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

Land Types for Afforestation: Soil & Fertility

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Document Control

Date	Version	Revision
27/06/2024	June 2024	➢ Revised guidance regarding the use of the Composite Peatland Map (see Section 2.4.1). ➢ More detailed methodology for the survey of organo-mineral soils (see Appendix A). ➢ Repositioning of the Recording Sheet for Peat Depth from the main text to appendices ➢ Text throughout revised to improve clarity and readability.

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Section 1: Introduction

1.1 Overview

The Afforestation Scheme 2023-2027 provides grants and premiums to encourage the planting of land and the expansion of Ireland's forest resource, in keeping with the Forestry Programme 2023-2027 and the European Commission's State Aid approval of that Programme.

This document sets out the potential eligibility of land for support under the Afforestation Scheme, based on two primary considerations:

- soil type(s) eligible for afforestation under the new Forestry Programme, taking into consideration carbon budgets; and
- the level of site fertility needed produce a sustainable commercial crop of timber.

The document sets out how to arrive at a decision as to whether or not the site considered for afforestation meets each of these requirements, in turn. It is also important to establish whether or not the site meets the soil type requirement first, before assessing the R+N score, which is a combined index of soil pH and fertility. A site that does not meet the first requirement regarding soil type is not eligible for afforestation and should not be submitted as an application. Similarly, a site that meets the soil type requirement, but which does not reach the required fertility level (i.e. R+N score less than 6.0), is not eligible for afforestation, and should not be submitted.

1.2 Eligible soil types

Soil types eligible for afforestation under the Forestry Programme are as follows:

- Mineral soils: Eligible soil type for afforestation under all Forest Types (FTs).
- Organo-mineral soils with a peat (organic layer) depth of 30 cm or less: Eligible soil type for afforestation under all FTs.
- Modified fens and modified cutaway raised bogs: Eligible soil type for afforestation, but only under those Forest Types (FTs) involving native woodland creation and only if capable of supporting the establishment and development of the most relevant native woodland type identified for the site, *without* further drainage.

Section 2 details these soil types and related requirements, and Appendix A sets out the methodology to be followed when undertaking soil surveys, if needed to resolve borderline cases of whether or not the site proposed for afforestation falls into one of the above.

Note, soil types other than the above are not eligible for afforestation under the Forestry Programme. Therefore, where the entire site comprises a soil type(s) other than the above, the entire site should not be submitted. Similarly, if certain areas or plots on the site comprises a soil type(s) other than the above, those areas should be excluded from the application.

1.3 Fertility requirement

Having established that the site meets the above soil requirement, the next step is to assess the level of fertility of that site, and its suitability to grow trees. The productivity requirement under the Afforestation Scheme is that land must be capable of growing to full rotation a commercial timber crop of Sitka spruce of greater than yield class (YC) 14, based on one standard application of phosphorus at establishment. Sitka spruce with a YC > 14 is used a proxy for the vigorous growth and rapid development of an emerging and sustainable forest canopy. The threshold of YC > 14

also ensures a neutral to positive greenhouse gas balance over three successive rotations on organo-mineral soils. Other species, if proposed and approved for planting, may not achieve the same level of production on the same site.

Regarding the potential eligibility of land for financial support under the Afforestation Scheme, two separate land types apply, one of which is under the Scheme:

- Eligible Land
- Ineligible Land

This document describes each of the above land types, based on the use of ground vegetation to assess the suitability of land for productive Sitka spruce. Photographs illustrate a selection of sites within each type. This provides direction to landowners and Registered Foresters when identifying which land type applies to a particular site (or part thereof) and represents the basis for DAFMs decisions in this regard.

It is important to note that the land types for afforestation presented in this document *refer to productivity only*. The environmental suitability of a proposed afforestation project is also considered by DAFM as part of its overall assessment process, with a wide range of environmental receptors considered (including high nature value farmland, breeding waders and high status objective waterbodies). Therefore, sites that meet the requirements for Eligible Land may not be approved, due to environmental and other constraints. Please see DAFM's *Environmental Requirements for Afforestation* document.

This document refers to applications for a licence under the Forestry Regulations 2017 (S.I.191 of 2017), as amended, and an approval for grant support under the Afforestation Scheme 2023-27. However, DAFM may also apply it to applications for a licence only (i.e. non-grant aid applications).

1.3.1 Using vegetation to assess site suitability

The use of ground vegetation to assess the suitability of land is a long-established method of assessing the suitability of sites for afforestation and as an aid to tree species selection. The presence of certain indicator plants within the existing onsite vegetation is used to indicate soil quality, based on the particular requirements of different plant species regarding certain soil parameters (nutrients, moisture, reaction (i.e. soil pH), etc.). A range of indicator values has been derived for plants found in UK and Ireland (Hill *et al.*, 1999, available for download at ECOFACT2a.pdf (nerc.ac.uk)).

More recently, Farrelly *et al.* (2011a&b) showed a strong relationship between the combined R (Reaction) + N (Nitrogen) value and the productivity of Sitka spruce in Ireland. To evaluate site productivity, plants are given combined R+N values and are then weighted by their occurrence to get an overall plot average. Generally, higher indicator values are associated with more fertile sites on neutral soils, and lower indicator values are associated with nutrient poorer sites on acid/peaty soils.

Appendix B sets out the mapping, sampling and scoring methodology underpinning the land type classification (i.e. R+N scoring) set out in this document. It is the responsibility of the Applicant and the Registered Forester to map each land type on the site correctly. This may or may not require the use of the sampling and scoring methodology. On sites where the land types are very clear, sampling and scoring will not be required. It is envisaged that this land type classification system will prove useful to Registered Foresters and DAFM in borderline cases and / or in situations where there is a difference of opinion between the Registered Forester and DAFM regarding which land type applies to a site (or part thereof) proposed for afforestation.

1.3.2 Note on reclaimed land

Land reclaimed since 1st January 2011 will be assigned its pre-January 2011 land type classification. This more accurately represents the underlying soil qualities and parameters and / or the level of agricultural activity foregone on the site.

Applications for Remediation of Industrial Cutaway Peatlands Pilot Scheme or where the applicant is proposing to afforest another comparable area of industrial cutaway peatland with native woodland species as compensation in

lieu of the deforestation of an equivalent area of natural woodland which came about through natural regeneration and where the project giving rise to the deforestation has already been granted planning permission and the compensatory planting was assessed for potential environmental impacts as part of that planning application, are not required to meet the specifications laid out in this document.

The overall purpose of the Remediation of Industrial Cutaway Peatlands Pilot Scheme is to support biodiversity, help reduce carbon emissions and to stabilise soils to minimise soil erosion. Grant funding for native woodlands created under this Pilot Scheme is subject to the applicant obtaining a licence for afforestation from the Minister.

Section 2: Afforestation and Soil Types

2.1 Introduction

A significant portion of Ireland's soil resource comprises organic soil of one type or another.

Many peat soils have been modified through drainage and agricultural use over the years. While modified fen peats and modified cutaway raised bogs on peat depths greater than 30 cm may support a native woodland with limited silvicultural interventions, the same is not true for blanket peats with depths of peat greater than 30 cm. Fen peats and cutaway raised bogs are naturally more fertile as they were fed by mineral rich ground or surface water as part of their formation. Blanket peats are inherently nutrient poor as they were fed by rainwater as part of their formation. Reclaimed blanket bog requires continuous inputs or reversion will occur.

As set out in the Environmental Requirements for Afforestation, all Annex 1 habitats, including those involving peatland, are excluded from afforestation.

2.2 Eligible soil types

Soil types eligible for afforestation under the Forestry Programme are as follows:

- Mineral soils: Eligible soil type for afforestation under all Forest Types (FTs).
- Organo-mineral soils with a peat (organic layer) depth of 30 cm or less: Eligible soil type for afforestation under all FTs.
- Modified fens and modified cutaway raised bogs: Eligible soil type for afforestation, but only under those Forest Types (FTs) involving native woodland creation and only if capable of supporting the establishment and development of the most relevant native woodland type identified for the site, ***without*** further drainage.

2.3 Identifying certain peat soils

2.3.1 Fen

A fen is a peatland system with a permanently high-water level at or just below the surface. They are formed in depressions occupied by shallow lakes in which undecomposed plant material forms a thick layer of peat that gradually rises up towards the surface. With the passage of time, as the decaying vegetation accumulates, marsh plants consolidate and build up a more solid footing. Eventually, the surface of the newly-formed peat is colonised by plants more suited to the different conditions, and the marsh is gradually replaced by fen.

The principal source of nutrients in fen originates from surface and / or groundwater. Fens are considered mineratrophic, which means they are groundwater-fed and heavily influenced by topography and groundwater table.

Fens have a greater diversity of plant species compared with raised bogs, due to higher mineral levels. They tend to occur in limestone regions where the water supply is sufficiently rich in minerals. They can occur throughout the country, most commonly in the West and Midlands. Many fens are contiguous to raised bogs.

Modified fens are those fens that have been drained and subsequently brought into agricultural use.

2.3.2 Raised Bog

Raised bogs are dome-shaped masses of peat occupying former lakes or shallow depressions in the landscape.

These depressions were previously occupied by shallow lakes in which anaerobic conditions occurred. Under such conditions, the complete decomposition of plant material is prevented, resulting in the build-up of a thick layer of peat that rises towards the surface of the lake. Where anaerobic conditions prevail, plants continue to accumulate

and the depth of the peat layer increases. Raised bogs can be up to 12 m deep, and 7.5 m on average.

Raised bog occurs throughout the Irish Midlands in lowlands below the 130 m contour. Their principal supply of water and nutrients is from rainfall (ombrotrophic peat). They are therefore heavily influenced by atmospheric precipitation and the substrate is acidic. Raised bogs began their development in depressions occupied by shallow lakes in which anaerobic conditions occurred leading to the development of fen peat initially. Overtime, the fen peat layer thickens and the associated plant species growing on the surface are no longer in contact with the mineral rich groundwater. The principal supply of water and nutrients is now from base poor rainfall. This acidic environment leads to the growth of bog mosses (*Sphagnum* species), which in time accumulate, forming ombrotrophic peat.

Raised bogs develop a system of micro-topography created by the varying growth-forms of different species. If left undisturbed and free from burning, grazing or drainage, they exhibit hummocks, pools and hollows with flat areas and lawns in between, and with flushes and paths of soaks. The water level is at or near the surface, and slopes are gentle.

Modified cutaway raised bogs are those peat sites that have been cutaway principally for peat extraction/turf cutting and subsequently brought into agricultural use through some or all of the following: drainage, fertilisation, ploughing and reseeding.

2.3.3 Blanket Bog

The profile of blanket bogs usually comprises of two distinct layers, i.e. a lower well-humified layer, below a younger and less well-humified peat of similar composition. Nevertheless, it is an ombrotrophic peat, meaning it is rain-fed, influenced by atmospheric precipitation.

Blanket bogs are divided into two categories according to the elevation above sea level:

Atlantic blanket bogs or Lowland blanket bogs cover the landscape of the West coast of Ireland where elevation is below 150 m – 200 m and precipitation exceeds 1,250 mm / year. They are found in low-lying coastal plains and valleys, and well developed in Donegal, Mayo, Galway, Kerry, Clare, and Sligo. Patterned surfaces of pools, flat and sloped areas, flushes, and swallow holes are important features of lowland blanket bogs.

Mountain blanket bogs or Uplands bogs occur relatively on flat terrain in the higher mountain ranges with an elevation from 150 m – 200 m above sea level, widely distributed throughout the country.

2.4 Composite Peatland Map

There is no definitive map detailing the distribution of peatlands in Ireland at a field-level. Nevertheless, there are a number of mapping products that can provide indicative information on the distribution of peatlands in Ireland. Figure 1 is a composite of the Derived Peatland map V2, the National Landcover map and the Irish Soils Database. It provides an indicative location of peatland and bog types. For the purpose of afforestation applications, it will be assumed that peat soils within these areas are as categorised (see legend and guidance on interpretation, below), unless it is proven otherwise by a peat survey, a habitat survey or other documented evidence.

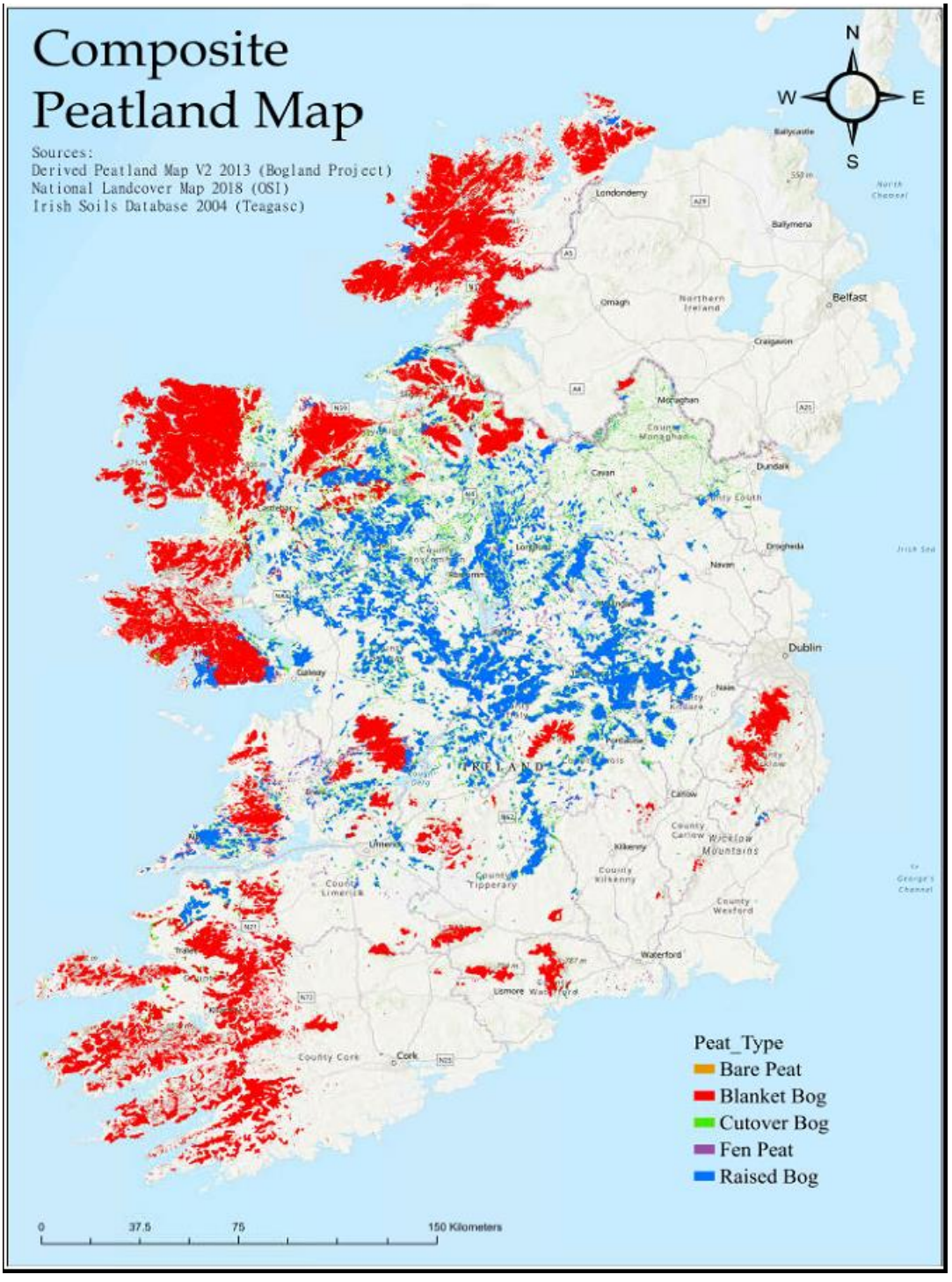
It is the responsibility of the Applicant and their Registered Forester to ensure only eligible soil types are presented in the application. This may or may not require the use of sampling. On sites where the soil types are clear sampling will not be required. Where a soil survey is undertaken it should accompany the initial application.

There are currently a number of initiatives underway to improve our understanding of peatland distribution in Ireland*. As these products become available the composite map presented in this document may be updated to provide more accurate information of the distribution of peatlands.

* RePeat Project in Trinity College Dublin and National University of Ireland Galway.

Tellus Release Report Analysing the Geochemistry of Ireland's Peatlands using Tellus Geochemical Data

Figure 1 Composite Peatland Map (from Derived Peatland map v.2, the National Landcover map and the Irish Soils Database).



2.4.1 Interpretation of Composite Peatland Map

If the site of the proposed afforestation overlaps any peatland area shown in the Composite Peatland Map, confirm that finding, undertaking a soil survey following the methodology set out in Appendix A, if required. The following then apply, based on the results of the confirmation:

- If the soil is found to be a mineral or organo-mineral soil, the latter with a peat (organic) layer 30 cm or less, the site is eligible for afforestation (from the perspective of soil type) and for all Forest Types (subject to FT rules). However, confirmation of this soil type must be provided (*via* Section 3 of the Environmental Considerations on iNET) and the R+N score must be 6.0 or greater.
- If the soil is found to be modified fen or modified cutaway raised bog, the site is eligible for afforestation (from the perspective of soil type), but only under those Forest Types (FTs) involving native woodland creation (subject to FT rules) and only if capable of supporting the establishment and development of the most relevant native woodland type identified for the site, ***without*** further drainage. Confirmation of this soil type must be provided (*via* Section 3 of the Environmental Considerations on iNET) and the R+N score must be 6.0 or greater.
- If the soil is blanket bog, it is not eligible for afforestation. However, where the above map indicates blanket bog, but where the confirmation process identifies an eligible soil type (e.g. a peat depth of 30 cm or less and a R+N score of 6.0 or greater), such sites may be eligible. Evidence in the form of a soil survey or documented findings must be supplied.

Section 3: Eligible Land: Forestry Types 1-12

Once the Applicant and Registered Forester are satisfied that the land falls into one of the eligible soil type categories in Section 2, the R+N score is established (following the methodology in Appendix C). If the R+N score is **6.0 or greater**, the site is eligible under Forest Types (FTs) 1 to 12 of the Afforestation Scheme (subject to the specific rules under each FT). The following are examples of sites most likely to be in this category:

- Cultivated and fertilised fields used for tillage, crops and pasture grazing, and land reclaimed for grazing prior to the 1st January 2011.
- Fields and dry grassland hill sites where the parent material is limestone or Silurian shale, or where steeper slopes limit the use of agricultural machinery.
- Pasture dominated by soft rush, where poorer drainage restricts agricultural activity.
- Lands showing evidence of agricultural improvement, either through the soil conditioning through animal husbandry / manuring or historic crop production.
- Old hill pastures composed predominately of velvet bent, tufted hair-grass, sheep's- fescue, Yorkshire-fog and sweet vernal-grass.
- Sites with the following species of rush: sharp-flowered rush, compact rush, bulbous rush and soft rush.
- Drier sites on hillsides, comprising dense bracken.
- If present, purple moor-grass should occur with better pasture grasses, i.e. sweet vernal-grass or bent grass, or with abundant soft rush, and should not constitute heathland-type vegetation. Note, if the soil type is peat, it must meet the requirements outlined in Section 2 of this document.

As set out in Section 1, the subsequent environmental assessment of each site proposed for afforestation may rule out sites matching the above descriptions.

Note: Eligible Land: FT1-12 spans the Afforestation Scheme Forest Types 1 to 12. However, within this range, the actual FT (or combination of FTs) that applies will depend on site conditions, specific FT rules and other factors.

The following images illustrate some of the site types that have a R+N score of 6.0 or greater. Please note, in each case, it is assumed that the soil requirements set out in Section 2 are met.

Photo 1

Wet grassland, with soft rush and perennial rye-grass.

Photo 2 (foreground)

Neutral grassland with Yorkshire-fog, sweet vernal-grass, red fescue and common sorrel.

Photo 3

Improved pasture with creeping thistle, broadleaved dock and creeping buttercup.

Photo 4

Neutral upland grassland, with bent grass, meadow buttercup, white clover and common sorrel.

Photo 5

Site dominated by bracken, and some sweet vernal-grass.

Section 4: Ineligible Land

The second category – 'Ineligible Land' – applies to sites that do not meet the soil requirements set out in Section 2 and / or have a R+N score of less than 6.0. Sites with certain inhibiting factors also fall into this category, regardless of their R+N score and status regarding organic soil.

Examples of Ineligible Land are as follows:

- Sites that do not meet the soil requirements set out in Section 2*.
- Sites with a R+N score of less than 6.0.
- Severely exposed sites and some sea-facing locations.
- Sites over 300 m above sea level in the west of Ireland, and over 400 m above sea level in the east of Ireland.
- Sites that are prone to flooding and / or cannot be adequately drained. (Note, exceptions may exist in relation to some site types potentially suitable under Native Woodland Scenario 6: Alluvial Woodland – see the current *Forestry Standards Manual* for details).
- Sites with rock outcrop and associated shallow soils accounting for 25% or more of the area.
- Sites with shell marl within 70 cm of the soil surface.
- Shallow soils.
- Private gardens.
- Golf courses (with the exception of areas that are not an integral part of the playing course – such area may be considered for afforestation, on application).
- Lands excluded for environmental reasons, due to sensitivities concerning water, biodiversity, archaeology, etc. Examples include sites within Special Protection Areas (SPAs) for birds or containing Annex 1 habitats that are protected under the EU Habitats Directive 92/43/EEC. **Note:** This exclusion *does not* apply to environmental setbacks incorporated into the afforestation design, as per the current *Environmental Requirements for Afforestation*.

Note: Ineligible Land, as described above, must not be submitted with the application.

* Industrial cutaway peatlands may be eligible in the following situations: (i) under the Native Woodland Intervention for Remediation of Industrial Cutaway Peatlands Pilot Scheme; or (ii) where the applicant is proposing to afforest another comparable area of industrial cutaway peatland with native woodland species as compensation *in lieu* of the deforestation of an equivalent area of natural woodland which came about through natural regeneration and where the project giving rise to the deforestation has already been granted planning permission, and where the compensatory planting has been assessed for potential environmental impacts as part of that planning application.

Photo 6

Wet heath, with purple moor-grass and ling heather.

Photo 7

Wet heath, with ling heather, cross-leaved heath, hare's-tail cottongrass and purple moor-grass.

Photo 8

Dry heath, with western gorse and bell-heather.

Photo 9

Dry heath, with ling heather and bilberry.

Photo 10

Site with exposed rocky outcrops.

Appendix A: Methodology for Soil Survey

Overview

It is the responsibility of the Registered Forester to ensure only eligible soil types are presented in the application. This may or may not require the use of soil sampling. On sites where the soil types are clear, sampling will not be required. Where a soil survey is undertaken, it should accompany the initial application.

Soil survey for organo-mineral soils

This procedure involves a desk and field element, as set out below. Also see supporting Figures 1 to 3.

Desk review

Undertake a desk review, using iNET and other online resources. The steps involved are as follows:

- Generate a sample grid for the application at a rate four (4) points per hectare, or alternatively, request a grid and points by e-mailing forest.environment@agriculture.gov.ie with the words 'Soil sampling grid request' in the message bar. Also provide location details and a map derived from an orthophoto (1:5,000 scale) with the proposed afforestation project clearly outlined in red.
- Stratify the site into different soil types, in order to ensure the most efficient targeting of sampling. This is done using aerial imagery, datasets, vegetation type and topography to identify areas which are likely to be underlain by mineral soil or peat.
- Note, if stratification is not possible due to the variability of the site, all points in the grid should be sampled. This will enable targeting of transitional areas.

Field procedure

1. The following items are required for the field element of the soil surveying procedure: a handheld GPS; a Peat Depth Recording Sheet (see Appendix B, print or photocopy the template, as required); a soil stick; and measuring tape. A spade and compass will also prove useful.
2. Based on the site's topography and vegetation features, and the surrounding landscape, check the accuracy of the stratification arrived at during the desk assessment, amending it, if necessary.
3. Plot a transect along the longest diagonal through each area which is stratified (one transect for possible mineral area, one transect for possible peat area).
4. Walk along the transect, sampling those points adjacent to it. **Note:** Navigation to the individual points can be done with GPS and / or using site features visible on aerial imagery (the latter using a smartphone location app).
5. Ensure that the coordinates of each point sampled are recorded.
6. Disregard sample points within 15 m of existing agricultural drains, hedgerows and roads, due to the potential for mixed soil layers. Points falling on or within 15m of these features should be moved from the sample point in a perpendicular direction away from the feature to a point 15m from the feature.
7. It will be necessary to sample every point generated, in areas that are clearly homogenous in nature.
8. Using the soil stick, record the soil type and depth:
    a. If a mineral soil type is encountered, record as 'Mineral'.

b. If a peaty layer with a depth less than or equal to 30 cm is encountered, record as 'Organo mineral', noting the depth to the nearest centimetre (cm).

c. If peat soil with a depth greater than 30 cm is encountered, record as 'Peat', noting the depth to the nearest centimetre.

9. Where soil *depth* is difficult to distinguish or variable, dig a soil pit or alternatively, measure the soil depth within 1.0 m north, east, south and west of the sample point using a soil stick, and average the results to give an average soil depth. Where an average soil depth is recorded, position a capital case 'A' beside the reference number of the sample point involved.

10. In situations where soil *type* is difficult to distinguish using a soil stick, dig a soil pit as this should give greater clarity.

11. While walking, if areas within the stratified area appear different from the general conditions, these should be investigated. For example, a wet rushy pocket or a dry mineral pocket may be present within the stratified area, some distance away from the transect. Sample points taken within these are to be recorded as secondary points.

12. Within the peat area, if there is a variation between peat depths along the transect, secondary points are required to delineate the areas in excess of 30 cm peat. **I**f all points along the transect are in excess of 30 cm, no further sampling is required, as the land is ineligible for afforestation.

13. Where it is not possible to delineated that peat is 30 cm or less, the following applies:

    a. If the area is outlined as Fen/Raised, it will only be eligible under those Forest Types involving native woodland establishment. Furthermore, the area involved must be capable of supporting the establishment and development of the most appropriate native woodland type identified for the site (typically Pioneer Birch Woodland), *without additional drainage*.

    b. If the area is outlined as Blanket Bog, it is not eligible for afforestation.

14. Results of sample points and a map of eligible and ineligible areas should be provided following the survey.

15. Generally, any mappable area (i.e. 0.2 ha or greater) that does not meet the soil type requirement must be excluded from the application. However, such an area may be included as ABE, if it has a R+N score of 6.0 or greater and is otherwise plantable.

The following are the possible outcomes when undertaking a soil survey for organo-mineral soils (assuming no mineral soils are encountered during the survey):

- Peat depth of 30 cm or less: Soil type eligible for afforestation under all Forest Types (FTs) (subject to FT rules).
- Peat depth greater than 30 cm, within a fen or raised bog area: Soil type eligible for afforestation, but only under those Forest Types involving native woodland establishment. Furthermore, it must be capable of supporting the establishment and development of the most appropriate native woodland type identified for the site, *without additional drainage*.
- Peat depth greater than 30 cm, within a blanket bog area: Soil type not eligible for afforestation, regardless of Forest Type.

Figure 1 Stratification of application area.

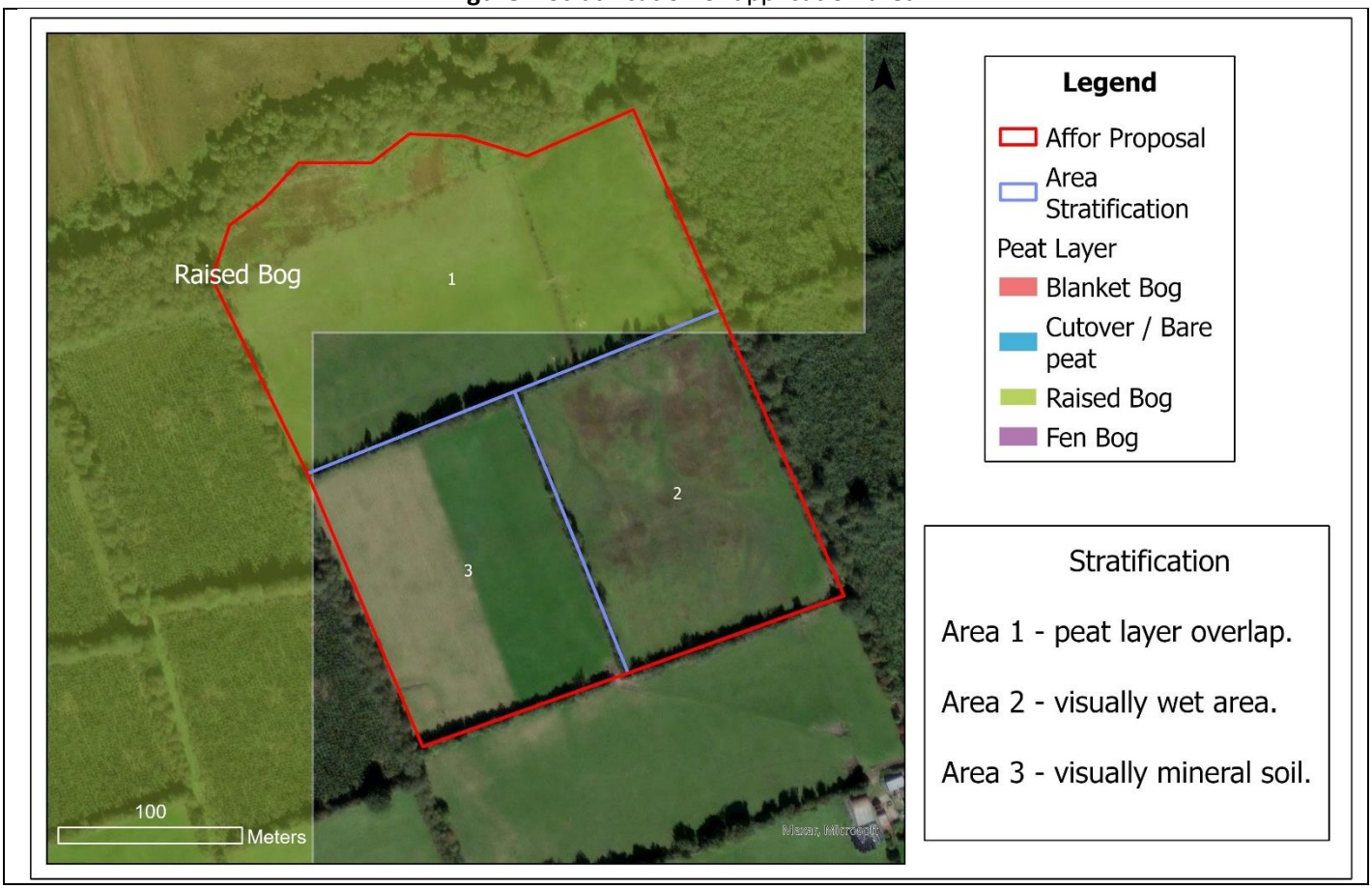


Figure 2 Plotting of transect and selecting sample points.

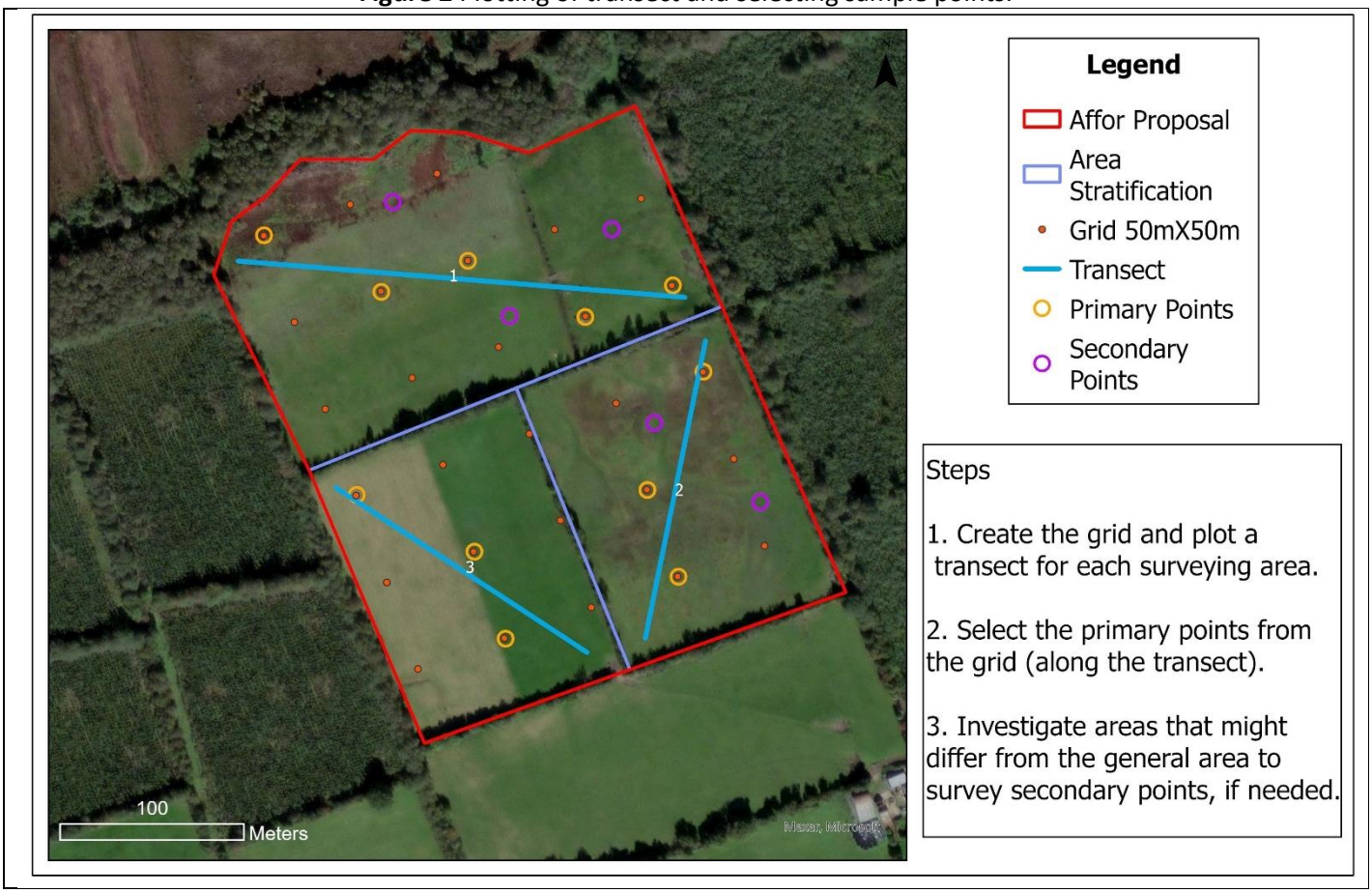
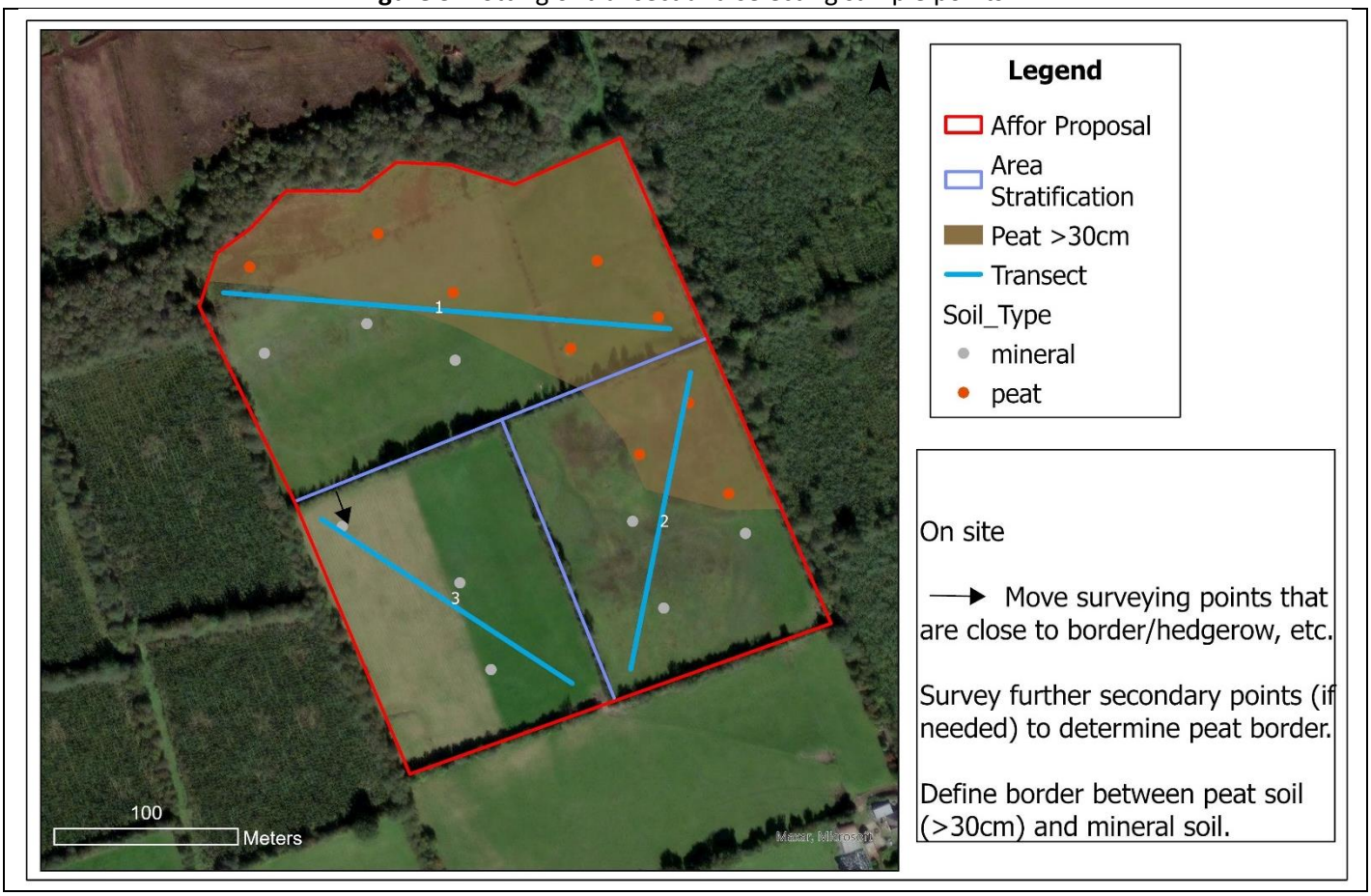


Figure 3 Plotting of transect and selecting sample points.



Appendix B: Recording Sheet for Peat Depth

The following pages set out a template Recording Sheet for Peat Depth for use in the field where a soil survey is being conducted as per the methodology in Appendix A. Print or photocopy, as required.

Recording Sheet for Peat Depth

(Print or photocopy as needed. A map should be provided to show transect / points taken and the eligible and ineligible areas.)

Affor. CN:		**Townland(s):**			
Point no.	**Point type[1]**	**X Coordinate (ITM)**	**Y Coordinate (ITM)**	**Soil type[2]**	**Peat depth[3] (cm)**

[1] Indicate whether the sample point is a primary or secondary point.

[2] Select from 'Mineral', 'Organo-mineral' or 'Peat'.

[3] Measure and record peat depth in centimetres. Measurements should be rounded to the nearest whole number, e.g., 22.4 cm to 22 cm, 26.7 cm to 27 cm.

Notes:

Appendix C: R+N Mapping, Sampling and Scoring

Overview

It is the responsibility of the Registered Forester to map each land type on the site correctly. This may or may not require the use of the sampling and scoring methodology set out in this appendix. On sites where the land types are very clear, sampling and scoring will not be required.

Mapping

Where there is a clear demarcation between areas based on vegetation types, these areas must be mapped as separate 'vegetation units'. A minimum vegetation unit of 0.2 ha applies. The use of aerial imagery from different years (as available on iNET) can provide an initial basis for demarcating such areas (see Figure 1).

If an area 0.2 ha or greater has a R+N score of less than 6.0, it cannot be included in the application, even as an Area for Biodiversity Enhancement (ABE). Any clearly demarcated area of Ineligible Land situated along the perimeter of the proposed afforestation site, must also be excluded.

Where an area shows a mosaic of vegetation types with no clearly defined boundaries, or where the area contains different vegetation in pockets less than 0.2 ha, the area should be treated as one vegetation unit for the purposes of the Land Types assessment, i.e. where a plot transitions into Ineligible Land which takes up less than 0.2 ha, this can be included within the plot as long as the average of the R+N scores recorded within the plot classify the plot as Eligible Land.

Sampling

Having identified and mapped the vegetation units, vegetation type sampling must be carried out separately for each vegetation unit, ensuring an adequate representation of the vegetation cover within that vegetation unit.

Vegetation sampling plots measuring 2 m x 2 m should be laid out within vegetation that is representative of the vegetation unit. The location of the center point, the north-west corner and the south-east corner must be recorded on the Sample Plot Recording Sheet (see Appendix E) to aid repeat sampling of the same plot, if required. Avoid any unrepresentative features such as drains and boundary edges. Table 1 provides further guidance.

Figure 1 An example of an initial stratification of vegetation units, based on aerial imagery and compiled prior to the site visit by the Registered Forester, which may subsequently lead to further refinement. (Note, this map is an example only and does not indicate whether or not this land is eligible for afforestation.)

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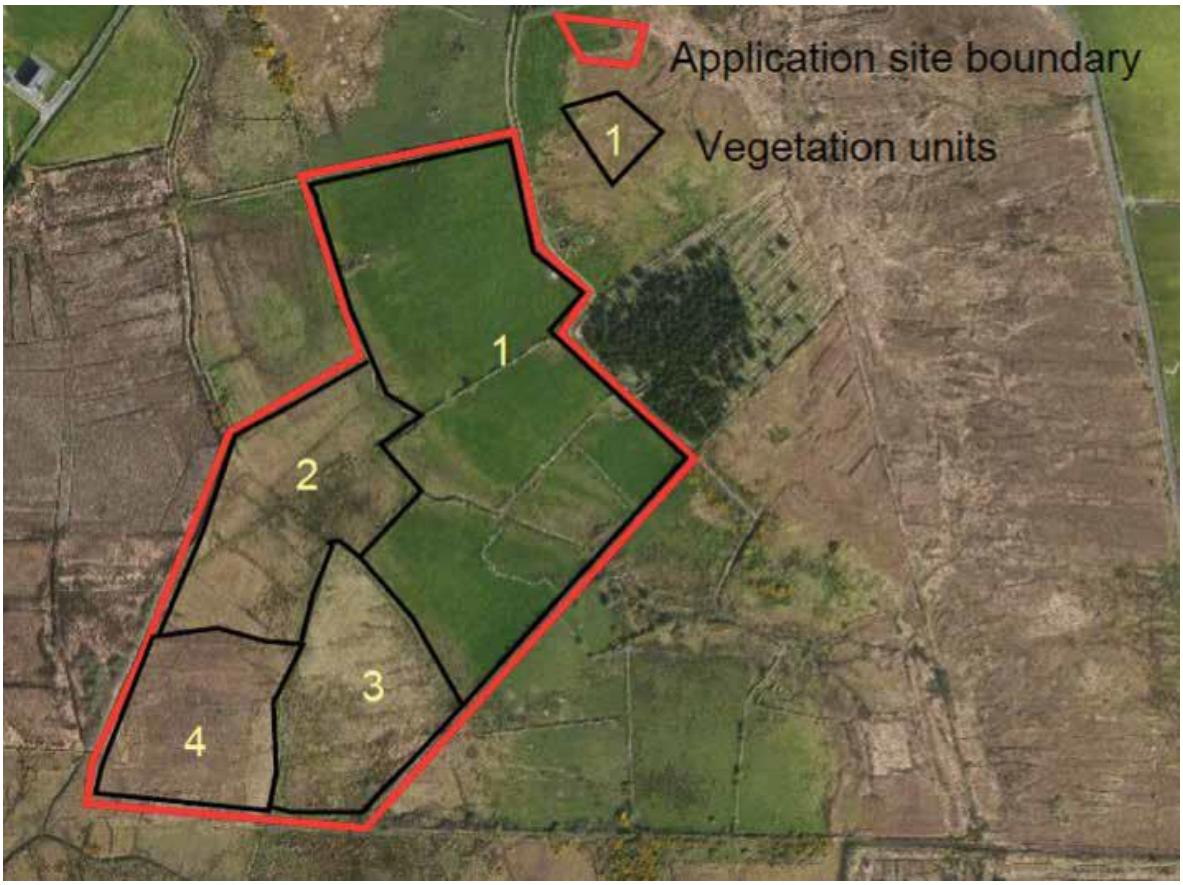


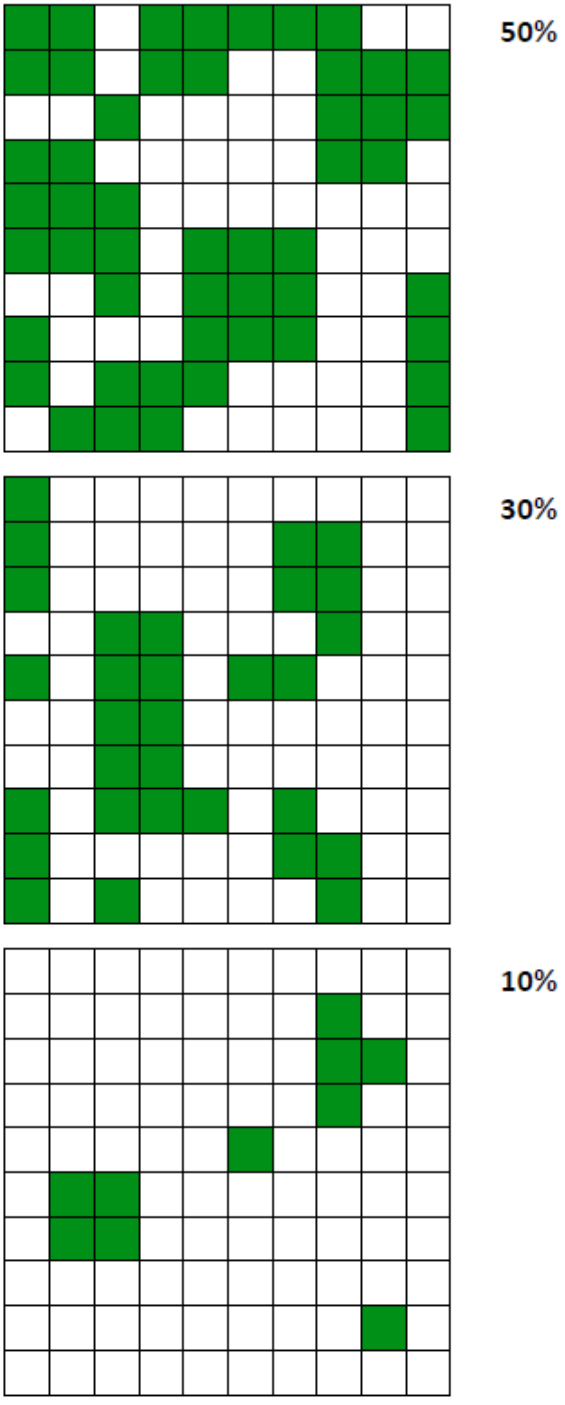
Table 1 Guidance on the number of vegetation sample plots required, based on the area of, and the vegetation variability within, the vegetation unit.

Area of vegetation unit	Variation within vegetation	Number of sample plots
< 8 ha	Uniform vegetation	5
< 8 ha	Variable vegetation	10
≥ 8 ha	Uniform or variable vegetation	≥ 10

Recording species percentages

Use a measuring tape and / or marking poles, mark out the boundary of the 2 x 2 m vegetation sample plot. Record the GPS position of the centre point, the north-west corner and the south-east corner. Identify the various plant species within this sample plot and estimate the percentage cover of each species in the plot. Figure 2 can be used as a guide to estimate the percentage cover of individual plant species. See Appendix E for a template of the Recording Sheet, to print off or photocopy as required.

Figure 2 A guide to estimating the percentage cover of individual plant species. The visual representations below show 50% cover, 30% cover and 10% cover.



Recording procedure

A list of common indicator plant species and their corresponding R+N scores is provided in Appendix C. For other species, see Hill *et al.* (1999), available for download at ECOFACT2a.pdf (nerc.ac.uk)

Tables 2 and 3 set out the steps required. (Note, Steps 1 to 5 are undertaken within *each* vegetation sampling plot.) Appendix E provides sample recording sheets for use in the field.

Table 2 Land Types for Afforestation recording procedure.

FOR EACH VEGETATION SAMPLE PLOT	**Step 1**	Identify and list the plant species within the vegetation sample plot, and estimate the percentage cover for each (identified as [A] in Examples 1-5).
	Step 2	For each species, find its combined R+N score [B], using Appendix C.
	Step 3	For each species, multiple its R+N score [B] by its corresponding percentage cover, to arrive at the weighted R+N score for that species [C].
	Step 4	Sum up the weighted R+N scores for all species to get the total weighted R+N score [D].
	Step 5	Determine the soil type within the sample plot. If peat, measure and record the depth of peat.
	Step 6	Repeat Steps 1 to 5 above for *each* vegetation sample plot along the transect line crossing the vegetation unit.
	Step 7	Examine the scores of each vegetation sample plot to verify the boundary of the vegetation unit. Areas 0.2 ha or greater of the land type Ineligible Land must be excluded. Therefore vegetation units must be adjusted accordingly. For example, if plots along the first half of the transect score high and along the second half of the transect score low, this indicates the presence of more than one vegetation unit and the boundary must be adjusted accordingly.
	Step 8	Calculate the average R+N score for the vegetation unit, by adding up the total weighted R+N scores [D] and dividing by the number of vegetation sample plots involved.
	Step-9	Using Table 3, assign a land type category (Eligible Land: FT1-12 OR Ineligible Land) to the vegetation unit, along with (as applicable) the proposed Forest Type. Note, Ineligible Land, as described in Section 4, must be excluded from the application.

Table 3 R+N score and corresponding Land Type category.

Average R+N score of vegetation unit	Corresponding Land Type of vegetation unit *
6.0 or greater	Eligible Land: FT1-12
Less than 6.0	Ineligible Land

* Sites are excluded from the Eligible Land category and fall into the Ineligible Land category if various other inhibiting factors apply, as listed in Section 4, regardless of their R+N score.

Examples

The following examples (below and overleaf) demonstrate the scoring of individual vegetation sample plots following Steps 1 to 5 in Table 2, and the outcome regarding which land type category applies (assuming the same results are reached for other plots within the vegetation unit).

Example 1

Soil type: Brown podzolic Vegetation: Dense bracken

Species within the vegetation sample plot	% cover [A]	Combined R+N score [B]	Weighed R+N score [C]
Bracken (*Pteridium aquilinum*)	70	6	4.2
Sweet vernal-grass (*Anthoxanthum odoratum*)	25	7	1.8
Velvet bent (*Agrostis canina*)	5	6	0.3
Total cover (%)	**100%***	**Total weighted R+N score [D] 6.3**	

Therefore, Eligible Land: FT1-12

Example 2

Soil type: Peat Vegetation: Wet grassland

Species within the vegetation sample plot	% cover [A]	Combined R+N score [B]	Weighed R+N score [C]
Purple moor-grass (*Molinia caerulea*)	70	5	3.5
Bracken (*Pteridium aquilinum)*	15	6	0.9
Sweet vernal-grass (*Anthoxanthum odoratum*)	10	7	0.7
Soft rush (*Juncus effusus*)	5	8	0.4
Total cover (%)	**100%***	**Total weighted R+N score [D] 5.5**	

Therefore, Ineligible Land

* **Note:** vegetation cover may be less than 100%, where there is high moss cover or bare ground. It may also be over 100% where plants overlap. In both cases, adjust % Cover of each species up or down proportionately, to add up to 100%.

Appendix D: Key Indicator Species for R+N Scoring

The following table lists key plant species indicative of varying degrees of site fertility, together with their corresponding R+N score (from Hill *et al.,* 1999) (the full list is available for download at http://nora.nerc.ac.uk/6411/1/ECOFACT2a.pdf).

Common name	Scientific name	Hill Ellenberg R Score	Hill Ellenberg N Score	Combined R+N Score
Ferns				
Scaly Male-fern	*Dryopteris affinis*	5	5	10
Broad Buckler-fern	*Dryopteris dilatata*	4	5	9
Bracken	*Pteridium aquilinum*	3	3	6
Rushes				
Field wood rush	*Luzula campestris*	5	2	7
Heath wood rush	*Luzula multiflora*	3	3	6
Great wood rush	*Luzula sylvatica*	4	4	8
Heath rush	*Juncus squarrosus*	2	2	4
Sharp-flowerd rush	*Juncus acutiflorus*	4	2	6
Jointed rush	*Juncus articulatus*	6	3	9
Bulbous rush	*Juncus bulbosus*	4	2	6
Compact rush	*Juncus conglomeratus*	4	3	7
Soft rush	*Juncus effusus*	4	4	8
Hard rush	*Juncus inflexus*	7	5	12
Black Bog rush	*Schoenus nigricans*	7	2	9
Sedges				
Green-ribbed Sedge	*Carex binervis*	3	2	5
Brown Sedge	*Carex disticha*	6	4	10
Star Sedge	*Carex echinata*	3	2	5
Glaucous Sedge	*Carex flacca*	6	2	8
Common Sedge	*Carex nigra*	4	2	6
Carnation Sedge	*Carex panicea*	4	2	6
Remote Sedge	*Carex remota*	6	6	12
Wood-sedge	*Carex sylvatica*	6	5	11
Common Cottongrass	*Eriophorum angustifolium*	4	1	5
Hare's-tail Cottongrass	*Eriophorum vaginatum*	2	1	3
Deergrass	*Trichophorum cespitosum*	2	1	3
Grasses				
Velvet Bent	*Agrostis canina*	3	3	6
Sweet Vernal-grass	*Anthoxanthum odoratum*	4	3	7
Tufted Hair-grass	*Deschampsia cespitosa*	5	4	9
Sheep's-fescue	*Festuca ovina*	4	2	6
Yorkshire-fog	*Holcus lanatus*	6	5	11
Purple Moor-grass	*Molinia caerulea*	3	2	5
Mat-grass	*Nardus stricta*	3	2	5
Common Bent	*Agrostis capillaris*	4	4	8

Common name	Scientific name	Hill Ellenberg R Score	Hill Ellenberg N Score	Combined R+N Score
Grasses (continued)				
Creeping Bent	*Agrostis stolonifera*	7	6	13
Meadow Foxtail	*Alopecurus pratensis*	6	7	13
Sweet Vernal-grass	*Anthoxanthum odoratum*	4	3	7
False Oat-grass	*Arrhenatherum elatius*	7	7	14
False-brome	*Brachypodium sylvaticum*	6	5	11
Quaking-grass	*Briza media*	7	3	10
Meadow Brome	*Bromus commutatus*	8	6	14
Tufted Hair-grass	*Deschampsia cespitosa*	5	4	9
Wavy Hair-grass	*Deschampsia flexuosa*	2	3	5
Sheep's-fescue	*Festuca ovina*	4	2	6
Red Fescue	*Festuca rubra*	6	5	11
Yorkshire-fog	*Holcus lanatus*	6	5	11
Reed Canary-grass	*Phalaris arundinacea*	7	7	14
Timothy	*Phleum pratense*	7	6	13
Common Reed	*Phragmites australis*	7	6	13
Smooth Meadow-grass	*Poa pratensis*	6	5	11
Rough Meadow-grass	*Poa trivialis*	6	6	12
Herbaceous flowering plants				
Bog Pimpernel	*Anagallis tenella*	5	3	8
Wild Angelica	*Angelica sylvestris*	6	5	11
Daisy	*Bellis perennis*	6	4	10
Common Knapweed	*Centaurea nigra*	6	5	11
Common Mouse-ear	*Cerastium fontanum*	5	4	9
Creeping Thistle	*Cirsium arvense*	7	6	13
Meadow Thistle	*Cirsium dissectum*	4	2	6
Marsh Thistle	*Cirsium palustre*	5	4	9
Spear Thistle	*Cirsium vulgare*	6	6	12
Smooth Hawk's-beard	*Crepis capillaris*	7	4	11
Round-leaved Sundew	*Drosera rotundifolia*	2	1	3
Great Willowherb	*Epilobium hirsutum*	7	7	14
Common Eyebright	*Euphrasia officinalis agg.*	5	3	8
Cross-leaved Heath	*Erica tetralix*	2	1	3
Meadowsweet	*Filipendula ulmaria*	6	5	11
Marsh-bedstraw	*Galium palustre*	5	4	9
Heath Bedstraw	*Galium saxatile*	3	3	6
Lady's Bedstraw	*Galium verum*	6	2	8
Hogweed	*Heracleum sphondylium*	7	7	14
Cat's-ear	*Hypochaeris radicata*	5	3	8
Meadow Vetchling	*Lathyrus pratensis*	6	5	11
Autumn Hawkbit	*Leontodon autumnalis*	6	5	11
Oxeye Daisy	*Leucanthemum vulgare*	7	4	11
Common Twayblade	*Listera ovata*	7	5	12
Perennial Rye-grass	*Lolium perenne*	6	6	12
Common Bird's-foot-trefoil	*Lotus corniculatus*	6	2	8
Greater Bird's-foot-trefoil	*Lotus pedunculatus*	6	4	10
Ragged-Robin	*Lychnis flos-cuculi*	6	4	10

Common name	Scientific name	Hill Ellenberg R Score	Hill Ellenberg N Score	Combined R+N Score
Herbaceous flowering plants (contined)				
Black Medick	*Medicago lupulina*	8	4	12
Water Mint	*Mentha aquatica*	7	5	12
Water Forget-me-not	*Myosotis scorpioides*	6	6	12
Bog Asphodel	*Narthecium ossifragum*	2	1	3
Lousewort	*Pedicularis sylvatica*	3	2	5
Mouse-ear-hawkweed	*Pilosella officinarum*	7	2	9
Ribwort Plantain	*Plantago lanceolata*	6	4	10
Silverweed	*Potentilla anserina*	7	6	13
Tormentil	*Potentilla erecta*	3	2	5
Selfheal	*Prunella vulgaris*	6	4	10
Meadow Buttercup	*Ranunculus acris*	6	4	10
Bulbous Buttercup	*Ranunculus bulbosus*	7	4	11
Lesser Celandine	*Ranunculus ficaria*	6	6	12
Creeping Buttercup	*Ranunculus repens*	6	7	13
Yellow-rattle	*Rhinanthus minor*	6	4	10
Bramble	*Rubus fruticosus*	6	6	12
Sorrel	*Rumex acetosa*	5	4	9
Broad-leaved Dock	*Rumex obtusifolius*	7	9	16
Common Ragwort	*Senecio jacobaea*	6	4	10
Common Chickweed	*Stellaria media*	6	7	13
Devil's-bit Scabious	*Succisa pratensis*	5	2	7
Purple Clover	*Trifolium purpureum*	7	5	12
White Clover	*Trifolium repens*	6	6	12
Common Nettle	*Urtica dioica*	7	8	15
Germander Speedwell	*Veronica chamaedrys*	6	5	11
Wood Speedwell	*Veronica montana*	6	6	12
Tufted Vetch	*Vicia cracca*	7	5	12
Vetch	*Vicia sativa*	7	4	11
Bush Vetch	*Vicia sepium*	6	6	12
Wood Vetch	*Vicia sylvatica*	7	5	12
Common Dog-violet	*Viola riviniana*	5	4	9
Low shrubs				
Ling Heather	*Calluna vulgaris*	2	2	4
Bell Heather	*Erica cinerea*	2	2	4
Cross-leaved heath	*Erica tetralix*	2	1	3
Bog-myrtle	*Myrica gale*	3	2	5
Gorse	*Ulex europaeus*	5	3	8
Western Gorse	*Ulex gallii*	3	2	5
Grey Willow	*Salix cinerea*	6	5	11
Bilberry	*Vaccinium myrtillus*	2	2	4
Mosses *				
	Aulacomnium palustre	3	2	5
	Brachythecium rutabulum	6	6	12
	Breutelia chrysocoma	4	2	6
	Calliergonella cuspidata	7	4	11

Common name	Scientific name	Hill Ellenberg R Score	Hill Ellenberg N Score	Combined R+N Score
Mosses * (continued)				
	Campylium stellatum	6	2	8
	Campylopus introflexus	2	2	4
	Ctenidium molluscum	7	2	9
	Dicranum scoparium	3	2	5
	Drepanocladus cossonii	7	2	9
	Drepanocladus revolvens	6	2	8
	Eurhynchium praelongum	5	6	11
	Fissidens adianthoides	6	2	8
	Hylocomium splendens	4	2	6
	Hypnum jutlandicum	2	2	4
	Philonotis fontana	4	3	7
	Pleurozium schreberi	2	2	4
	Polytrichium commune	2	2	4
	Rhytidiadelphus loreus	2	2	4
	Rhytidiadelphus squarrosus	5	4	9
	Scleropodium purum	6	3	9
	Scorpidium scorpiodes	6	2	8
Bog Moss	*Sphagnum capillifolium*	2	1	3
	Sphagnum cuspidatum	1	2	3
	Sphagnum palustre	3	2	5
	Sphagnum papillosum	1	1	2
	Sphagnum subnitens	3	2	5
* Mosses included for information only, and do not form part of the Land Types for Afforestation assessment procedure.				

Appendix E: Recording Sheet for R+N Scoring

The following pages set out a template Recording Sheet for use in the field where the R+N score is being assessed, following the methodology set out in Appendix C: Mapping, Sampling and Scoring. These sheets, to be printed off or photocopied as required, can be used to record the information required in Steps 1 to 5 of the procedure detailed in Table 2 of that appendix.

Afforestation R+N Score Recording Sheet

(Print or photocopy, as required)

CN		**Date**
Grid Reference	**Centre Point** **NW Corner** **SE Corner**	
Townland & County		**Recorder's Name**

Topography	***Slope (level / moderate / steep)***
Soil type	***Peat depth (cm)***
Exposed rock % cover	***Surface water % cover***
Habitat type As listed in Fossitt's *A Guide to Habitats in Ireland* (2000) Potential links to Annex 1	
Land type general description	

Vegetation Sample Plot No:			
Species within the sample plot	***% cover [A]***	***Combined R+N score [B]***	***Weighted R+N score [C]***
		Total weighted R+N score [D]	

CN	**Date**
Townland & county	**Recorder's name**

Vegetation Sample Plot No:			
Species within the sample plot	***% cover [A]***	***Combined R+N score [B]***	***Weighted R+N score [C]***
		Total weighted R+N score [D]	

Vegetation Sample Plot No:			
Species within the sample plot	***% cover [A]***	***Combined R+N score [B]***	***Weighted R+N score [C]***
		Total weighted R+N score [D]	

Appendix F: Reference and Further Reading

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