

Ecological Site Classification Version 4

Draft Quickstart Guidance for Site Assessment

1 Overview

The current system is structured to provide an interface organised as follows :

	Resource links
Quick navigation	Tool selector <i>Changing the option will change the contents of the tool options window.</i>
Tool options	Map view + legend
Results window	

- Resource links – the terms of use, update history, case studies, manual, contact email.
- Quick navigation – enter a six figure Ordnance Survey GB grid reference, the map will zoom into the region of interest.
- Tool selector – Ecological Site Classification and related decision support tools can be selected from a list.
- Maps of species suitability alongside climatic and topographic data can be accessed using Forest Maps.
- Tree species suitability can be evaluated using Ecological Site Classification (Tree Species).
- Native Woodland suitability can be evaluated using Ecological Site Classification (NVC Woodland).
- If ESC base data is required for sample sites, this can be obtained by uploading a file containing a list of Ordnance Survey GB grid references (i.e. two letters followed by six digits e.g. NT090950), this will return a common separated value file containing the four ESC climate variables and the modelled soil properties for the given site.
- Data is entered via the Tool Options window pane (e.g. soil properties and management options).
- The outcomes of an analysis are displayed in the Results Window, alongside options to save the data where applicable as a csv or pdf file.

2 Forest Maps Data Browser Options

The Forest Maps data browser contains folders which can be expanded by clicking on them to reveal a number of datasets. Clicking on the map will reveal metadata about the map currently being viewed alongside the option to download the data as a file (usually a geotiff).

a) Climatic Data

This option contains the baseline climatic data (accumulated temperature, continentality, days (exposure) and moisture deficit for the period 1961-1990 at a resolution of 250 metres. Rainfall is provided at 5km resolution for the same period.

b) Topographic Data

These are data derived from 250m Ordnance Survey open data digital elevation models and publicly available methods for calculating topographic shelter (topex) and topographic wetness (compound topographic index). Aspect and slope were derived from models in QGIS.

c) Broadleaf Species

Climatic timber suitability maps for a range of broadleaved species.

d) Conifer Species

Climatic timber suitability maps for a range of conifer species. In some cases such as Douglas fir, Scots pine and Sitka spruce additional information is available on provenance and soils suitability.

The species climatic suitability maps show the theoretical maximum planting extent of a selected species assuming optimal soil (edaphic) conditions within GB. However in practice the range will be considerably reduced due other factors, particularly the site soil type. Like many aspects of decision support tools the maps are intended to complement site level assessments, expert judgement and local knowledge.

e) Native woodland maps (Baseline)

Native woodland maps combine the **climatic** species suitability of the main component species with the **climatic** NVC suitability guidelines published in Ecological Site Classification Bulletin 124. Information on soil type will inform the actual NVC woodland type suitable for a given location.

f) Climate Zones and Modelled Soil Data

These are the broad ESC climate zones for GB alongside ESC soil properties data (SMR/SNR) which has been modelled to 250x250 metre pixel resolution based on FC soil maps and national scale data. While the soil data indicates trends it is not intended for site level planning, users are recommended to use their own data in site analyses if possible.

g) Establishment

Maps are included for bareroot planting windows according FC Bulletin 121 and GB Seed Zones.

h) In Development

Those are provided for evaluation and are part of ongoing work which is yet to be finalised. A map is included that provides an estimate of site fertility according to underlying solid geology (based on an old, and now superseded BGS 1:625k dataset).

In addition two new maps are in development that describe the climatic potential of broadleaved or conifer species according to the potential of various key species. Those climatic zone maps are intended to help users quickly identify the species and objectives that are likely to be supported in a given location.

For the broadleaved map the key is as follows:

Zone	Interpretation
OK/BE/SY/WCH	The site is climatically very suitable for one or more of Oak, Beech, Sycamore or Wild Cherry.
PBI/SBI	The site is climatically very suitable for Birch, or suitable for other broadleaved species. Good production is still possible.
OK/SY/Native	The site is climatically suitable for Birch, Oak and Sycamore, though there may be climatic constraints. Site may also be suitable for other native woodland (NVC) types where production is not an objective.
PBI/SBI	The site is only suitable for Birch, as a low yield species.
PBI/ROW	The site is possibly suitable for Birch and Rowan as native woodland habitat.

3 Map View

The map displays the dataset currently selected. The following actions are available

- a) zoom in/out using mouse wheel or the +/- control on the map. Pinch to zoom may work on devices with touch interfaces.
- b) pan by holding mouse down and dragging the map
- c) zoom to region of interest by holding down shift key then pressing left mouse button to draw a box, on release of the mouse button the system zooms in to the selected region.
- d) click to analyse – if the left mouse button is clicked the system analyses the site with the user selected (or default) site variables and query parameters.

4 Site and Query Parameters

The input panel for Ecological Site Classification includes the options to amend site level data on soil type, operations and query parameters.

a) Soil Moisture Regime

Select the appropriate soil moisture regime for the site. We assume that this data is obtained through a formal soil survey.

b) Soil Nutrient Regime

Select the appropriate soil moisture regime for the site. We assume that this data is obtained through a formal soil survey. Note there are now three categories of very poor site (VP1, VP2 and VP3). VP1 is the most impoverished (e.g. FC deep peat soil type 10a), VP2 the intermediate grade (e.g. FC deep peat soil type 11a) and VP3 is the richest (e.g. FC podzolic peaty gley soil type 6z).

Soil data for common FC soil types are included in appendix A.

c) Brash Management

If new planting ignore this option. If restock indicate if the site will replanted quickly to take advantage of nutrients from decomposing brash.

d) Drainage

Wet sites (soil moisture regimes very wet, wet, very moist and moist) can benefit from drainage, which has the effect of drying the site and slightly improving the nutrient availability on very poor sites.

e) Fertiliser/Nursing mixture

The application of fertiliser can raise the site nutrient regime, however this is only warranted on very poor and occasionally poor soil nutrient regimes. Depending upon the site type some species may require several applications and/or a unique fertiliser prescription based upon specific site/species issues (e.g. imbalance in NPK ratios).

There is evidence that pines planted in mixture with other species can ameliorate nitrogen deficiencies on certain sites, but not PK or other limitations. The favoured mixture species for use with Sitka spruce is Alaskan Lodgepole pine, as this will grow more slowly and the stand is therefore more likely to self thin.

Larch, birch and alder may also confer nurse benefits though they may not be suitable in some situations due to site requirements, or their tendency on exposed sites to damage leaders of adjacent trees through crown whipping.

f) Results Filter

This list provides options to constrain the results list to suitable species only, native only and so on. When looking at native woodland creation remember that NVC types have different niches to the suitability ranges of component species. For example Scots Pine is suitable on a wide range of soil types (very poor to rich), but the related W18 native woodland only tends to occur where the soil nutrient regime is very poor or poor (see pages 48-49 of bulletin 124).

g) Climate Scenarios

The ESC model can be run against different climate scenarios. For current operational use we recommend the baseline scenario with some thought given to the consequences for selected species should the site become drier in the future.

h) Update button

Assuming a site has been identified on the map, the update button allows the same site to be re-analysed but with different soil or management options.

5 Results View

a) Site Data

The first table lists all the site data and the user inputs. Sometimes SMR and SNR will be amended according to the impact of a site operation (e.g. drainage).

b) Results

Species suitability results are displayed for all 57 species available unless the user subsets the list via option 4(f). Suitability scores are presented in the classic coloured chart on the right hand side and complemented with the underlying model outputs on the left hand side.

There is a link at the top of the table that allows the results to be saved in CSV or PDF format.

ESC Score	Description	Interpretation
0.75+	Very suitable	Factors will not significantly constrain growth
0.5 – 0.74	Suitable	Some impact upon growth, for example lower yielding Sitka spruce on a peaty gley (YC 14-16).
0.3 – 0.49	Marginal	Species in this category may have significantly reduced growth, high risk of check or absolute failure. Examples -Sitka spruce on certain deep peats without fertiliser exhibiting wide variation in growth rates(YC 0-10). -Downy birch on very poor sites forming a scrub woodland .
0 – 0.29	Unsuitable	In this category the species will usually fail to establish extensive tree cover.

The species suitability scores operate on the basis that a higher value means a particular factor (AT, SMR etc) is unlikely to prevent tree growth. Values above 0.75 are very suitable and have the lowest risk, but the incidence of failure or significantly reduced growth is usually much higher when one or more factors is below 0.5.

The numeric outputs give a little more information about how marginal or suitable a species may be on a given site. For example a species with a suitability score of 0.50 in reality may be close in performance to another with a score of 0.49.

ESC Species Symptoms by Climatic/Edaphic(Soil) Variables and Suitability Classes

Variable	Suitability Class	Effects
Accumulated Temperature (AT)	Unsuitable	- High mortality due to winter cold. - Very slow growth. - Potentially death at any age.
	Marginal	- Significantly reduced growth rate.
	Suitable	- Growth reduction of 25-50%
	Very Suitable	- No warmth constraints
Continentality	Unsuitable	
	Marginal	
	Suitable	
	Very Suitable	
DAMS	Unsuitable	- High mortality due to wind exposure
	Marginal	- Significantly reduced growth rate. - Severe stem form problems
	Suitable	- Possible stem form problems
	Very Suitable	- No exposure constraints
Moisture deficit	Unsuitable	- High mortality due to drought. - Limited growth due to excessive rainfall
	Marginal	- Severe growth constraints - Stem damage risk from drought cracks
	Suitable	- Some growth constraints - Possible drought cracks(Grand/Noble fir)
	Very Suitable	- No constraints
Soil Moisture Regime	Unsuitable	- Mortality due to anaerobic conditions (wet sites) - Mortality due to dry conditions (very dry sites)
	Marginal	- Severe growth constraints due to limited rooting in wet soil. - Difficulty sustaining growth of larger trees due to limited water availability on dry soils.
	Suitable	- Some growth constraints due to limited water availability on dry soils. - Wet conditions inhibit uptake of nutrients.
	Very Suitable	- No constraints
Soil Nutrient Regime	Unsuitable	- High mortality due to acid soil conditions. - Check, trees unable to grow due to

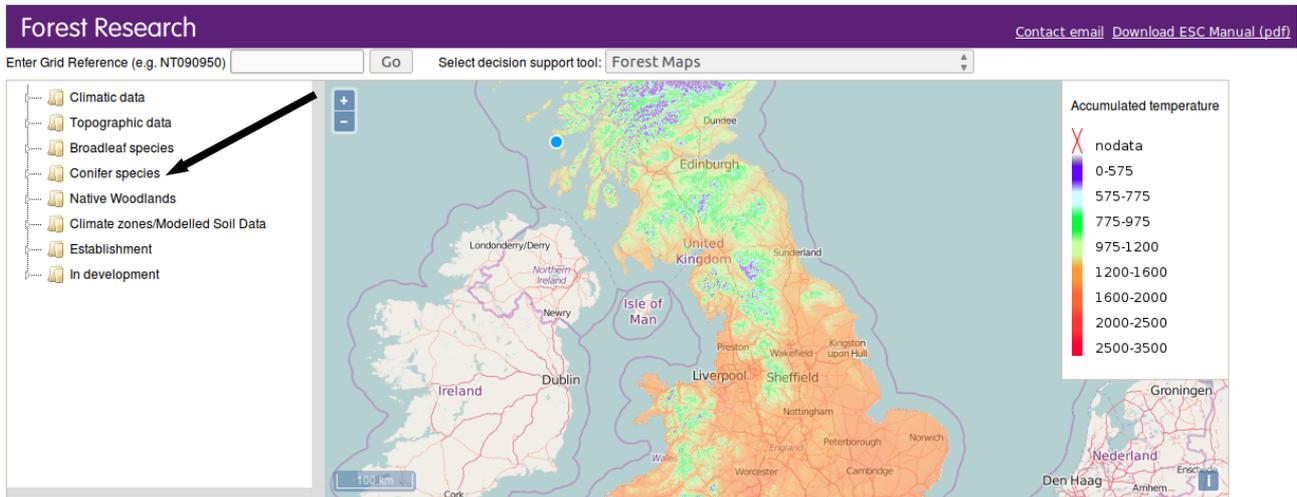
		nutrient deficiencies. - Mortality associated with carbonate soils.
	Marginal	- Uneven and limited growth due to lack of nutrients. - Stunted stems.
	Suitable	- Some reduction in growth potential.
	Very Suitable	- Good growth. - Coarse branching on richer soils (Scots pine, birch)

6. ESC Examples

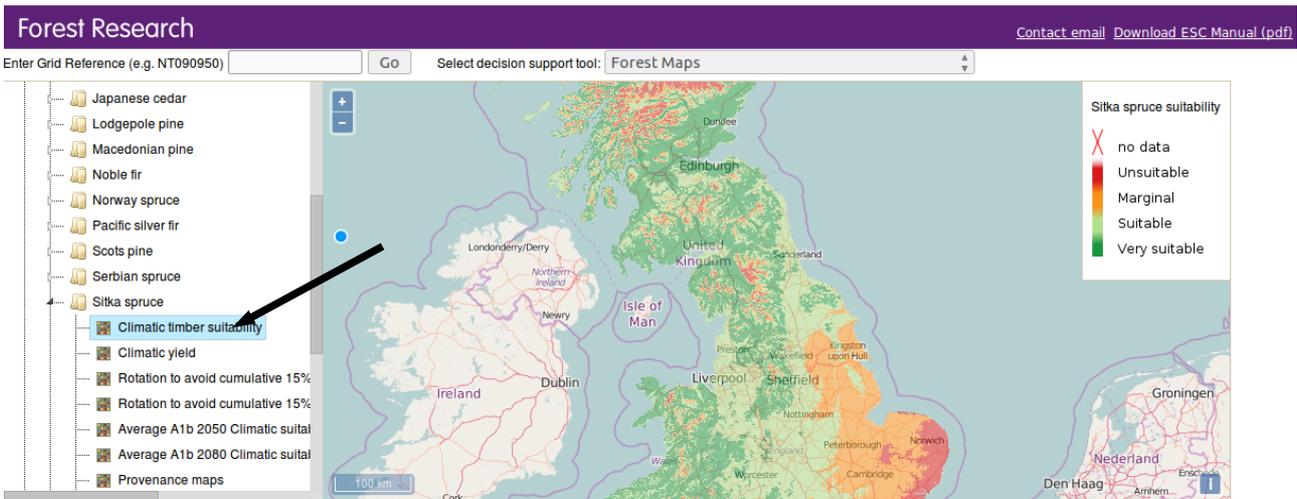
Case Study One – Restock of poor wet site type with Sitka spruce.

1. On the layer view expand the conifer species folder by clicking on it

This will allow you to select the map for the species of interest.



2. Select the map for climatic suitability of Sitka spruce in baseline climates

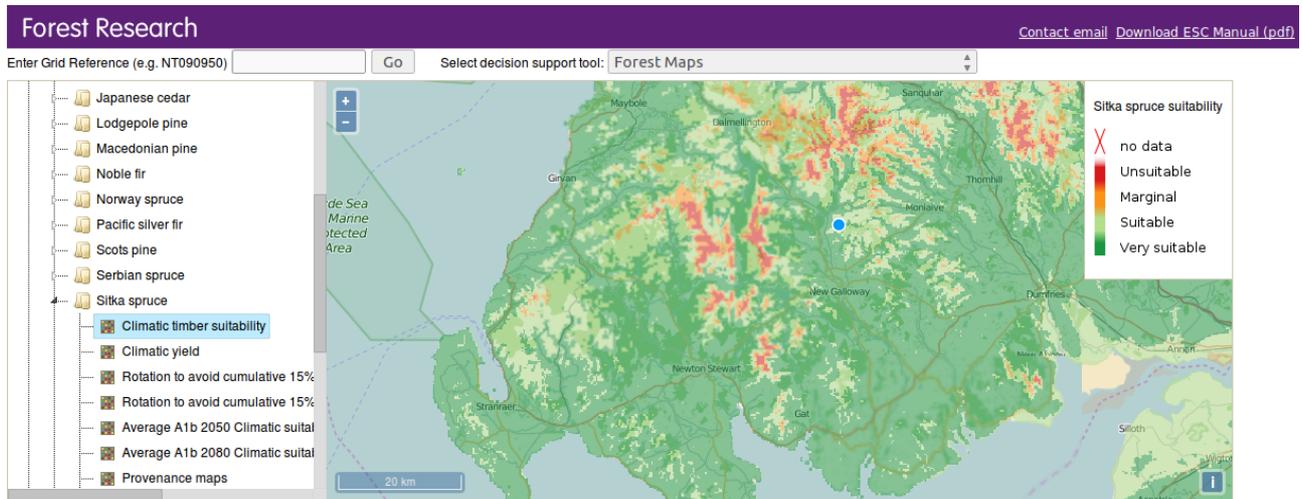


This map gives an overview of yield potential for the selected species, considering ESC climatic factors only (i.e. AT, CT, DAMS and MD). Darker green indicates increasing suitability while regions in red are unsuitable.

ESC assumes adverse climatic factors cannot be compensated by ideal soil conditions, so those maps can be viewed as the maximum areas of land suitable for a given species. However there is evidence that some climatic constraints can be compensated by local site properties, for example high climatic moisture deficits/dry regions may be offset by wet soils. Those issues require foresters to make on the ground adjustments based on their own experience and history of the site.

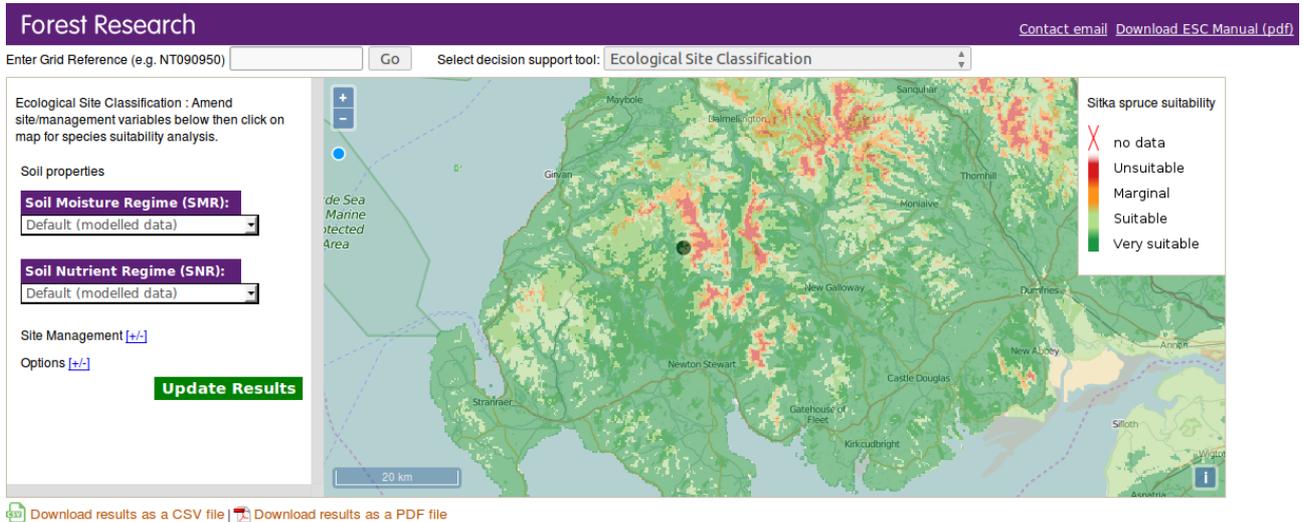
3. Locate Site of interest

The map has various functions such as pan/zoom. Use those to locate the site of interest. In this example we have zoomed into Galloway.



Now to obtain a site assessment from ESC we simply select Ecological Site Classification in the drop down menu and click on the site of interest indicated by the cursor (blue dot). A set of results is added below the map and a black circle indicates the location.

4. Initial Results



Adjustments	Eastings(m)	Northings(m)	Site Grid Reference	Climate Scenario	Site Class	Filter	Brash	Drainage	Fertiliser
Site defaults	238745	584975	NX387849	Baseline climate 1961-1990	Cool - Moderately exposed - Wet	All species	No brash present	No drainage installed	No fertiliser

Modifications	Accumulated Temperature(AT)	Continentality(CT)	Exposure(DAMS)	Moisture Deficit (MD)	Soil Moisture Regime (SMR)	Soil Nutrient Regime(SNR)
None	1102	6	15	62	2(Wet)	0.5(VP2 Very poor)

The analysis at this stage is based upon default settings, such as a soil type of SMR Wet and SNR VP2 Very poor.

The site we wish to test is a restocking site with soil conditions SMR=Wet, SNR=VP3 determined by a site visit. Brash will be retained on the site but it will not be restocked

for 4 years after felling due to the risk of damage from *hylobius*. To minimise site costs we wish to avoid the investment in fertiliser if possible.

5. Site Data Input

Forest Research [Contact email](#) [Download ESC Manual \(pdf\)](#)

Enter Grid Reference (e.g. NT090950) Select decision support tool: Ecological Site Classification

Ecological Site Classification : Amend site/management variables below then click on map for species suitability analysis.

Soil properties

Soil Moisture Regime (SMR):
Wet

Soil Nutrient Regime (SNR):
Very poor (VP3)

Site Management [\(+/-\)](#)

Brash management:
Brash > 18 months

Drainage:
Drainage installed

[Download results as a CSV file](#) | [Download results as a PDF file](#)

Adjustments	Eastings(m)	Northings(m)	Site Grid Reference	Climate Scenario	Site Class	Filter	Brash	Drainage	Fertiliser
Site defaults	238745	584975	NX387849	Baseline climate 1961-1990	Cool - Moderately exposed - Wet	All species	Brash older than 18 months	Drainage installed	No fertiliser

Modifications	Accumulated Temperature(AT)	Continentality(CT)	Exposure(DAMS)	Moisture Deficit (MD)	Soil Moisture Regime (SMR)	Soil Nutrient Regime(SNR)
None	1102	6	15	62	2(Wet)	1(VP3 Very poor)
Drainage					1	0.5
Final	1102	6	15	62	3(Very moist)	1.5(Very poor-poor)

The site data is amended using the drop down options on the right hand side. Click update results to change the site analysis to reflect the new data. Drainage has altered the soil wetness class from wet to very moist and improved the site soil nutrient regime by half a class.

6. Results

Suitability key Very Suitable (0.75-1.00) Suitable (0.50-0.74) Marginal (0.30-0.49) Unsuitable (0.0-0.29)

Common name	Species Code	Suitability		YC	Lim	AT	CT	DAMS	MD	SMR	SNR	Suit.	AT	CT	DAMS	MD	SMR	SNR	Version (Rating)	Suit. Charts
		Ecological	Timber																	
Corsican pine	CP	0.49	0.33	7	AT5	0.49	1	0.78	0.97	0.75	0.67								3.3(A)	download chart(csv)
Lodgepole pine	LP	0.67	0.62	9	SNR	0.92	1	0.89	0.72	1	0.67								3.1(A)	download chart(csv)
Macedonian pine	MCP	0.64	0.64	9	MD	1	1	0.87	0.64	1	0.67								3.1(C)	download chart(csv)
Maritime pine	MAP	0.18	0.07	1	MD	0.37	1	0.61	0.18	0.35	0.67								3.1(C)	download chart(csv)
Monterey/Radiata pine	RAP	0	0	0	MD	0.21	0.83	0.85	0	0.58	0.72								3(C)	download chart(csv)
Scots pine	SP	0.63	0.61	8	SMR	0.96	1	0.77	0.98	0.63	0.67								3.3(A)	download chart(csv)
Weymouth pine	WEP	0	0	0	SMR	0.78	0.74	0.6	0.94	0	0.47								3(B)	download chart(csv)
Norway spruce	NS	0.56	0.51	12	SNR	0.91	1	0.62	0.93	0.82	0.56								3.1(A)	download chart(csv)
Oriental spruce	ORS	0.25	0.15	3	SNR	0.62	0.87	0.59	0.49	0.6	0.25								3(C)	download chart(csv)
Serbian spruce	OMS	0.46	0.4	9	SNR	0.88	0.9	0.64	0.49	0.8	0.46								3(B)	download chart(csv)
Sitka spruce	SS	0.53	0.45	13	SNR	0.86	1	0.87	1	0.99	0.53								3.1(A)	download chart(csv)
Sitka spruce(VP)	VPSS	0.53	0.45	14	SNR	0.86	1	0.87	1	0.99	0.53								3.1(A)	download chart(csv)
Douglas fir	DF	0	0	0	SMR	0.74	1	0.49	0.66	0	0.46								3.1(A)	download chart(csv)

The results for Sitka spruce are highlighted. For discussion the results are tabulated below.

Field	Value	Explanation
Common Name	Sitka spruce	
Species Code	SS	
Ecological suitability	0.53	The ecological suitability based on the most limiting factor, in this case SNR. Indicates suitable.
Timber suitability	0.45	The timber suitability based on AT and SNR in this case, the growth potential is just below 50% of potential. Indicates marginal.
Yield Class	13	The predicted yield class. $YC = ATFactor * LimitingFactor * Species\ Max\ YC\ in\ GB$ $0.86 * 0.53 * 28 = 13$
Limiting factor	SNR	The factor with the lowest response.
AT	0.86	AT value (1099) Very Suitable (≥ 0.75)
CT	1	CT value (6) Very Suitable (≥ 0.75)
DAMS	0.87	DAMS value (16) Very Suitable (≥ 0.75)
MD	1	MD value (61) Very Suitable (≥ 0.75)
SMR	0.99	SMR value (3/Very moist) Very Suitable (≥ 0.75)
SNR	0.53	SNR value (1.5/Very Poor-Poor) Suitable (≥ 0.5 and < 0.75)

So currently the site is predicted to be suitable ecologically and therefore likely to

establish. Sitka Spruce has the potential to achieve YC 13.

The conclusion of the ESC analysis is that the site is suited for restocking with Sitka Spruce provided drainage operations can improve soil conditions. Without drainage operations Lodgepole pine may be a better option for lower yield timber production or Downy birch for native woodland habitat.

7. Other ESC Terms

Suitability

Ecological Site Classification uses the term suitability to describe the likely success of a particular tree species establishing and growing to maturity on a given site. There are two measures of suitability, one broadly considers timber in terms in yield potential, the other the ecological suitability of the site. It is possible for situations to arise where a species is ecologically suited to a given site despite being unsuitable for timber production.

Timber Suitability

In ESC4 the definition of very suitable is the potential to achieve 75% or more of the maximum general yield class for the given species in British conditions. The threshold for suitable is 50% or more and marginal is 30% or more. Unsuitable conditions for timber production are defined as those where the predicted yield is less than 30% of the maximum possible in British conditions.

Marginally suitable species are usually only recommended where no other options exist or when production goals are of lesser importance as a site objective.

Ecological Suitability

The ecological suitability of a site describes the suitability of a species in terms of the most limiting factor. A species is ecologically suited to a site if the species response to each of the climatic and edaphic(soil) variables is greater than 0.5.

Note it is possible for a species to be suitable for a site ecologically, but unsuitable for timber production. This reflects the distribution of some native species and the occurrence of low density woodlands.

In most cases productive goals are met when a species is a least suitable for timber production and is ecologically suitable for a given site. When woodland habitat is an objective an ecological suitable or marginal species may be a valid option, assuming that establishment goals (e.g. stocking density can be achieved).

Model Version

ESC models are assigned a version. Models are revised and tested as the system changes to ensure consistent outputs. The 3.1 series models onwards are revisions associated with the introduction of additional classes of very poor soil nutrient regime.

Model Class

Species suitability models are assigned a class according to the amount of evidence available to support the model.

Class A – the species is well understood in British conditions, with widespread historical

planting and trials.

Class B – the species has been trialled in British conditions on a limited scale.

Class C – the species has very limited or no trials in British conditions, e.g. individual planting or experimental use in limited geographic extents.

Therefore a species recommended as suitable in class B is a safer option than an equivalent species in class C.

Appendix A

1. The ESC Soil properties of common Forestry Commission Soil Types

The ESC properties for the main Forestry Commission soil types are tabulated below. The values applied are typical observed mean attributes, and it is common for soil moisture and nutrient regime values to vary depending upon local factors. For example mineral soils in higher rainfall areas are more likely to be wetter and soils overlying richer bedrock may be more fertile.

Soil Moisture Regime (SMR) and Soil Nutrient Regime (SNR) are modelled as continuous variables though for convenience they are often referred to as the following classes described in tables A.1 and A.2 respectively.

Soil Moisture Regime	Numeric value	Example
Very wet (VW)	1	Deep peat
Wet (W)	2	Peaty gley
Very moist (VM)	3	Surface water gley
Moist (M)	4	Gleyed brown earth
Fresh (F)	5	Freely draining mineral soil
Slightly dry (SD)	6	Sandy mineral soil
Moderately dry (MD)	7	Shallow sandy mineral soil
Very dry (VD)	8	Rankers, shingle, rendzinas

Table A.1: Soil Moisture Regimes

Soil Nutrient Regime	Numeric value	Example
Very poor (VP1)	0	Unflushed deep peat
Very poor (VP2)	0.5	Podzols
Very poor (VP3)	1.0	Podzolic ironpans
Very poor-Poor (VP-P)	1.5	Ironpans
Poor (P)	2.0	Peaty gleys, upland brown earth
Medium (M)	3	Brown earth and surface water gleys
Rich (R)	4	Brown earths with high base status
Very rich (VR)	5	Calcareous brown earths
Carbonate	6	Rendzinas

Table A.2: Soil Nutrient Regimes

When using ESC the following tables allow users to enter default values for common soil types as described by the Forestry Commission Soil Classification. The table is not exhaustive because many mineral/organo mineral soils have a wide range of potential phase interactions.

2. ESC Properties of Mineral and Organo-Mineral Soils

Tables A.3 and A.4 describe the default ESC properties of the most common mineral and organo-mineral forest soil types according to the Forestry Commission soil classification system. Note that significant variation around the default properties can be expected due to local factors such as underlying geology.

In the case of Ironpan soils two sets of information are provided, one assumes establishment will occur with the pan unbroken; the other assumes site preparation techniques will break the pan and drain the perched water table.

FC Soil Code	Description	Soil Moisture Regime (SMR)		Soil Nutrient Regime (SNR)	
		Text	Value	Text	Value
1	Typical brown earth	Fresh	5	Medium	3
1u	Upland brown earth	Fresh	5	Poor	2
1z	Podzolic brown earth	Fresh	5	Poor	2
3	Podzol	Fresh	5	Very poor (VP2)	0.5
5	Ground water gley	Very moist	3	Rich	4
6	Peaty gley	Wet	2	Poor	2
6l	Peaty gley (loamy)	Very moist	3	Poor	2
6z	Podzolic Peaty gley	Very moist	2	Very poor (VP3)	1
7	Surface water gley	Very moist	3	Medium	3
7z	Podzolic Surface water gley	Very moist	3	Poor	2

Table A.3: Mineral and organo-mineral soil properties without perched water tables.

FC Soil Code	Description	Soil Moisture Regime (SMR)		Soil Nutrient Regime (SNR)	
		Text	Value	Text	Value
4*	Ironpan	Very moist	3	Very poor (VP3)	1
4z*	Podzolic Ironpan	Very moist	3	Very poor (VP2)	0.5
4	Ironpan	Fresh	5	Very poor-Poor	1.5
4z	Podzolic Ironpan	Fresh	5	Very poor (VP3)	1
4b	Ironpan intergrade	Fresh	5	Poor	2

Table A.4: Mineral soil properties with perched water tables . *=assumes the ironpan is not broken through ground preparation

3. Organic soils

Table A.5 describes the properties of deep peats according to the FC soil classification system and ESC. Many of those soils would have been afforested with the assistance of drainage systems which may need to be maintained if such sites are to be restocked.

FC Soil Code	Description	Soil Moisture Regime (SMR)		Soil Nutrient Regime (SNR)	
		Text	Value	Text	Value
8a	Phragmites fen	Very wet	1	Rich	4
8b	Juncus articulatus/acutifloris	Very wet	1	Medium	3
8c	Juncus effusus	Very wet	1	Medium	3
8d	Carex	Very wet	1	Rich	4
9a	Molinia, Myrica, Salix	Very wet	1	Medium	3
9b	Tussocky Molinia/Calluna	Very wet	1	Poor	2
9c	Tussocky Molinia Eriophorum vaginatum	Wet	2	Poor	2
9d	Non Tussocky Molinia, Eriophorum vaginatum, Trichophorum	Very wet	1	Very poor (VP3)	1
9e	Trichophorum, Calluna, Molinia	Wet	2	Very poor (VP2)	0.5
10a	Lowland Sphagnum	Very wet	1	Very poor (VP1)	0
10b	Upland Sphagnum	Very wet	1	Very poor (VP1)	0
11a	Calluna	Very moist	3	Very poor (VP2)	0.5
11b	Calluna, Eriophorum vaginatum	Wet	2	Very poor (VP2)	0.5
11c	Trichophorum, Calluna	Wet	2	Very poor (VP1)	0
11d	Eriophorum	Wet	2	Very poor (VP1)	0

Table A.5: Properties associated with organic soils.

Document Change History

Version	Date Changed	Changed By	Comments
4.2	23 May 2016	Stephen Bathgate	Revised introduction to match latest user interface. Minor text edits to table labelling. Revised text describing of suitability. Corrected case study to indicate use of drainage.
4.1	15 April 2016	Stephen Bathgate	Included default soil properties as appendix.