Firetail Environments Pty. Ltd.
1 Halford rd, Castlemaine;
Dja Dja Wurrung,
Victoria. 3450

UAV capacity and capability - Workflows and Data Collection

OVERVIEW

Firetail Environments is a specialist UAV operator in central Victoria providing specialised drone and aerial services in photogrammetry, multispectral, LiDAR and on ground treatment disciplines with a strong reputation for developing tailored solutions for client based outcomes. Firetail works collaboratively with clients to deliver these outcomes that meet specific project needs.

There are numerous options in delivering appropriate UAV outcomes depending on the questions and investigations being posed. Firetail prides itself on understanding the intended project scope and any outcomes that are required to develop the necessary workflows and deliverables that provide the most appropriate data for your project.

1. Standard video and photopoint collection of target area

This can be manually flown with ad-hoc data capture or photopoint data collection that can be planned and scheduled at specific intervals, enabling more accurate comparisons and repeatability over time.

2. Photogrammetry data collection (standard RGB imagery)

Mapping data is collected and processed for GIS applications, such as importing into GIS platforms for data assessment, including vegetation cover, canopy assessment, water levels, inundation, and general landscape surveys.

This method can be integrated with other data collected simultaneously. It delivers accurate mapping data embedded with GIS positioning and elevation information, allowing for a deeper analysis of data and scenarios.

3. Multispectral Photogrammetry

These acquisitions allow a comprehensive analysis that includes plant and surface reflection data. Information can be utilised with specific formulae applied to gain deeper insights into surveillance or plant reflectance scenarios, achieving more accurate analytical results for project objectives.

When using this option, standard RGB imagery is always collected, resulting in the capture of RGB (standard) images alongside independant red, green, red edge (NDRE) and near-infrared (NDVI) bands for formulaic analysis.

4. LiDAR or Light Detection and Ranging data collection

Firetail Environments Pty. Ltd.
1 Halford rd, Castlemaine;
Dja Dja Wurrung,
Victoria. 3450

A highly advanced and detailed acquisition method, using laser and range-based remote sensing to create precise surface models of target areas. Its laser-integrated sensing technology allows for greater penetration through the vegetative canopy, providing a more detailed elevation model of your target area, more detailed assessments are also available including classification of vegetation and terrain, biomass assessments and other three dimensional analysis.

5. Thermal detection and surveys

Thermal services provide the ability to deploy repeatable or ad-hoc surveys targeting native fauna, pest vertebrates such as deer, fox or cat issues or other vertebrate based surveys providing advanced data collection for projects and landscape use.

Thermal surveys can also be deployed to monitor or detect large irrigation issues, hydrological features such as soaks or surface water and also provide landscape condition mapping using thermal temperatures to monitor vegetation and infrastructure interfaces and other environmental conditions between canopy, grasslands and soils.

6. Onground services

Our on ground services deliver precision based spray, seed or fertiliser treatments and with a number of advantages including capacity to cover large areas quickly, providing targeted treatments safely, quickly and efficiently and accessing areas where other treatment methods can be often difficult to deploy.

Utilising leading drone technology alongside precision positioning and mapping data, specific areas and species identified during the planning process can be accurately targeted. This integrated approach enhances treatment effectiveness and results in significant savings in time, resources, and products.

These services are also capable of accessing difficult to reach locations, making them more adaptable and efficient than traditional methods for both environmental and agricultural applications. The same method can also be applied to native seed broadcasting, providing significant opportunity in developing or fortifying native seed banks in soils.

Firetail Environments Pty. Ltd.
1 Halford rd, Castlemaine;
Dja Dja Wurrung,
Victoria. 3450

SERVICE OUTPUTS

Photogrammetry

Photogrammetry surveys involve drones capturing a large number of high-resolution photos over a specific area. These images overlap so that the same point on the ground is visible from multiple angles in different photos. Similar to how the human brain uses information from both eyes to perceive depth, photogrammetry leverages these multiple vantage points to generate coordinate-referenced maps, including 2D and 3D mapping data.

The process results in high-resolution, coordinate-referenced reconstructions that include elevation and terrain information, detailed imagery, and 3D data for every point on the map. This data can be used to create maps and models for various applications, such as vegetation cover assessment, canopy analysis, water level monitoring, and general landscape surveys. The integration of GIS positioning and elevation data enhances the depth of analysis, making it easier for end users to interpret the outputs for more effective decision-making and documentation.

Photogrammetry is a cost-effective method that offers exceptional flexibility in terms of where, when, and how data is captured, making it a valuable tool for a wide range of projects.

Firetail Environments Pty. Ltd.
1 Halford rd, Castlemaine;
Dja Dja Wurrung,
Victoria. 3450

Multispectral and Plant Reflectance

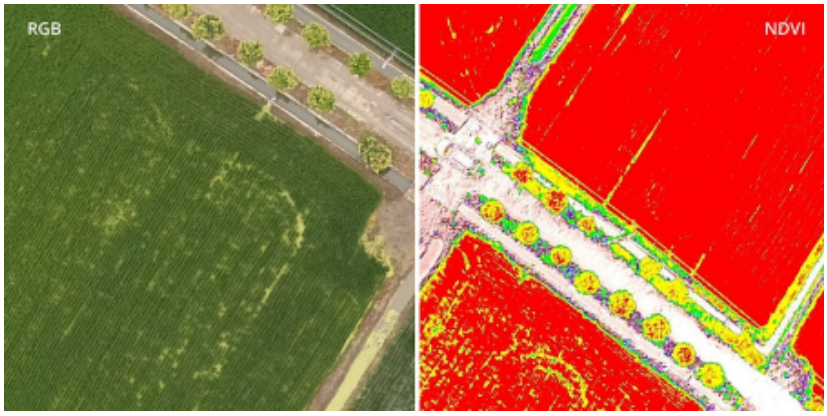
Multispectral surveys capture light in red, green, near-infrared, and red edge wavelengths to produce colour and colour-infrared images of target areas. This imaging technology is a valuable tool for understanding the reflectance, health, and composition of plants or plant communities.

Using the right equipment, plant reflectance imagery can be collected by drone and processed to create map overlays that offer a wealth of potentially cost-saving information. Multispectral imaging simplifies the decision-making and assessment process by providing crucial data on plant health and flora analysis, especially when evaluating specific impacts or land use actions.

Changes in reflectance can reveal stress levels and activity within vegetation and plant communities, enabling more detailed and responsive decision-making tailored to the condition of the plant community. This approach has significant benefits for environmental impact management and other applications, including:

- Targeted use of chemicals
- Weed treatment and surveillance
- Vegetation restoration projects
- Flora reporting and management

For best results, Firetail uses precision positioning and absolute reflectance workflows to ensure detailed replicability across intervals and data collections, enhancing the accuracy and reliability of multispectral imaging outcomes.



comparison between standard RGB imagery and multispectral image processing identifying vegetation health attributes.

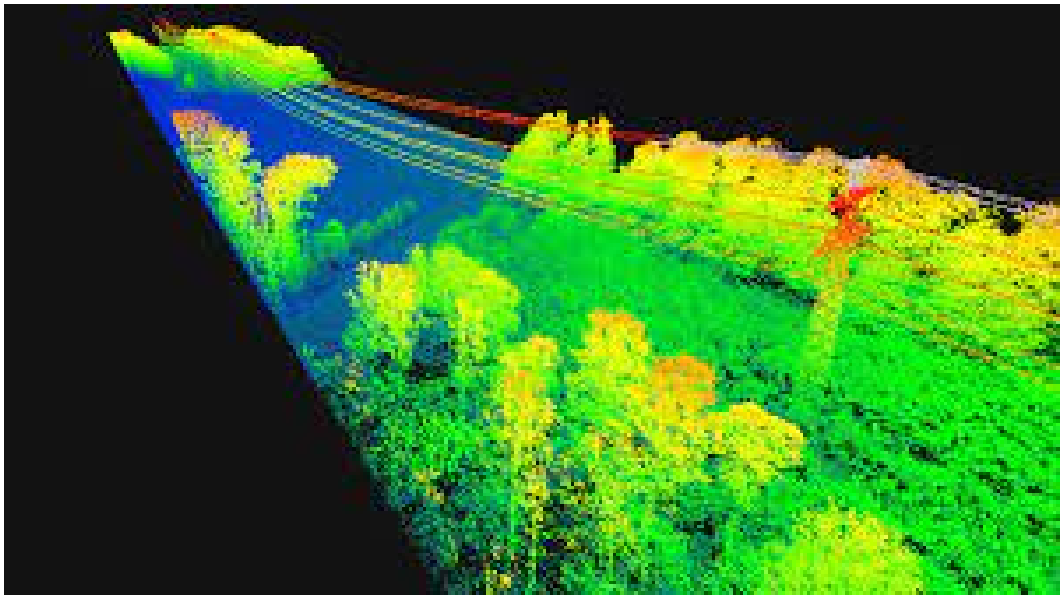
Firetail Environments Pty. Ltd.
1 Halford rd, Castlemaine;
Dja Dja Wurrung,
Victoria. 3450

LiDAR (Light Detection and Ranging) Surveys

LiDAR utilises UAV systems equipped with advanced laser and sensing technology to gather precise and detailed three-dimensional data of target areas. This method is significantly more advanced than traditional terrain modelling photogrammetry, as it measures distances by emitting laser pulses and recording the time taken for them to return, resulting in highly accurate 3D point clouds. These point clouds can then be processed into colourised maps and models.

LiDAR drone surveys are invaluable for a wide range of applications, including topographic mapping, vegetation analysis, infrastructure inspection, flood modelling, and urban planning. This technology provides critical data for industries such as agriculture, forestry, and conservation.

The advantages of using LiDAR from drones include its speed, mobility, and capability to reach inaccessible areas. It allows for faster and more efficient data collection compared to traditional methods, enabling the coverage of large areas with ease. The high-resolution, detailed data collected by LiDAR enables better decision-making, resource management, and problem-solving in various fields



Firetail Environments Pty. Ltd.
1 Halford rd, Castlemaine;
Dja Dja Wurrung,
Victoria. 3450

On-Ground Drone and Aerial Services

Firetail offers customised and detailed on ground drone solutions for environmental and agricultural applications. These services include the spraying of treatment and amendment products, as well as the broadcasting of native and pasture seeds, compost pellets, and fertilisers.

Specialising in challenging projects, Firetail draws on extensive expertise in both environmental and agricultural industries to deliver effective logistical and on ground outcomes. Through meticulous job planning and a deep understanding of technical requirements, Firetail targets specific areas or species with precision.

Utilising advanced drone technology, Firetail employs precision positioning and mapping to plan and execute projects efficiently. These services offer:

- Targeted and efficient foliar applications
- Treatment of difficult weed infestations
- Native seeding of erosion-prone areas
- Over-seeding and reinforcing revegetation efforts
- Spreading compost and fertiliser to reduce soil compaction

The integration of precision positioning with multispectral mapping data allows for the targeted application of products and materials, resulting in significant savings in time and resources. Firetail's on-ground services are highly efficient, enabling coverage of large areas quickly, including those that are otherwise inaccessible, while ensuring treatments are delivered safely and effectively.

Mapping + Positioning for On-Ground Applications

Leading drone technology facilitates the tandem application of products and materials with precision positioning. By deploying mapping drones during the planning phase, Firetail can identify and target specific areas and species, leading to cost effective and accurate interventions. This precision method is especially valuable in environmental weed management, offering a sophisticated approach to identifying, accessing, and treating areas more efficiently than traditional on-ground methods.

Firetail Environments Pty. Ltd.
1 Halford rd, Castlemaine;
Dja Dja Wurrung,
Victoria. 3450

Thermal Assessments and Environmental Management

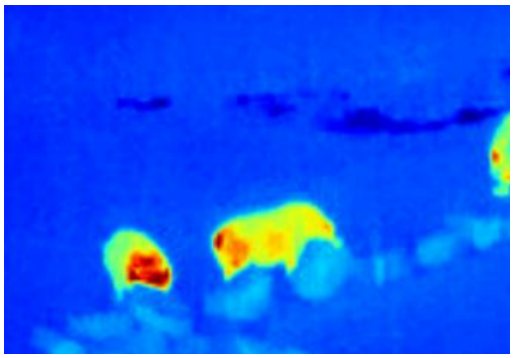
Using drones for thermal inspections of assets, environmental conditions, and locating vertebrate species offers a safe, efficient, and cost-effective solution for identifying specific areas of interest or prescribed targets, particularly in pest vertebrate management.

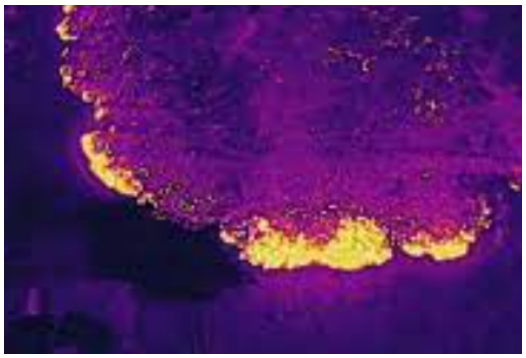
Thermal drone workflows provide flexibility in:

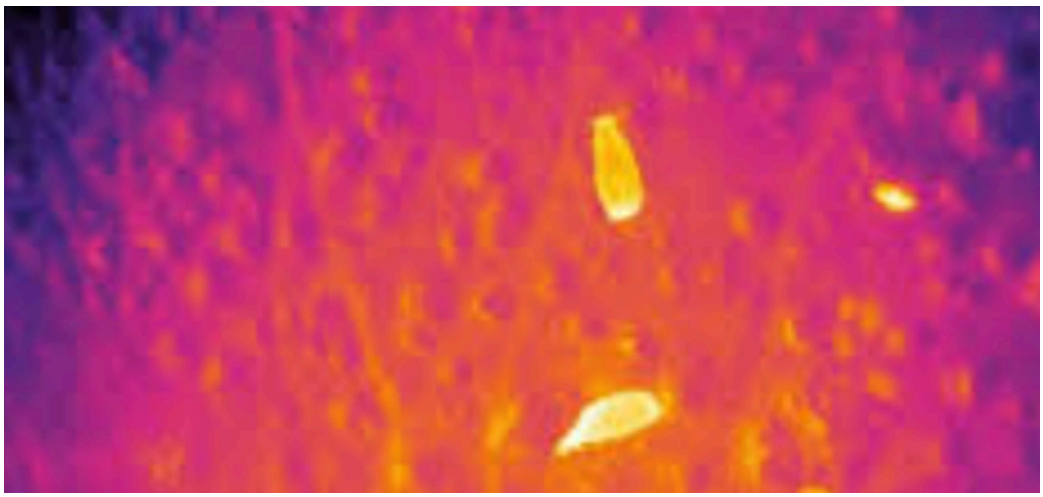
- Accessing remote or dense areas to create thermal maps
- Identifying vertebrate pest targets for management or surveillance
- Conducting transects and searches of vertebrates for data collection, surveys, and reporting
- Analyse ecological fire outcomes including adopting plant reflectance surveys in port burn stages
- Assisting in the counting or identification of vertebrate species in conservation or pest management

These methods allow for the swift scanning of large areas, capturing real-time thermal data that can be used immediately (e.g., relayed to on-ground extermination crews) or analysed to create baseline data and build upon inspection intervals.

High-resolution thermal images captured by our drones can be analysed and processed into comprehensive reports, providing detailed insights for more informed decision-making, all in a fraction of the time required by conventional inspection or monitoring practices.







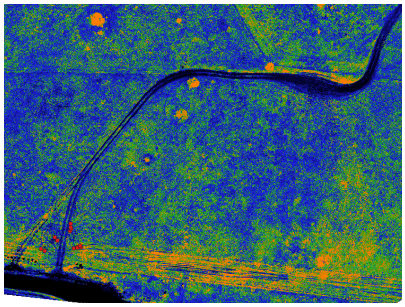
Firetail Environments Pty. Ltd.
1 Halford rd, Castlemaine;
Dja Dja Wurrung,
Victoria. 3450

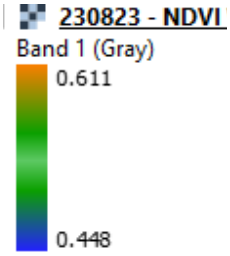
Group training and workshops

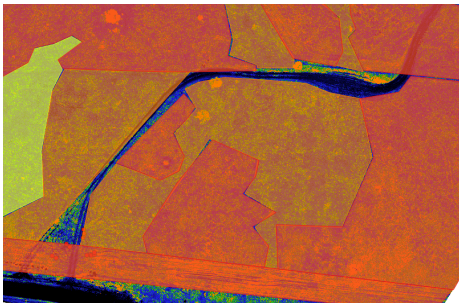
Drawing on extensive experience in technical skills, engineering, design, and tertiary teaching, Firetail Environments offers custom training and designing of drone systems, workflows, and skill development. These services aim to help you effectively utilise your drone fleets to gather and manage the most relevant data.

Training packages include:

- Developing effective management and workflows for drone fleets
- Understanding photogrammetry techniques
- Concepts in multispectral data collection and GIS analysis
- Using ground control points for precise drone surveys
- Advanced GIS training for analysing drone survey data
- Managing and piloting on-ground drones for environmental outcomes







TARGET SPECIES DENSITY	AREA (ha)
HIGH DENSITY (RED)	1.578058
MODERATE DENSITY (AMBER)	0.715684
LOW DENSITY (YELLOW)	0.291682

Current Projects

ASC Corporate Greenhouse Gas Carbon Abatement and Sequestration Policy

Firetail is currently working with Alpine Shire Council in the development of its Corporate Greenhouse Gas reduction and carbon abatement policy.

The project focuses on pathways for the Shire to develop internal carbon sequestration opportunities with local catchment authorities, Landcare groups and Network and other community-led groups to pursue meaningful outcomes in carbon and in biodiversity improvements.

Pale Yellow Water Lily Survey and Aerial Treatment Development

Firetail is working with North Central CMA to survey and monitor populations of Pale Yellow Water Lily in reaches of Gunbower Creek. This project includes five monitoring sites that are treated seasonally and monitored to better understand how the species responds to treatments. It has also evolved to include the development of aerial spray trials and practices to better manage the species in areas of the creek.

Victorian Carbon Program Pilot

Firetail is working with regen Farmers Mutual, as its Lead Regen Advisor in Victoria, to deliver the State Government Victorian Carbon Program Pilot. This program is designed to work with Victorian primary producers to understand their opportunities and take advantage of program incentives to develop well designed carbon and biodiversity projects that can become registered ERF or, once developed, Nature Repair Market projects. The program is currently being piloted in the North Central catchment before rolling out across Victoria.

Weed Surveillance UAV Workflow Development

Firetail is currently working with interested groups and land managers to better identify and assess areas of Serrated Tussock in areas managed for biodiversity values. These methods provide improved management opportunities and assist in reporting and decision making actions for more effective landscape management.

Drones for Hire Victorian Technical Support

Firetail is the Vicorian technical representative agent for Drones for Hire, we work with DfH and its clients to develop appropriate and fit-for-purpose fleet management workflows, provide technical and setup support and provide specialist training in utilising UAV workflows for environmental management

Our Clients and Collaborators