

# UAV-based Terrestrial and Freshwater Ecosystem Monitoring

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## **Abstract:**

Digital imagery derived from a fixed-wing unmanned aerial vehicle (UAV) is used to model topography and gather information on vegetative indices. Our multispectral sensors also provide insight on shallow, freshwater environments. Using a lightweight autonomous platform, Sensefly's Ebee Ag drone, we are developing novel and cost-effective methods to quantify change in geomorphic datasets to monitor dynamics on a regular or event-specific basis. The strategic collection of these data is twofold: 1) Improving the current and future management of regions subjected to changing climate and land-use, 2) At a fraction of the cost of traditional airplane-based data acquisition, gaining insights on biogeochemical characteristics of focus areas. For example, we have partnered with local land resource agencies to detect invasive species among native vegetation using scaled reflectance band detection, and monitoring success of revegetation sites. In addition, we are trialling the use of reflectance data to detect surface algal concentrations in local drinking water reservoirs. Each dataset is captured in short (<30 minute) flights following predetermined transects yielding thousands of overlapping images. Subsequently mosaicked and georeferenced, the compound image is incorporated into a four-dimensional software environment. These decimetre-scale baselines can be used for quantitative and qualitative time-series comparisons. This regional approach provides higher resolution data products, bridging the gap between satellite-derived spatial information and ground-based measurements. Our methods allow for efficient, rapid-response assessments over time.

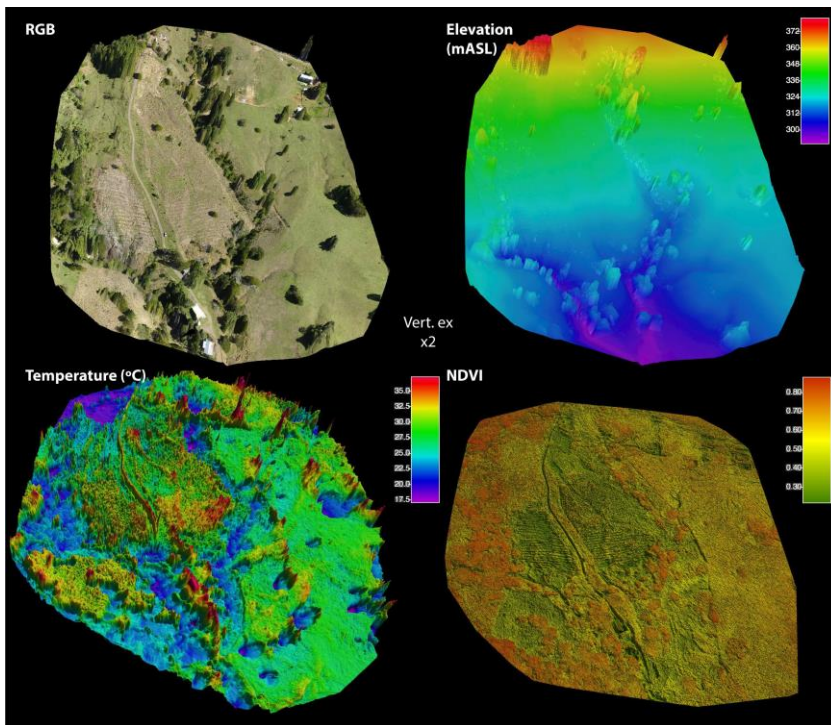


Figure 1. Landslide mosaics from RGB, multispectral and thermal sensor data.