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Woodland surveys in the field: Making sense of the woodland census

Why do a woodland census?

Tree species, their structures and overall woodland complexity all influence woodland biodiversity and carbon storage capacity. Without a full woodland census approach these valuable woodland attributes can be underestimated.

Highlands Rewilding undertook woodland censuses at six sites to capture a range of woodland types and antiquities, including long established woodland plantations of non-native species, ancient riparian woodland, Juniper-Birch scrub and temperate rainforests A 1 ha plot was surveyed at all three Highlands Rewilding Estates (Bunloit, Beldorney and Tayvallich), with an additional ¼ ha plot at Bunloit and two ¼ ha plots at Tayvallich. The data generated provides ground-truth data for comparisons with remote sensing data generated by satellite and drones from the same woodland (e.g. Figure 1)

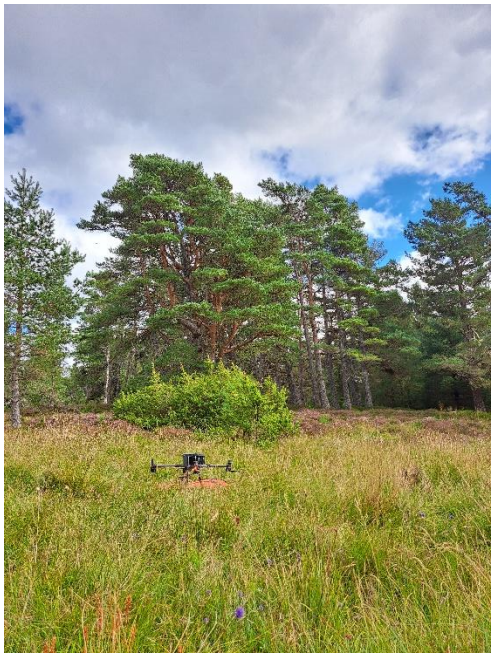

Figure 1: Field surveys and drone surveys were undertaken in the same woodlands to ground-truth remote sensing data.

Figure 2: Field surveys using 10 x 10 m compartment used to record precise tree locations (left) and drone surveys at the same woodland site (right).

Where's that tree?

A key challenge in woodland censuses is providing accurate and precise location data. Handheld or mobile GPS devices are typically accurate within 3-10 m of true locations. Add a woodland canopy, particularly one of dense conifers, and GPS 'walk' makes the need for an alternative approach to recording locations increasingly apparent. In dense and species rich tropical rainforests the Forest Global Earth Observatory, uses a precisely measured grid to navigate and

monitor long-term species dynamics – the same approach can be applied in Scotland.

Starting from a GPS-located south-west corner Highlands Rewilding surveyors measured out 1 ha or ¼ ha plots by 10 x 10 m compartments using a compass, measuring ropes and stakes (e.g. Figure 2). Tree locations from the edges of these compartments could then be precisely measured as a micro-grid of x-and-y-coordinates. Knowing tree location in the compartment and compartment location relative to the GPS-located south-west corner can then easily be translated into a unique British National Grid reference for each tree.

Surveying approach

Surveyors recorded the location, species and height of all trees and shrubs. Tree locations and height were recorded using a Haglof Vertex 5 laser and transponder (Figure 3 [left]). Many trees can have multiple stems which contributes to tree canopy complexity and carbon storage (Figure 3 [right]). Diameter at breast height (DBH) was recorded for all stems greater than 7 cm DBH and all those less than 7 cm were counted. Where stems were too dense for DBH measurement (e.g. Juniper and Gorse), width of the longest axis was measured. To prevent duplicate data, recorded individuals were assigned a unique identifier and marked with a crayon. The presence of deadwood and species-specific natural regeneration was also recorded per compartment. The data collected is summarised in Table 1.

Figure 3: Vertex 5 and transponder used to record tree height and location relative to compartment edge (left) and multi-stemmed Downy Birch with Willow at Beldorney Estate highlighting importance of recording canopy complexity during woodland census (right).

Table 1: Summary of field survey data

Measured variable	Additional comments
Tree ID	Unique ID
Location	xy-coordinates were transcribed into British National Grid locations from the GPS located south-west corner
Species	Species or Genus level
Height	In meters
Multi-stemmed (Y/N)	Whether individuals were multi or simple stemmed
DBH	In cm for all stems with DBH > 7 cm
Number of stems DBH > 7 cm	
Number of stems DBH < 7 cm	
Shrub width	Only applicable where inaccessible for DBH measurements
Comments	Inc. deadwood, natural regeneration, fallen trees etc.

What did we find?

These surveys captured a variety of woodland structures, complexities and compositions on the ground providing a wealth of information for analyses of remote sensing data and site-specific management. In total these surveys recorded 2,678 trees/shrubs comprising 20 species, 17 of these being native to Scotland. Stand densities ranged from 588-1068 trees per ha. The tallest tree was a Larch at Bunloit reaching 32 m, whilst the widest recorded DBH was an Elm at Tayvallich with an 124 cm DBH. 25 % of surveyed trees were multi-stemmed.