



**An Roinn Talmhaíochta,
Bia agus Mara**
Department of Agriculture,
Food and the Marine

Assessment of thinning in plantation forests

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9th June 2022

Presentation Overview



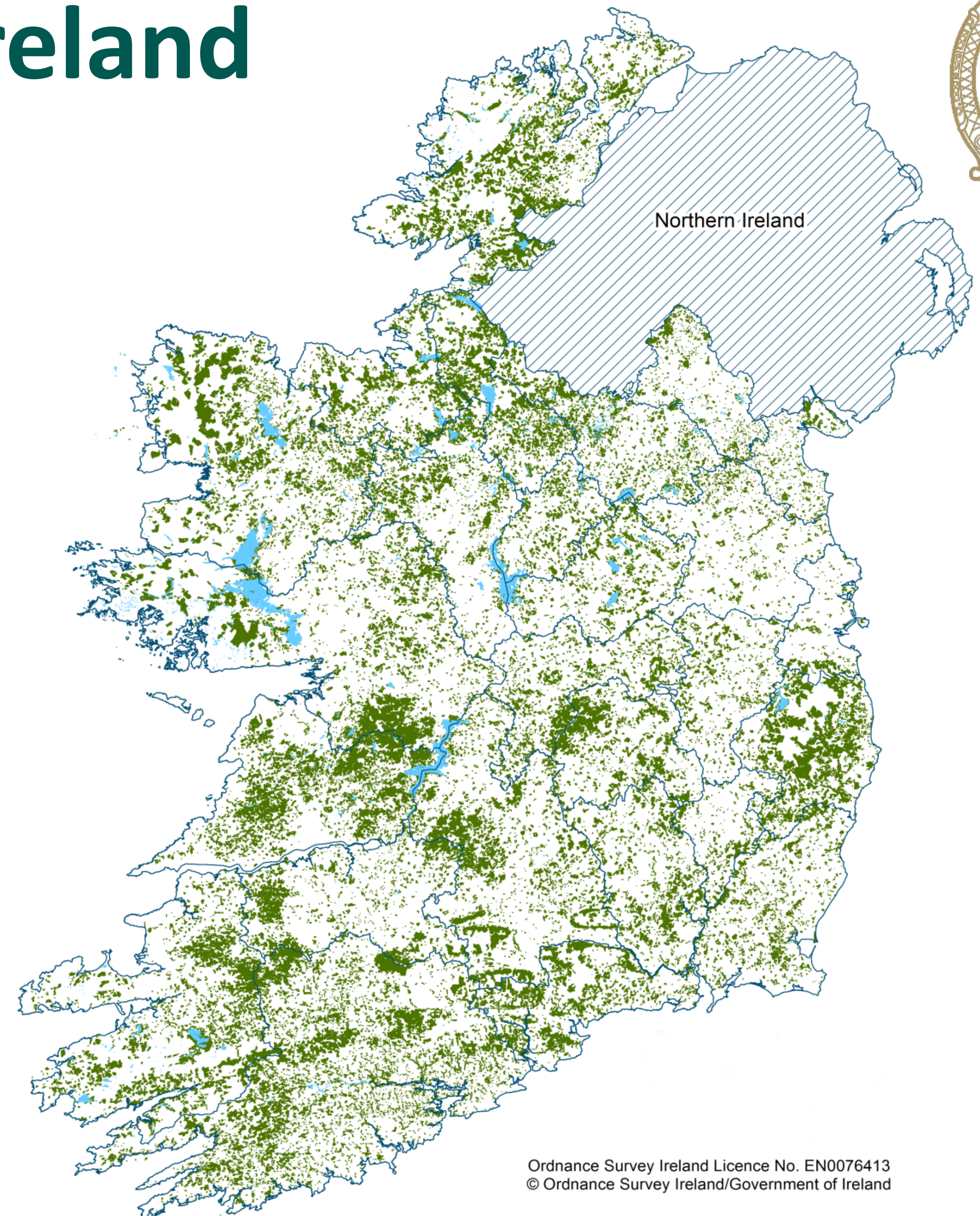
- Background
- Use of Field-map for NFI
- Field-map in Thinning study
- Sample Sites
- Initial Results



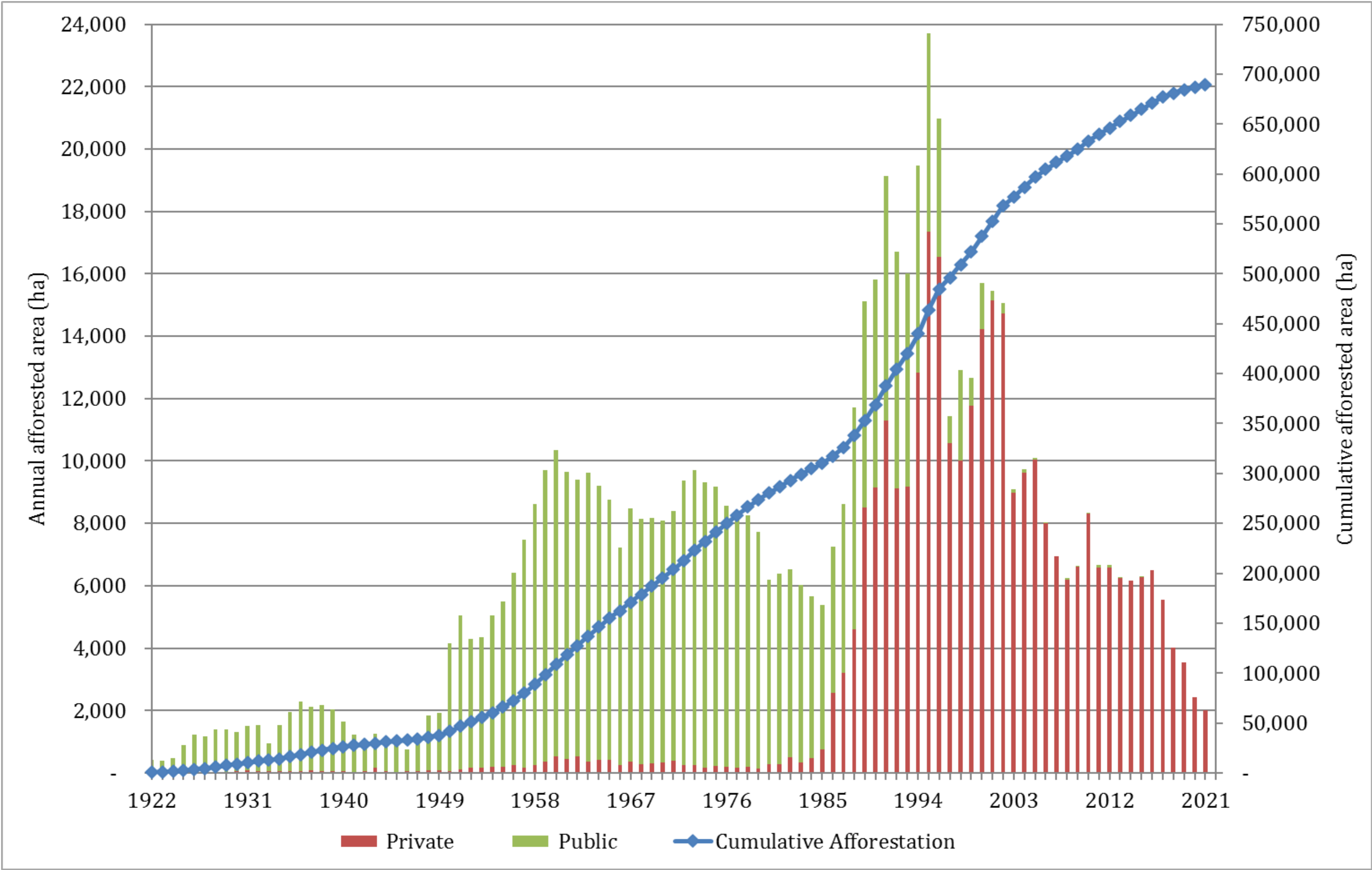
Forestry In Ireland



- 11% forest cover (770,020 ha)
- Over 23,000 owners (85% farmers)
- 12,000 jobs (mainly rural)
- Forestry sector worth €2.3 billion



Development of Forest Cover



National Forest Inventory (NFI)



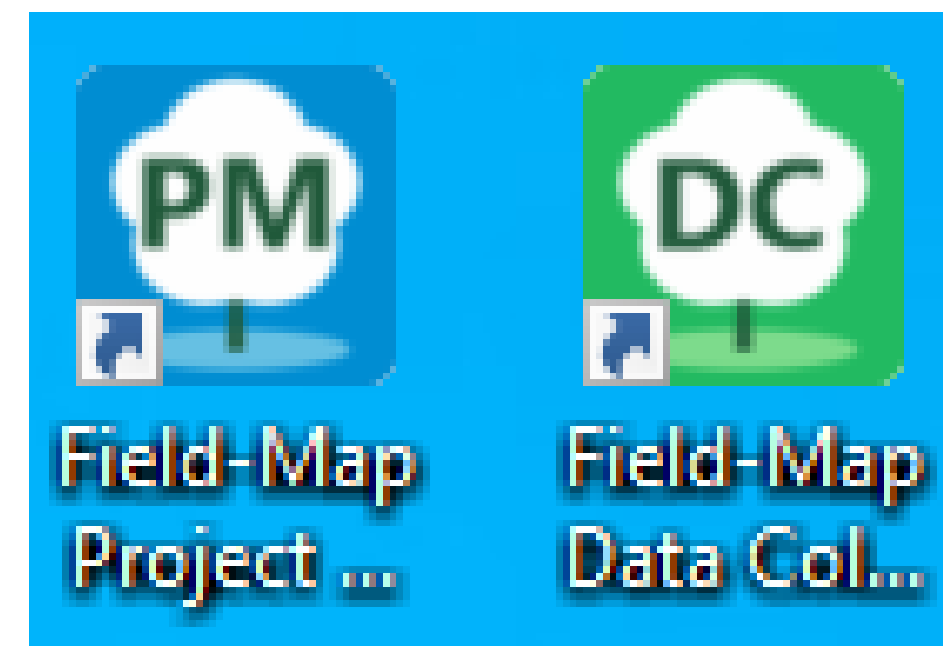
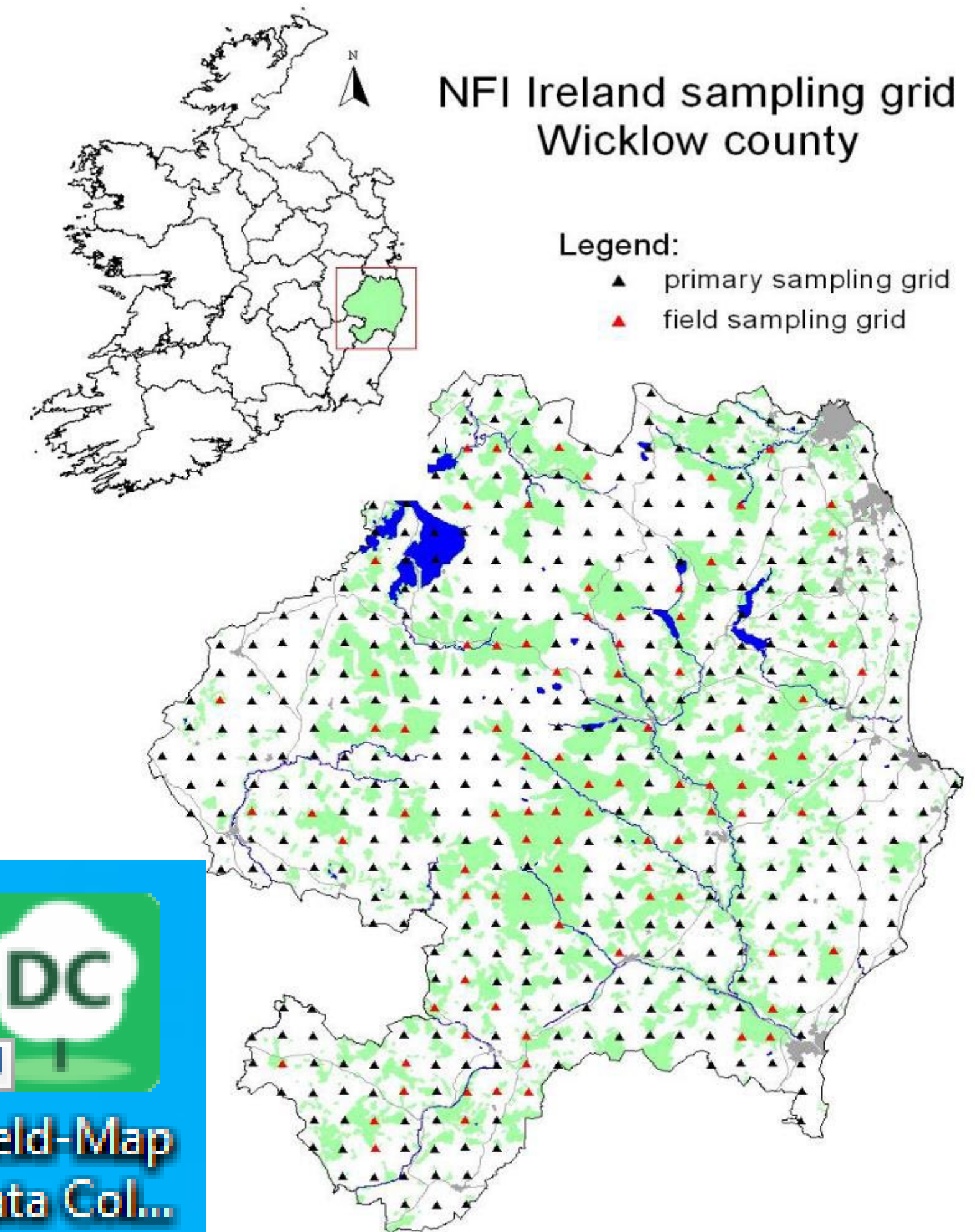
- To assess the current extent, state and composition of Ireland's forest resource in a timely, accurate & reproducible manner.

- **Sampling frame:**

- 2 km grid
- 17,423 points
- Each plot represents 400ha nationally

- **Permanent sample plots**

- NFI 1 (2004-2006) - **1,742** forest plots
- NFI 2 (2009 – 2012) - **1,827** forest plots
- NFI 3 (2015 – 2017) – **1,923** forest plots
- NFI 4 (2020 – 2022) – **2,020** forest plots



NFI Data checks and analysis

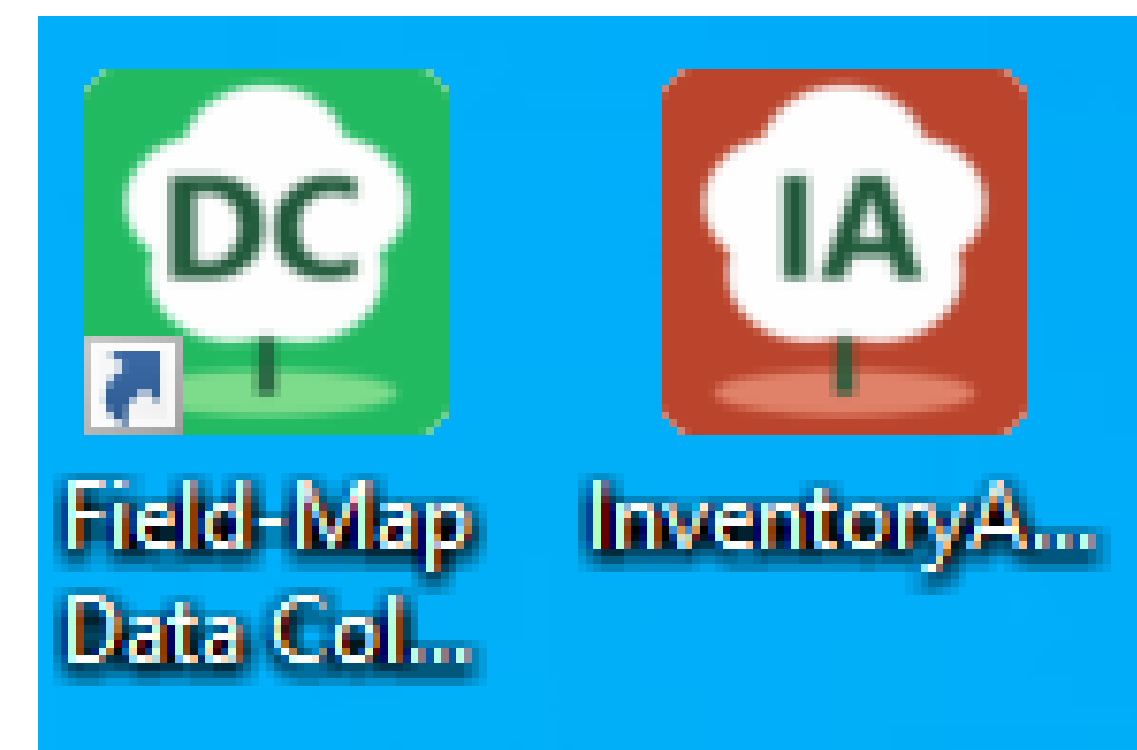


Data and check: Prior leaving the inventory plot, the operator performs a comprehensive data checks, including:

- Missing data check: Field-Map searches for all missing information
- Data verification script: Field-Map checks defined logical relations and list errors
- Visual check: visual check of DBH distribution and Height x DBH graphs

Data Analysis: Fieldmap inventory analyst

- Volume calculation
- Data stratification and aggregation



COFORD Wood Mobilisation Group



- Established to identify specific mobilisation issues and make recommendations. Concern that some first thinning operations may be removing only larger trees (high-grading), which goes against good forestry practice.

Recommendation from report

The Forest Service to periodically review and report on thinning control, and the level and quality of thinning in plantations.

- The Forest Service agreed to undertake an assessment thinning operations in plantation forests in Ireland and report on the findings in privately and publicly owner plantation forests in Ireland.
- Work has been progressing on:
 - A review of thinning practice in Ireland
 - Development a methodology and data collection to assess thinning operations in plantation forests



Site Selection



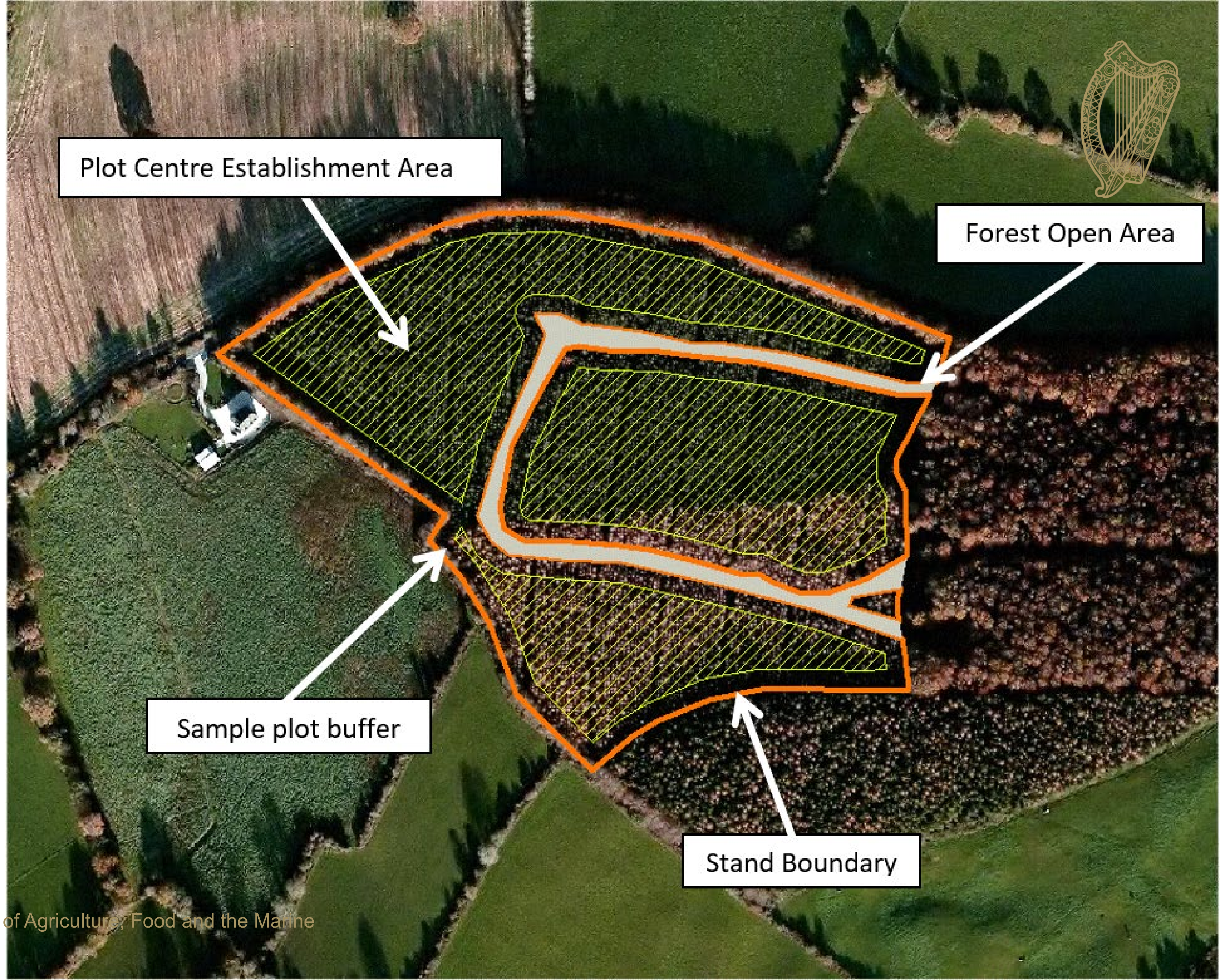
Consider factors which may lead to a variation in the level and quality of thinning operations.

The following factors were taken into consideration:

- **Ownership:** 50% Public and 50% private.
- **Thinning Interventions:** - first - second - third & subsequent
- **Species Composition:** forest stands dominated by conifer tree species.
- To ensure that the results generated are unbiased, the sites will need to be selected at random from across the various ownership and management groupings that exist.

| Thinning Intervention | Ownership | | Total |
|--|-----------|--------|-------|
| | Private | Public | |
| 1 st thinning | 40 | 40 | 80 |
| 2 nd thinning | 40 | 40 | 80 |
| 3 rd or subsequent thinning | 40 | 40 | 80 |
| Total | 120 | 120 | 240 |

Stratification of sample sites



Sample Plot Details



- Pilot study to assess the variability of sample plot estimates.
- The removal estimates were less precise compared to the post-thin estimates
- Therefore the sampling size requirement for this study will be driven by the requirement to obtain removal estimates at a harvest unit level, with an average standard error associated with removal estimates of within 10%
- From the ten sites visited as part of the pilot study, an average of 12 plots per harvest unit is required to provide this level of accuracy

Number of sample plots required per harvest unit

| Harvest Unit Size | Number of Plots Required |
|--------------------|--------------------------|
| Less than 5 ha | 8 |
| 5 to 15 ha | 12 |
| Greater than 15 ha | 14 |

Size of sample plots required

| Thinning Intervention | Post-thin Stocking (stems per hectare) | Sample Plot Details | |
|-----------------------|---|---------------------|------------------------|
| | | Radius (m) | Area (m ²) |
| First | 1,300 to >1,700 | 8 | 201 |
| Second | 700 to 1,300 | 10 | 314 |
| Third & Subsequent | <500 to 700 | 12.5 | 491 |

Transect Sampling

Parameters of sampled area

Area, ha:

Slope azimuth, °:

Transect lines

Target line layer:

Sampling intensity, %:

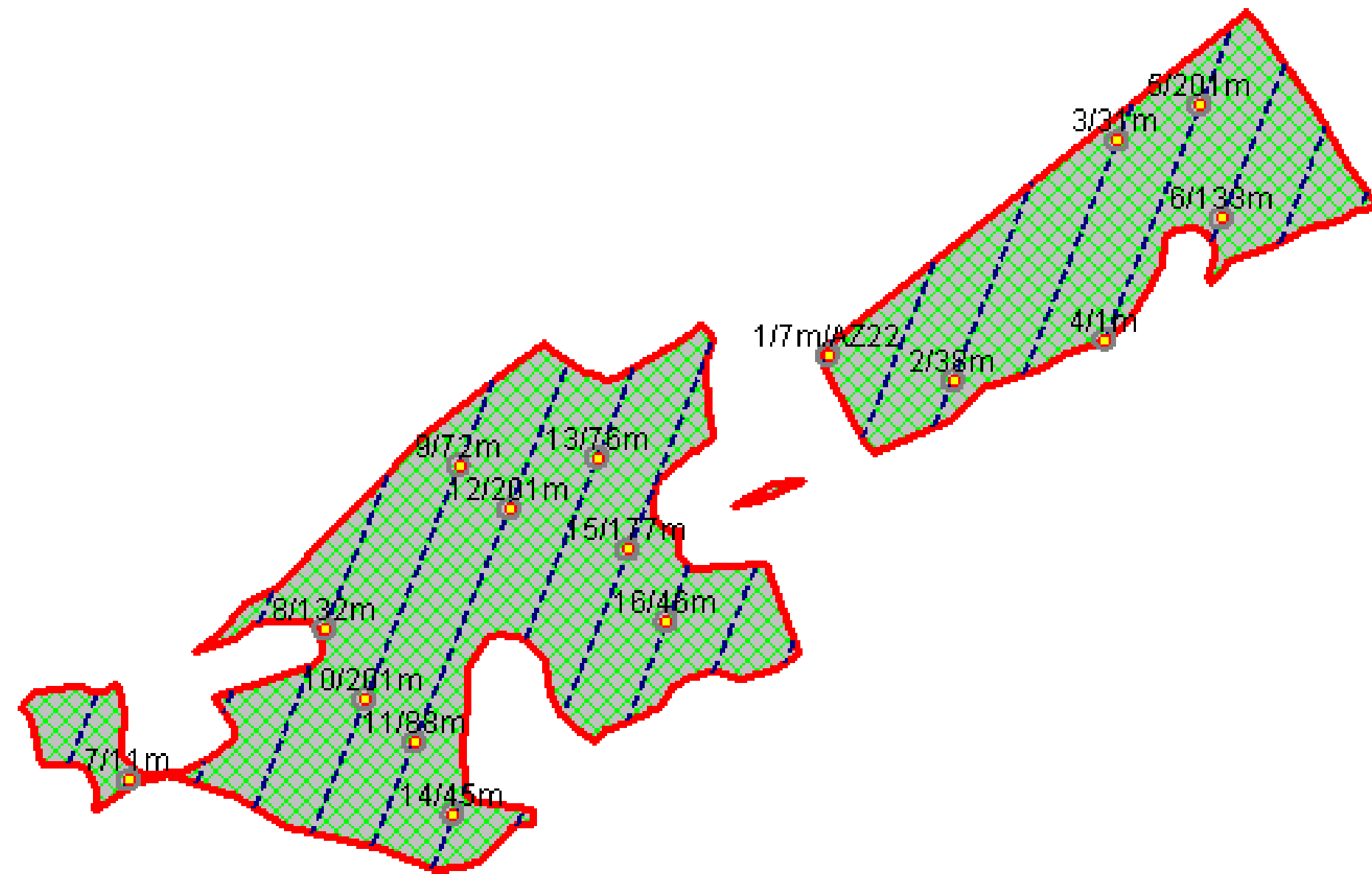
Transect width, m:

Sample points

Target point layer:

Attribute to store polygon ID:

Draw Polygon

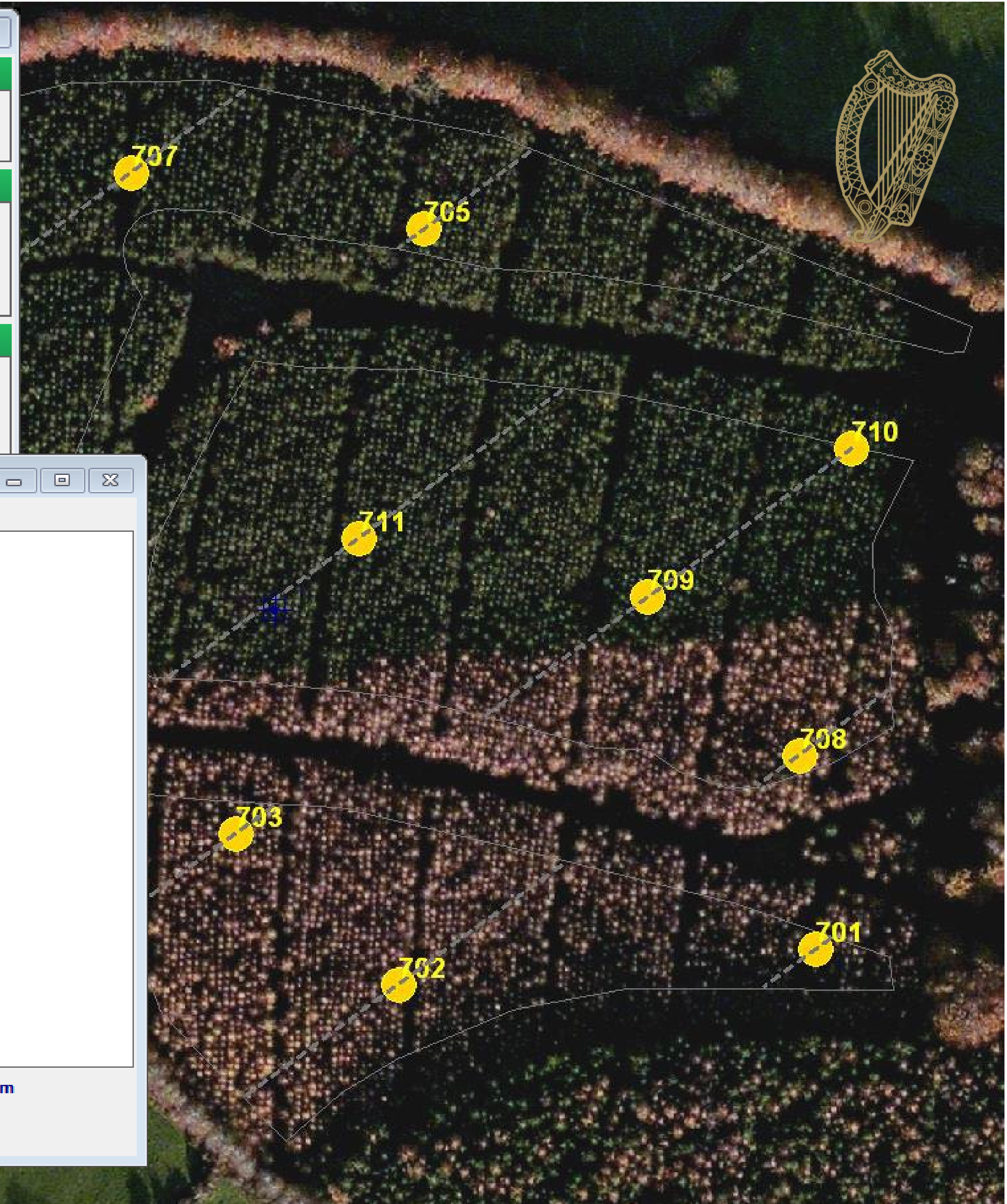
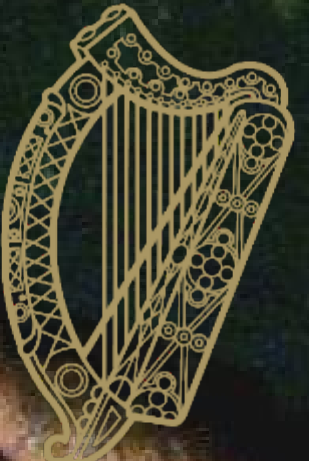


Area = 16.38 ha Transect length = 3,214 m Transect spacing = 50 m Number of sample points = 16 Plot spacing = 201 m

OK

Cancel

Help



Descriptive Variables assessed



Stand-level: Qualitative variables describing the harvest unit are assessed at sample plot level

| Variable | Description |
|-------------------|---|
| Planting year | Year when the harvest unit was planted |
| Thinning date | Date when the thinning took place |
| Forest type | Conifer, broadleaf and mixed |
| Rotation type | Afforestation and reforestation |
| Development stage | Thicket, small pole, pole stage, high forest, and multistoried |
| Thin status | No thinning, tending, first, second and subsequent |
| Thin type | Not thinned at recent intervention, no thinning, rack & selection, and selection only |
| Rack frequency | No thinning, 1 in 4 or less, 1 in 5, 1 in 6, 1 in 7 and 1 in 8 or more |
| Soil type | Brown earth, brown podzol, podzol, gley, grey brown podzol, basin peat, blanket peat |
| Cultivation | No cultivation, mounding, ripping, plough, pit planting, DMB, SMB |
| Ground conditions | Very good, good, average, poor and very poor |

Equipment and Software



- The field data collection process is based on Field-Map Timber software, which was developed for standing timber volume assessment.
- The software facilitates the generation of sample plots, navigation in the field and field data collection.



Masser BT Caliper to measure DBH



Tree height was assessed using a Laser Tech TruPulse 360r



GPS navigation to sample plots and all field data collection will be undertaken using a GETAC UX10 field computer

Tree and stump data recorded



- Trees

- DBH is assessed on all trees
- Height is assessed on a sample of three trees
- Top Height

- Stumps

- Top diameter
- Stump height is assessed



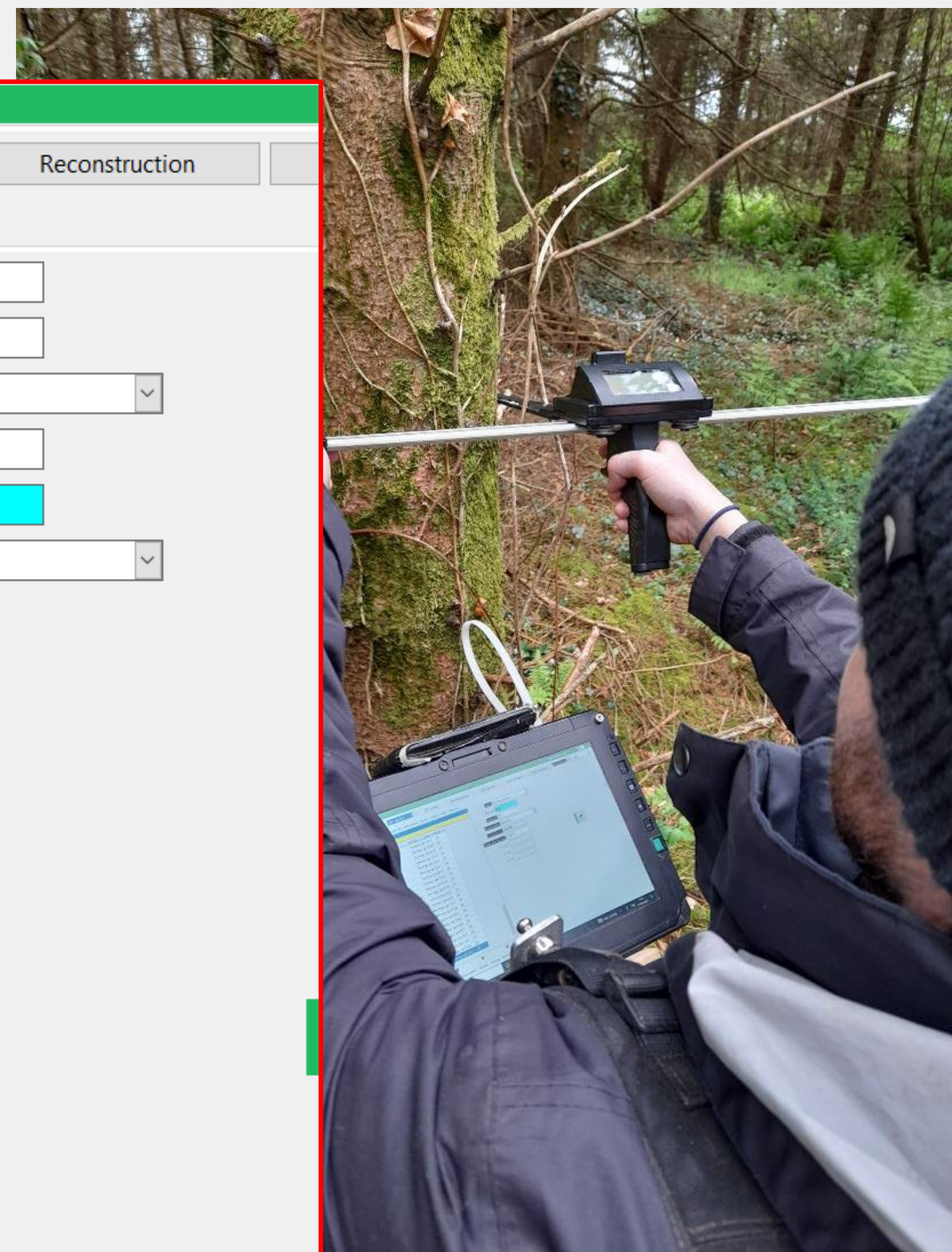


Tree sound activation: Tree species [v] DH model Reconstruction Calc volume Script manager Make sampling Stump diameter: With bark [v]

Stumps Trees Sample trees Diam. classes Species Height models Yield Class

| ID | Sample Plot ID | Species | Diam. c | Height, cr |
|----|----------------|--------------|---------|------------|
| 68 | 2010 | Sitka spruce | 30.7 | 21 |
| 69 | 2010 | Sitka spruce | 38.5 | 21 |
| 70 | 2010 | Sitka spruce | 24.7 | 21 |
| 71 | 2010 | Sitka spruce | 21.9 | 21 |
| 72 | 2010 | Sitka spruce | 24.7 | 21 |
| 73 | 2010 | Sitka spruce | 25.7 | 30 |
| 74 | 2010 | Sitka spruce | 28.4 | 12 |
| 75 | 2010 | Sitka spruce | 22.3 | 15 |
| 76 | 2010 | Sitka spruce | 25.2 | 21 |
| 77 | 2010 | Sitka spruce | 26.2 | 21 |
| 63 | 2011 | Sitka spruce | 15.3 | 21 |
| 64 | 2011 | Sitka spruce | 12.7 | 21 |
| 65 | 2011 | Sitka spruce | 14.0 | 21 |
| 66 | 2011 | Sitka spruce | 18.4 | 21 |
| 67 | 2011 | Sitka spruce | 22.4 | 21 |
| 54 | 2012 | Sitka spruce | 29.0 | 21 |
| 55 | 2012 | Sitka spruce | 21.7 | 21 |
| 56 | 2012 | Sitka spruce | 18.6 | 21 |
| 57 | 2012 | Sitka spruce | 29.7 | 21 |
| 58 | 2012 | Sitka spruce | 27.9 | 21 |
| 59 | 2012 | Sitka spruce | 24.7 | 21 |
| 60 | 2012 | Sitka spruce | 22.2 | 21 |
| 61 | 2012 | Sitka spruce | 32.1 | 21 |
| 62 | 2012 | Sitka spruce | 25.6 | 21 |
| 41 | 2013 | Sitka spruce | 22.3 | 21 |

Species: Sitka spruce [v]



READY

Tree sound activation: Tree species [v] DH model Reconstruction

Stumps Trees Sample trees Diam. classes Species Height models Yield Class

| Species | Age at | Heigh | Yield-class |
|--------------|--------|-------|-------------|
| Sitka spruce | 25 | 19.7 | 26 |
| Sitka spruce | 25 | 19.0 | 26 |
| Sitka spruce | 25 | 19.0 | 26 |
| Sitka spruce | 25 | 17.2 | 22 |
| Sitka spruce | 25 | 18.0 | 24 |
| Sitka spruce | 25 | 15.3 | 20 |
| Sitka spruce | 25 | 16.1 | 20 |

Sample Plot ID: 2016

Tree ID: 3

Species: Sitka spruce [v]

Age at time of assessment: 25

Height, m: 19.7

Yield-class: 26 [v]

Map Plots Mensuration Sample points Transects Tracking Plot border Lines

Modelling Volume – Living Trees

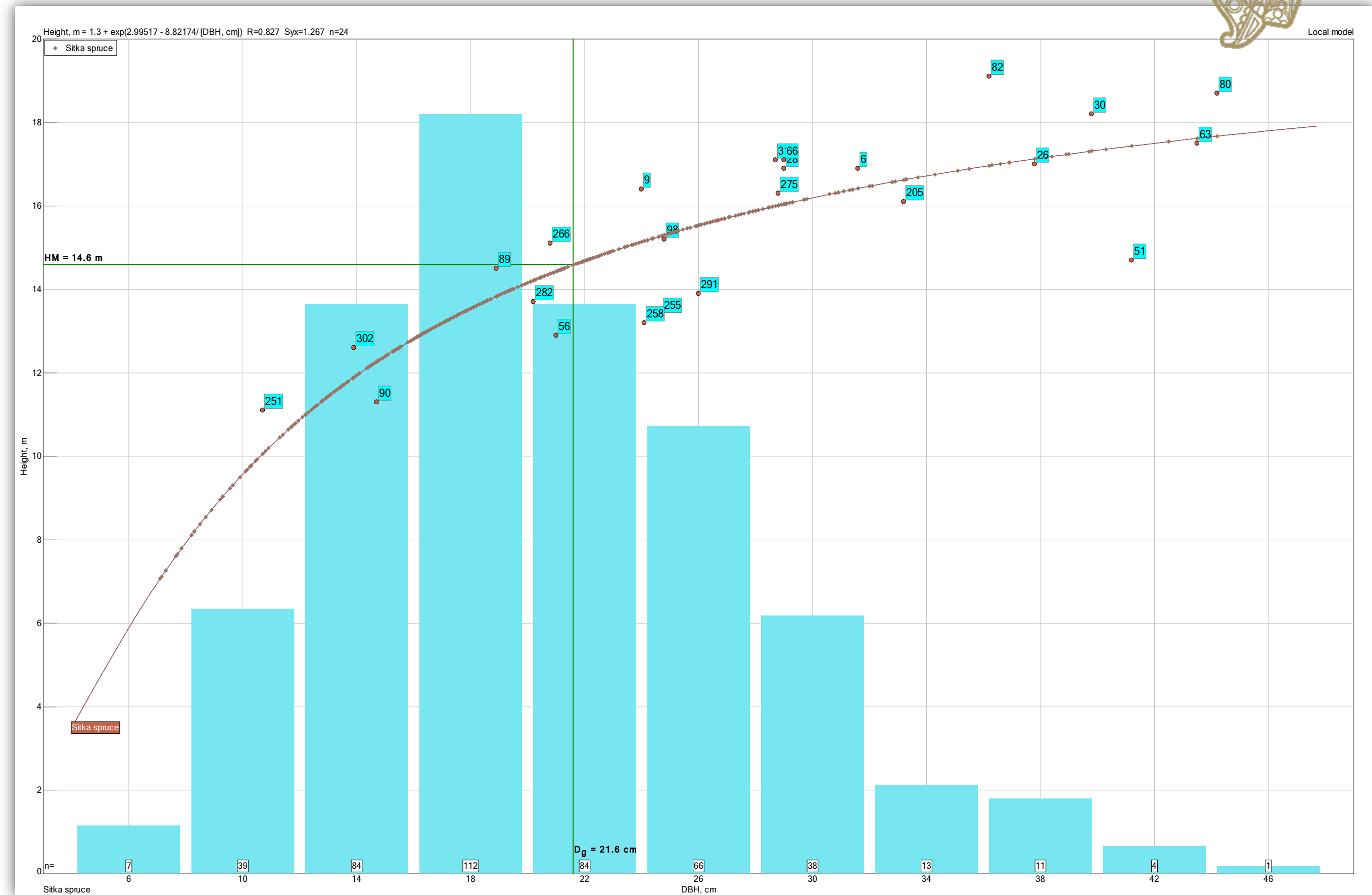


- Height

Using the sample tree height data, a species level height-DBH model is developed for the harvest unit

- Volume

Ireland's single tree stem profile equations are used to calculate standing trees volume using the individual DBH and height data



Modelling Volume – Stumps

- DBH

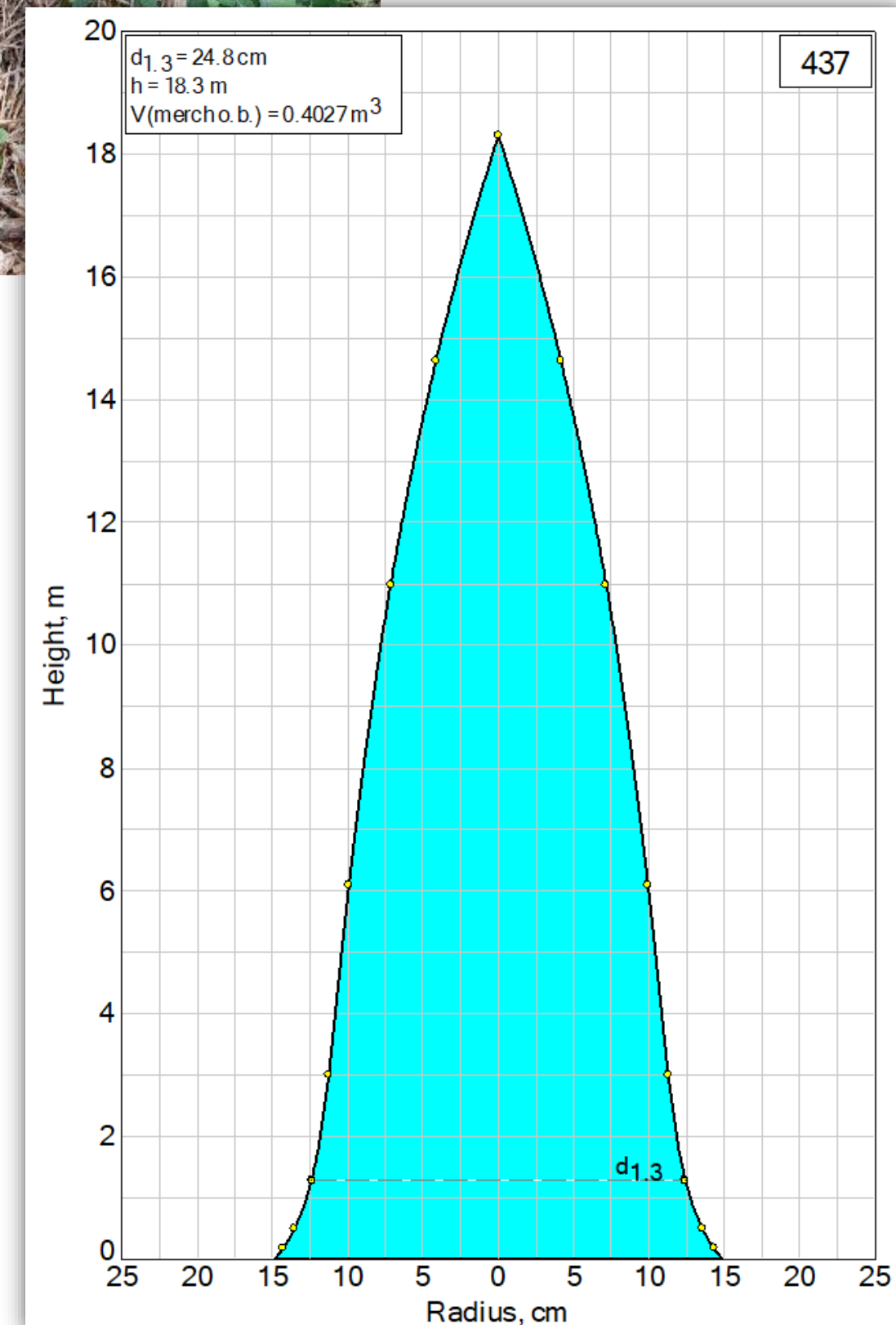
Ireland's single tree stem profile equations are used to calculate DBH using the stump diameter and height

- Height

Using the sample tree height data, a species level height-DBH model is developed for the harvest unit

- Volume

Ireland's single tree stem profile equations are used to calculate standing tree volume using the tree DBH and height data





Sample Sites

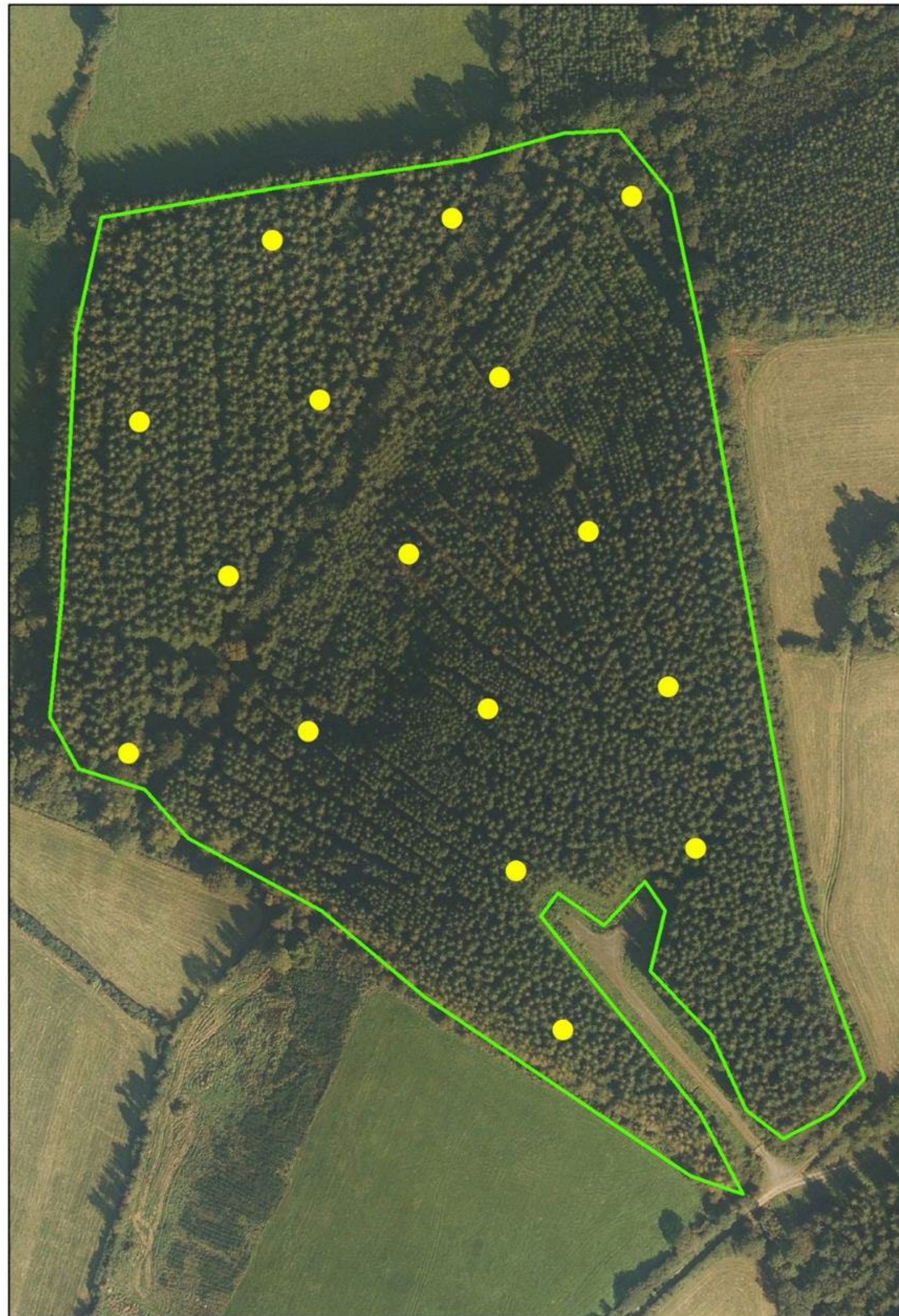
Fossy Hill - LS13-H0053 – First Thinning



| | |
|------------------------------|--------------------|
| Area (ha) | 17.6 |
| Sample Plot Area (ha) | 0.32 |
| Thinning Intervention | First |
| Thin type | Rack and Selection |
| Rack Frequency | 1 in 6 |
| Rotation Type | Afforestation |
| Soil type | Gley |
| Cultivation | Mounding |

| | Sp. 1 | Sp. 2 |
|-------------------------------|--------------|--------------|
| Species | SS | JL |
| Age at thinning | 20 | 20 |
| Top Height (post-thin) | 16.3 | 15.6 |
| Yield Class | 28.0 | >14 |

Fossy hill- LS13-H0062 – Sub & 2nd Thinning



| | |
|------------------------------|---------------|
| Area (ha) | 11.32 |
| Sample Plot Area (ha) | 0.68 |
| Thinning Intervention | Subsequent |
| Thin type | Selection |
| Rack Frequency | 1 in 7 |
| Rotation Type | Afforestation |
| Soil type | Brown Podzol |
| Cultivation | Ripping |

| | Sp. 1 | Sp. 2 |
|-------------------------------|--------------|--------------|
| Species | SS | JL |
| Age at thinning | 27 | 27 |
| Top Height (post-thin) | 19.8 | 15.9 |
| Yield Class | 24.0 | 10.0 |

Wolfhill- LS13-H0063 – Sub & 2nd Thinning



| | |
|------------------------------|--------------------|
| Area (ha) | 17.39 |
| Sample Plot Area (ha) | 0.7 |
| Thinning Intervention | 2nd and Subsequent |
| Thin type | Selection |
| Rack Frequency | 1 in 7 |
| Rotation Type | Afforestation |
| Soil type | Gley |
| Cultivation | Ripping |

| | Sp. 1 | Sp. 2 |
|-------------------------------|--------------|--------------|
| Species | SS | NS |
| Age at thinning | 27 | 27 |
| Top Height (post-thin) | 21.6 | 15.4 |
| Yield Class | 26.0 | 20.0 |



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**Thank you
& Any questions?**

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