the surrounding environment highlighting the importance of sustainable and responsible mining practices. Part of responsible mining practice is to provide continual environmental management planning, monitoring, and compliance reporting to mining regulators.

Over the past three years FrontierSI together with Curtin University, mining companies and regulators co-designed and delivered two projects that used remote sensing data to monitor Groundwater Dependant Vegetation (GDV) to investigate potential areas of concern.

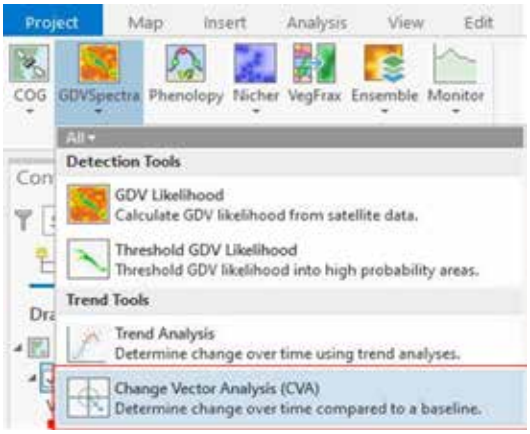
The output from these two projects, **ENVestigator Tools**, is an interactive ArcGIS Pro plug-in that offers a suite of functionalities to assist users in detecting and monitoring GDV, vegetation species and more broadly monitoring vegetation health at a tenement-scale.

A third project is now underway to extend the ENVestigator Tool capability to include monitoring of GDV or rehabilitated areas relative to a reference site or pristine area, species discrimination, disturbance mapping, wetland mapping and fine-scale monitoring of inflow-dependant ecosystems (IDE's), threatened ecological communities (TEC's) & priority ecological communities (PEC's).

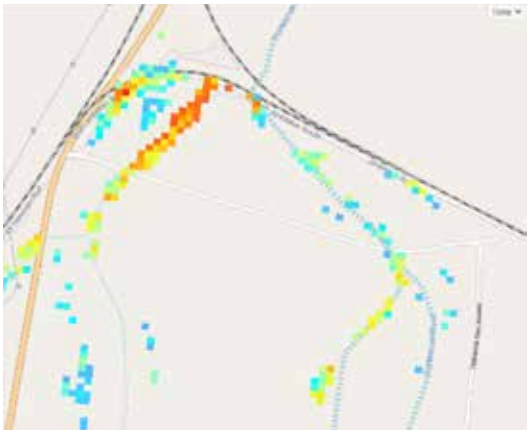
The benefits of the ENVestigator Tool are its ability to:

- Provide near real-time analysis of satellite imagery.
- Provide early warning of vegetation health decline.
- Improve ground-survey efficiency by prioritising locations to visit.
- Support decisions from anywhere in the world.
- Be extended to incorporate additional modules to support enhanced environmental modelling and monitoring and timely decision-making.

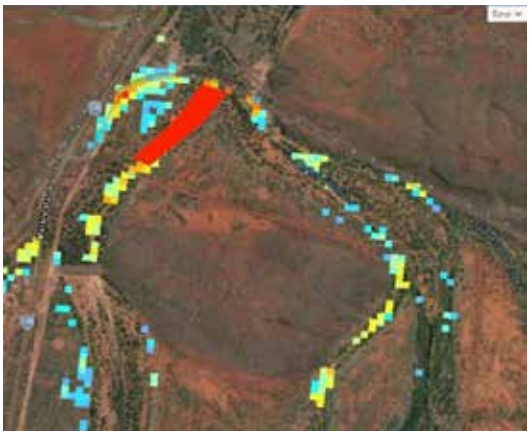
Figures a,b & c on the right highlight a function of the ENVestigator Tool as to how users can identify areas of significant vegetation decrease along drainage zones for ongoing monitoring, with 'hotter' colours indicating more pronounced changes compared to the baseline period.



a) ENVestigator Toolbar options



b) Analysis output with 'hotter' colours indicating more pronounced changes compared to the baseline period



c) RED polygon showing the area identified for real-time on-going monitoring uses the outcome from figure (b)

"The development of the ENVestigator tool has produced a remote sensing data processing stream abstracted from complicated software that allows users to focus on the environmental questions at hand. This is important, as other more generic methods can and do struggle in the unique physical environment of the Pilbara. The Department of Biodiversity, Conservation and Attractions (DBCA) is supportive of this rigorous and targeted methodology."

Bart Huntley, Department of Biodiversity, Conservation and Attractions

CASE STUDIES

Strengthening Climate Change Preparedness with EO Data

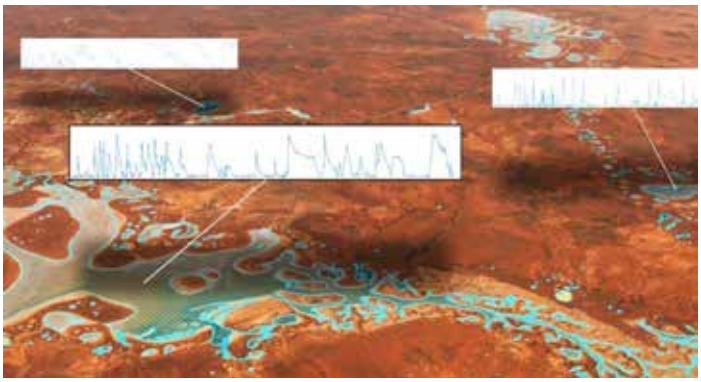
Project: Identifying Water Sources for Aerial Firefighting

Client: Natural Hazards Research Australia (NHRA)

Project Partners: National Aerial Firefighting Centre (NAFC), Geoscience Australia (GA), National Council for Fire and Emergency Services (AFAC), and Country Fire Authority of Victoria (CFA)

To identify locations for aerial firefighting operations the National Aerial Firefighting Centre (NAFC) rely heavily on accurate data about surface water availability for planning and decision-making during active fire events. This was a collaborative project with the team from Geoscience Australia Digital Earth Australia working together to tailor their Waterbodies data product. The team enhanced the waterbodies data product with attributes detailing the latest observation dates for waterbodies to support more accurate information to inform aerial firefighting operations during active fire events. The resulting prototype integrated seamlessly with NAFC's web mapping applications, showcasing how Earth Observation data can significantly bolster firefighting efforts. The research has highlighted the potential to broaden to other applications in areas such as agriculture (dam monitoring) and land/catchment management within the emergency services sector.

The online map can be explored to find all waterbodies larger than 2,700 sq m (three Landsat satellite image pixels) that are present more than 10% of the time.



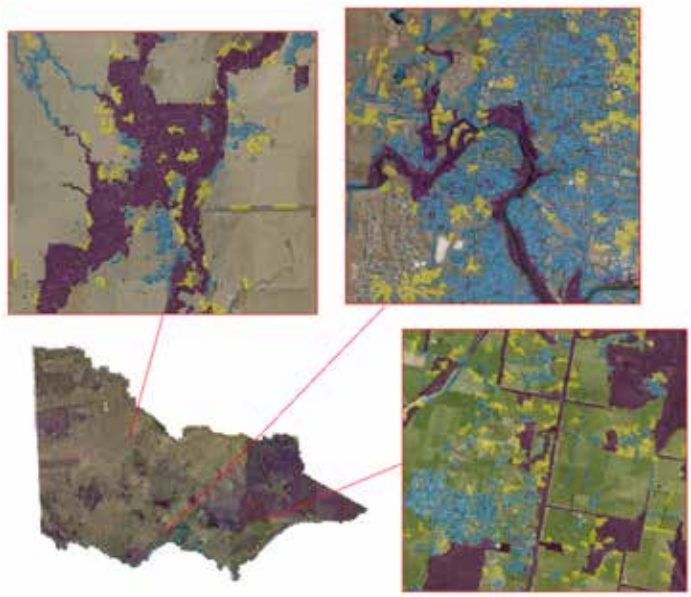
DEA Waterbodies defines polygon boundaries around the significant water areas of Western Australia's Lake Carnegie, revealing changes in wet areas within each polygon over time.

Protecting biodiversity decline with remote sensing and machine learning

Project: Vicmap Vegetation

Client: Department of Environment, Land, Water, and Planning (DELWP) [now Department of Energy, Environment and Climate Action (DEECA)]

The previous vegetation product used by Vicmap mapped the density of tree cover across the state at a spatial resolution of 10m, and temporal coverage from 1991-2001, meaning it was twenty years out of date. The lapse in creation was due to the manual effort required to create the product, as well as the cost associated with purchasing commercial satellite imagery with sufficient resolution. Our data science team used machine learning models to train and produce state-wide 2m resolution tree density data for Victoria from aerial imagery. This project produced a repeatable, consistent, maintainable process that can be run to automate the ongoing generation of this new high-resolution Vicmap Vegetation dataset. This reduces manual effort, increases efficiency, and saves money. A similar machine-learning solution could be applied to generating other vegetation and biodiversity datasets.



State-wide density product showcasing dense areas in purple, medium density in light blue, and sparse regions in yellow.

ADDITIONAL CASE STUDIES

- Spatial Technology for the Victorian State of the Environment
- Change Detection System from High Resolution Satellite Images
- National Digital Twin for Flood Resilience in New Zealand
- Land Unit Classification System (LUCS)
- Earth Observation for Farm Scale Carbon Accounts
- Geoscience Australia's AusSeabed Data Hub
- Van KIRAP Climate Information Services

A SELECTION OF PROJECT PARTNERS & PAST CLIENTS

Commissioner for Environmental Sustainability Victoria

Government of Western Australia
Department of Water and Environmental Regulation

Australian Government

Digital Earth AFRICA

Food and Agriculture Organization of the United Nations

EPA VICTORIA

Government of South Australia
Department for Environment and Water

NAFC
National Aerial Firefighting Centre

Natural Hazards Research Australia

NCCARF
National Climate Change Adaptation Research Facility

Curtin University

Myriota

Queensland Government | Department of Resources

MURRAY–DARLING BASIN AUTHORITY

SMARTSAT
Cooperative Research Centre

TETRA TECH

RMIT UNIVERSITY

UNSW SYDNEY

UC UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

WINYAMA
DIGITAL SOLUTIONS

NGIS

HOW CAN WE HELP?

FrontierSI has over 20 years experience creating practical and innovative solutions for government, industry, and communities to help address problems. We aim to empower businesses within the Environment sector with tailored solutions that harness the boundless power of spatial technology.

Work with us to create customised solutions, enhance your capabilities, and tap into our extensive network and industry expertise.

FRONTIER SI

We know where.

GET IN TOUCH
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