DRONES IN ECOLOGY & GEOLOGY

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Geckoella Ecology and Geology

Why Geckoella Use Drones?

Drones offer a reliable method of surveying natural and anthropogenic environments that complements and advances standard methods.

At Geckoella, we understand the need to embrace new and innovative technology to ensure our clients are provided with a robust and competitively priced service. We have been at the forefront of implementing new and innovative technologies in order to explore complex environments.

Drones are increasingly used by Geckoella; we have a growing track record of providing photogrammetry and mapping services to our clients as a valuable addition to our standard survey methods.

Drones for Ecosystem Survey

Ecosystems often provide multiple benefits, including halting biodiversity loss, mitigating climate change and providing a sustainable income for communities.

It is essential to develop innovative approaches to anticipate and identify future disruptions that erode the ability of habitats to support biodiversity and deliver the ecosystem services upon which communities depend.

Remote sensing, including drones has the potential to revolutionise the way in which flora, fauna and geological features are surveyed and monitored.

Provides Accurate & Extensive Data

One drone survey can provide thousands of data points which can be visualised in a range of formats (orthomosaic, DTM, point cloud, contour lines etc). This data is created simultaneously and increases the range of uses for the collected data.

Surveying Inaccessible Areas

Health and safety is a key component to our surveys at Geckoella. A drone can fly across unsafe or harsh terrain; meaning surveys are no longer limited to areas which can be reached safely on foot or by vehicle.

What are the benefits?
DRONE-ASSISTED SURVEYS ARE OFTEN MORE EFFICIENT AND EFFECTIVE, BECAUSE DATA CAN BE QUICKLY GATHERED AT HEIGHT ACROSS LARGE AREAS

Geckoella drone surveys are undertaken by an in-house commercially licensed drone pilot. All field work is carried out in compliance with CIEEM guidance.
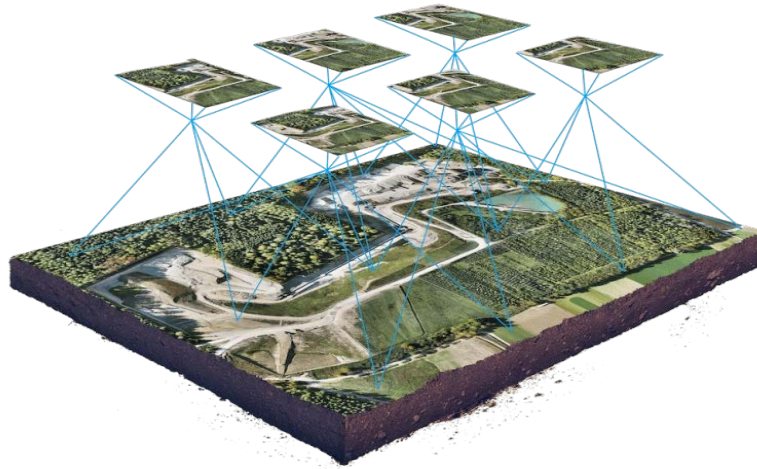
PHOTOGRAMMETORY

3D Point Cloud
A densified point cloud is a collection of a large number of measurements in three dimensions, composed from drone images. During post-processing, this can create a 3D model of the surveyed area which can be navigated from the viewers desk.
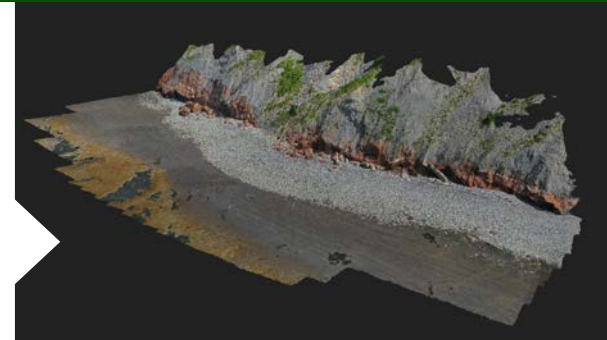
Orthomosaic Maps
Drone images are corrected for image distortion, camera tilt and topographic relief. The images are then stitched together during post-processing to create highly accurate orthomosaic map.

Background
Drone surveys generate high-resolution and detailed models of areas where low-quality, outdated or even no data, are available. With this data, maps can be produced quickly and easily, even for complex and difficult to access environments.
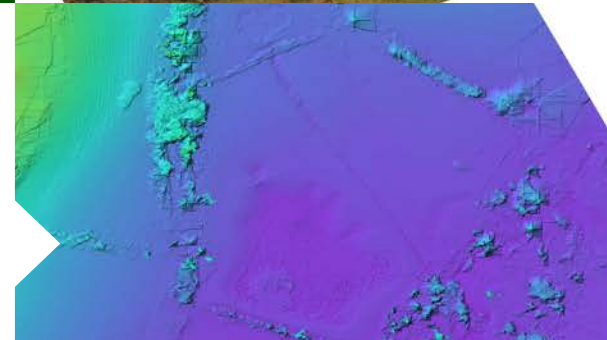
Uses
- Vegetation mapping
- Invasive species monitoring
- Flood risk management
- Condition assessments
- Species counts

A pre-determined flight plan is designed and the drone is flown autonomously in a grid pattern whilst capturing aerial imagery. This allows subsequent surveys to be replicated faithfully, giving highly consistent spatial coverage.

Digital Terrain Model
This captures both natural and artificial features of the environment and grades the feature based on height. These models are regularly used for urban planning.

Plant Health
The assessment of plant health uses the 'Normalised Difference Vegetation Index For Agriculture'. It is a measure of the state of plant health based on how the plant reflects light at certain frequencies.
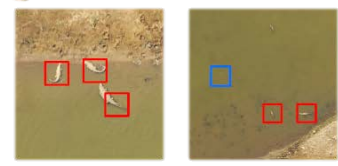
Darker colours equates to more chlorophyll, which is a strong indicator of plant health

POPULATION COUNTS

Recent studies have also shown that drone derived estimates of population size, result in smaller cumulative variance than other methods and hence greater accuracy (Woolcock et al., 2021).

Background

The behaviour and habitat of particular species can make collecting survey data challenging. This is due to the fact that they congregate in large aggregations, move rapidly over large areas and occupy inaccessible habitats. As a result, drone surveys are now used to collect population data on these species.

Compared to traditional methods, drones gather data:

- More efficiently
- More accurately
- Often safely
- With less disturbance on the target species than many traditional methods
- Surveyor bias eliminated

Example 2: Accessing the Inaccessible
Heron nesting surveys were carried out via drone surveys due to the inaccessible location, and the reduction in disturbance as compared to standard techniques.

Animals such as fallow deer in this video can be challenging to survey due to their elusive and timid nature. Drones were able to survey this group without eliciting any adverse reaction.

MONITORING & CONDITION ASSESSMENTS

'On the Edge of a Cliff'

Geckoella is increasingly using drones to aid their condition assessment work. Drones enable the team to safely gather data relating to previously inaccessible areas.

Using drones can also reduce the time required on site, reducing risk for surveyors working in inter-tidal areas.

This was demonstrated in Spring 2022 when working for Natural England on geological SSSI condition assessments. The team obtained high resolution images and videos for key features of the Jurassic Coast World Heritage Site along 30 miles of the Dorset coast.

The image shown on the right is a section of images that are stitched together by software creating a visualisation of the cliff from top to bottom.
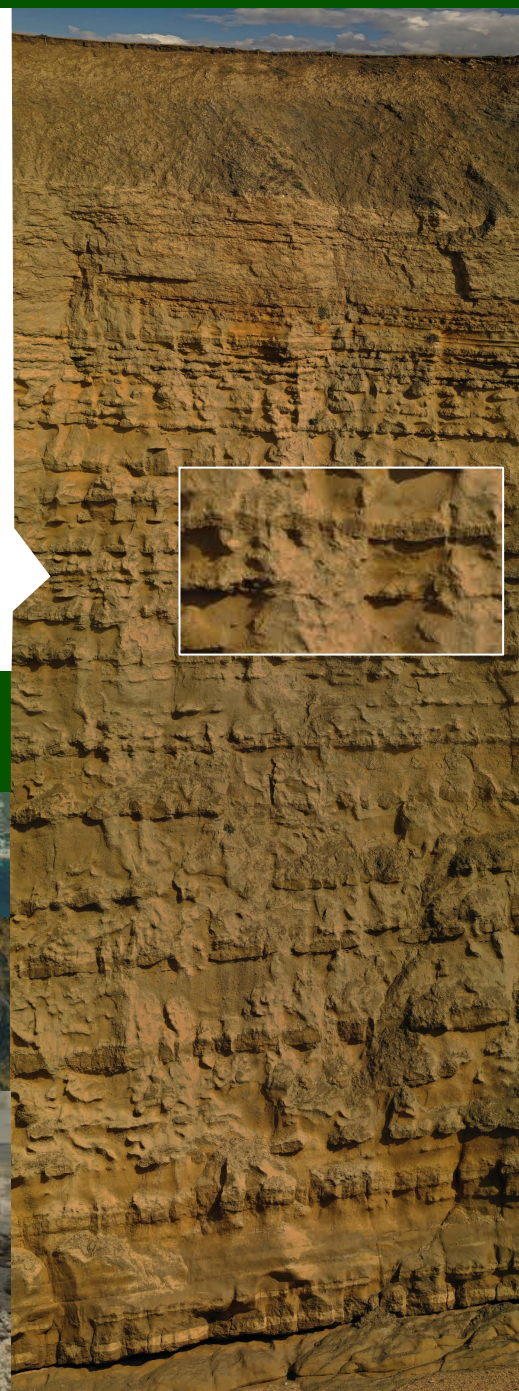
Background

Aerial and satellite imagery often have relatively low resolution and are unfit for detecting small-scale disturbance or change. By contrast, drones can gather highly-detailed geo-located imagery to support condition assessments and impact assessments.
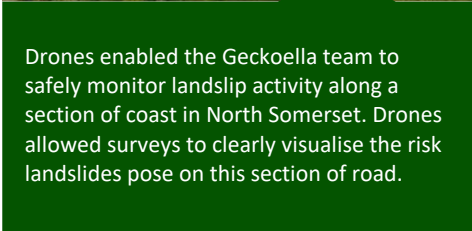
From erosion monitoring to vegetation assessment, drones offer innovative tools which allow the surveyor to obtain highly accurate, repeatable data over various spatial and temporal scales.

Drones can also be used to monitor anthropogenic influences, such as oil spills or the volume of litter on beaches, even allowing the ID and volume of different types of litter.
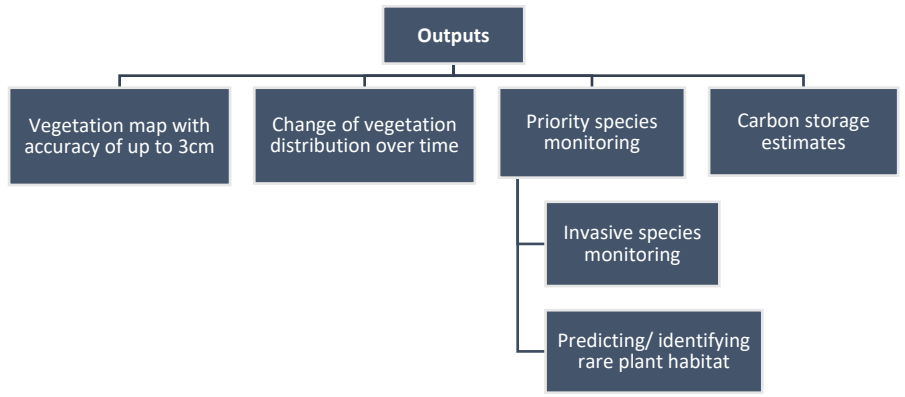
AI techniques can aid auto-classification of features and habitats; sample areas can then be ground truthed by surveyors to ensure and improve accuracy.

Drones enabled the Geckoella team to safely monitor landslip activity along a section of coast in North Somerset. Drones allowed surveys to clearly visualise the risk landslides pose on this section of road.

Drones enable the user to take geolocated images which have the potential to be repeated over consecutive years, highlighting any changes to the survey area.

VEGETATION MAPPING

Vegetation map with accuracy of up to 3cm

Change of vegetation distribution over time

Priority species monitoring

Carbon storage estimates

Invasive species monitoring

Predicting/ identifying rare plant habitat

Geckoella implemented drones to carry out detailed habitat surveys of Bridgwater Bay NNR.
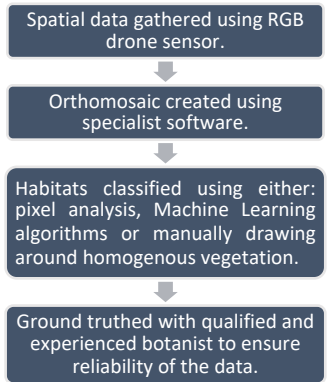
Robust vegetation maps offer an effective means of assessing detailed land use change over time. These maps underpin biodiversity management and planning from local to regional scales.
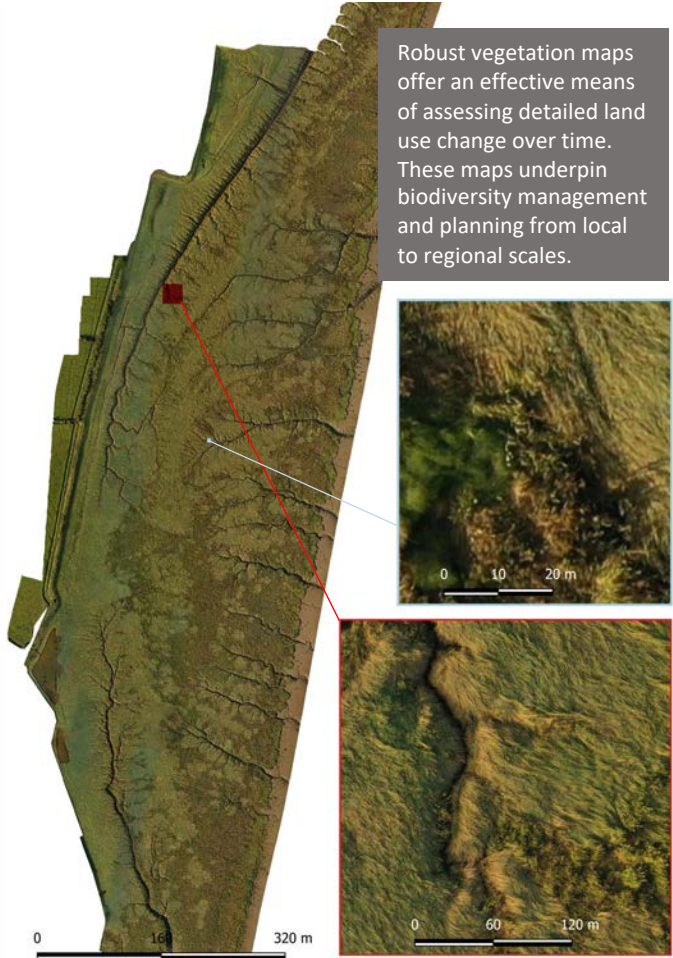
Background

Drone images provide a useful means of assessing habitat types. At its most basic level it is possible to characterise many habitats according to Phase 1, UK Habitat Classification or National Vegetation Classification.

Vegetation mapping workflow:

Spatial data gathered using RGB drone sensor.

Orthomosaic created using specialist software.

Habitats classified using either: pixel analysis, Machine Learning algorithms or manually drawing around homogenous vegetation.

Ground truthed with qualified and experienced botanist to ensure reliability of the data.

Drones enabled the team to map the site from a safe location, in a fraction of the time it would otherwise have taken to walk. Ground-truthing was carried out at a number of accessible control points to ensure reliability of the data.

The area in question is undergoing managed coastal realignment and is therefore subject to rapid vegetation change. The initial drone survey can act as a baseline and accurate vegetation change over various temporal scales can be obtained through repeated drone surveys.

Using a digital terrain model, generated through the analysis of the point cloud data, individual trees can be identified. This can then be used to calculate the biomass and even carbon storage.

0   10   20 m

0   160   320 m

0   60   120 m