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An Introduction to Our Drone Surveys

Drones (also known as Unmanned Aerial Vehicles, UAVs) equipped with different sensors can collect rich data about natural assets in an eco-conscious way.

The research team at The James Hutton Institute (JHI) has already used drones in soil health assessment, with ongoing studies examining how aerial imagery, combined with ground-truthing methods, can evaluate soil moisture, composition, and structure. This research provides actionable insights to improve soil health and productivity, leading to higher-quality produce.

A range of natural assets were the target of drone surveys to be carried out at sites owned by JHI and project partner Highlands Rewilding, with access to additional sites at Caerlaverock provided by the Estate and the Nature Reserve teams (Table 1).

Table 1: The surveyed sites and associated Features of Interest (FOI) at each.

Site	Description	FOI 1	FOI 2	FOI 3	FOI 4
Beldorney Estate	Upland/Lowland transition	Grassland	Woodland	Regenerative agriculture	Heathland
Bunloit Estate	Central Highland	Ancient Woodland	Plantation	Peat	
Tayvallich Estate	Coastal Highland (livestock)	Rainforest	Saltmarsh	Heathland	
Glensaugh	Upland farm (livestock)	Peatland (restored)	Grazing	Grassland	Hedgerows
Balruddery	Lowland large-scale agriculture (crops)	Cropland	Hedgerows		
Caerlaverock NNR	Coastal lowland	Coastal	Seagrass	Intertidal	
Caerlaverock Estate	Lowland large-scale agriculture (livestock)	Cattle	Grazing	Grassland	Hedgerows

The JHI fieldwork team consisted of a Civil Aviation Authority qualified and registered drone pilot, an experienced data analyst, and a specialist in using nature tech for natural capital. The drone used was a DJI Matrice 350 RTK, mounted with a Zenmuse L2 LiDAR sensor and guided by an Emlid Reach RS3 RSK receiver. Starting points for the survey were planned from surfaced roads, as the weight of the kit made it difficult to move without vehicular assistance.

Figure 1: The JHI team with the drone, its batteries, and LiDAR sensor about to be unpacked for first flight at Caerlaverock.

A great benefit of using sites managed by our project partners is having contact with estate teams to acquire the necessary permissions to fly! Practically, two to three surveys per day were achievable when battery life and recharging time were considered. A 500m radius of data was collected from each survey, with exact locations agreed between the drone survey and estate teams, balancing the practical considerations with the features of interest (Figure 2).

Each survey was planned well in advance, but bad weather did change a few dates at the last minute! Rain and wind can disrupt flying conditions and battery life, and snow cover can also cause problems.

However, good weather prevailed for long enough over the Scottish summer to collect all our drone survey data, which was processed using DJI Terra Pro Terrasolid software – a bundle of Terrascan and TerraModeler UAV.

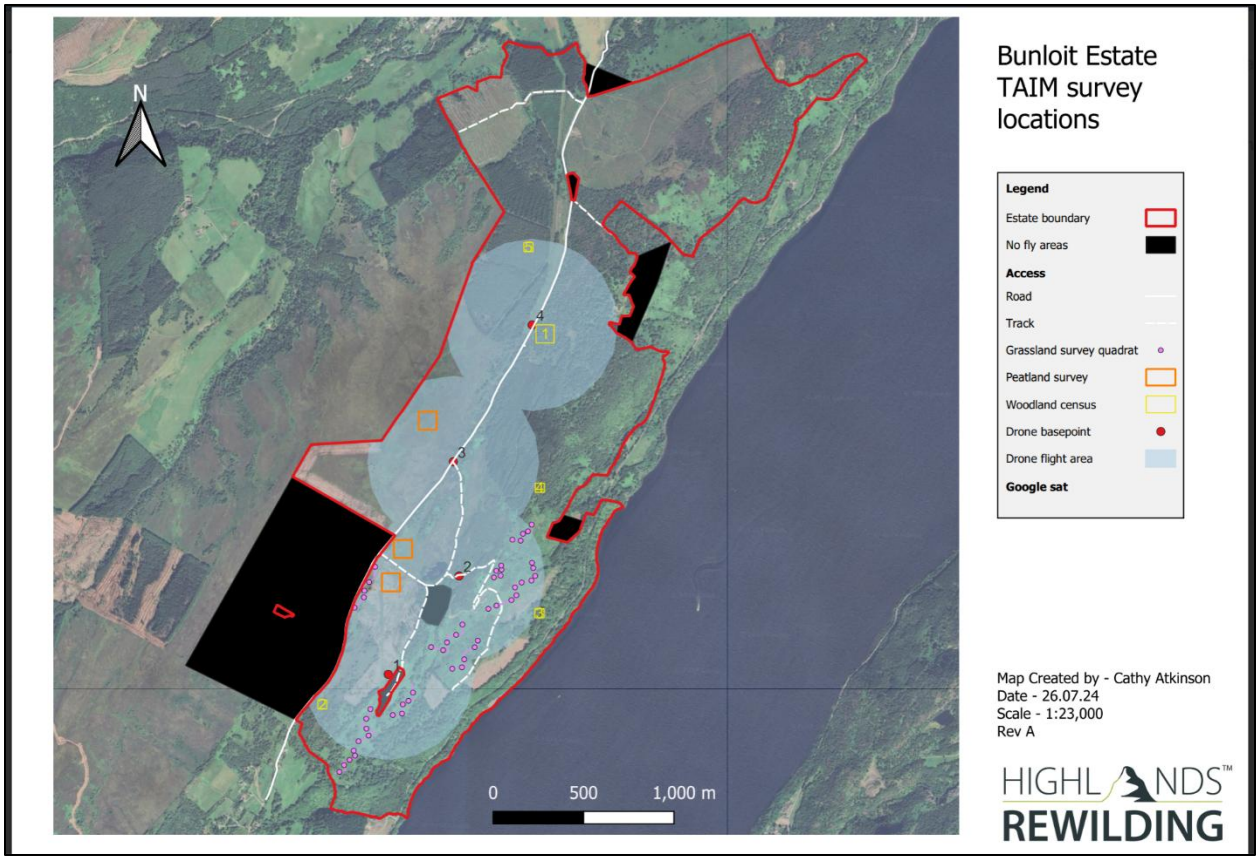

Figure 2: The drone survey map for Bunloit Estate, created by Highlands Rewilding in consultation with JHI.