

SITE ASSESSMENT AND SPECIES CHOICE



Tree establishment characteristics

Likes

- Shelter
- Free drainage
- Deep rooting
- Poor nutrition
- Warm soil temperatures (>5°C)
- Minimal root competition
- Full sunlight

Dislikes

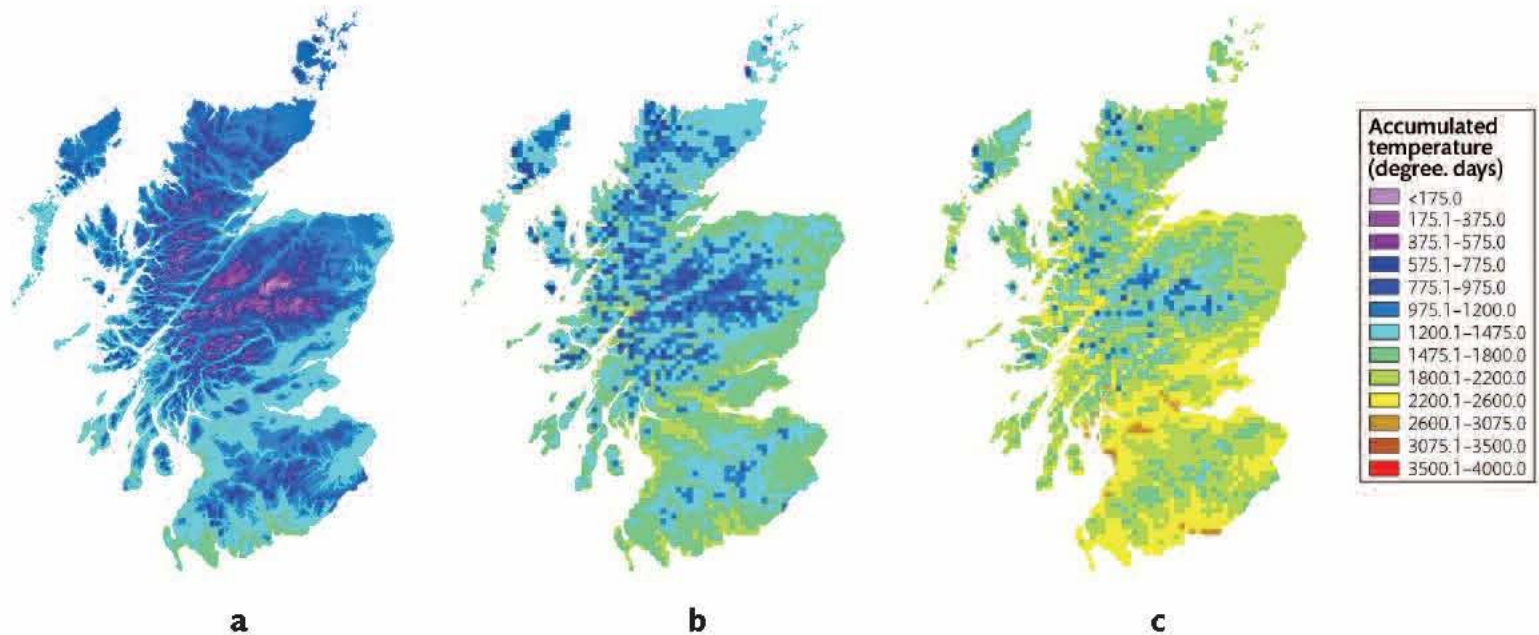
- Exposure
- Waterlogging
- Very poor nutrition
- Cold soil temperatures (>5°C)
- Root competition
- Shade

Tree growth limiting site factors which cannot be modified

- **Accumulated temperature**
 - **Moisture deficit**
- **Exposure (DAMS)**
 - **Continentality**
 - **Soil lithology**

Scottish accumulated temperature projections

Figure 1
Accumulated temperature distribution of Scotland's climate: a) baseline climate, 1961–1990; b) projection for 2050; c) projection for 2080.

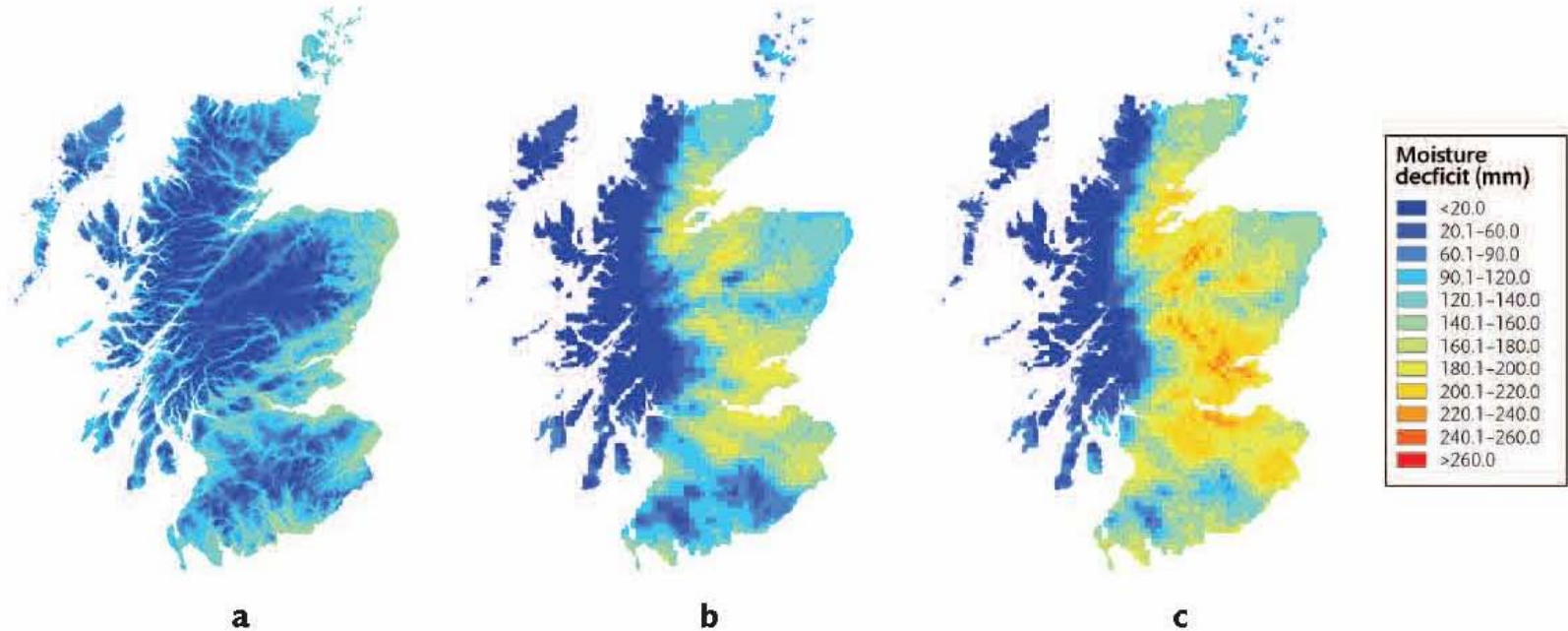


Note: Figures 1 and 2 show average climatic conditions simulated for a 30-year period. Climate projections suggest a significant change in summer rainfall and evaporation in central, eastern and southern Scotland, leading to drier summer conditions and more frequent summer drought. In the northwest of Scotland, the level of summer rainfall is expected to be maintained or to increase. Both Figures are based on projections from the UKCIP High-emissions scenario.

Scottish moisture deficit distribution projections

Figure 2

Moisture deficit distribution of Scotland's climate: a) baseline climate, 1961–1990; b) projection for 2050; c) projection for 2080.



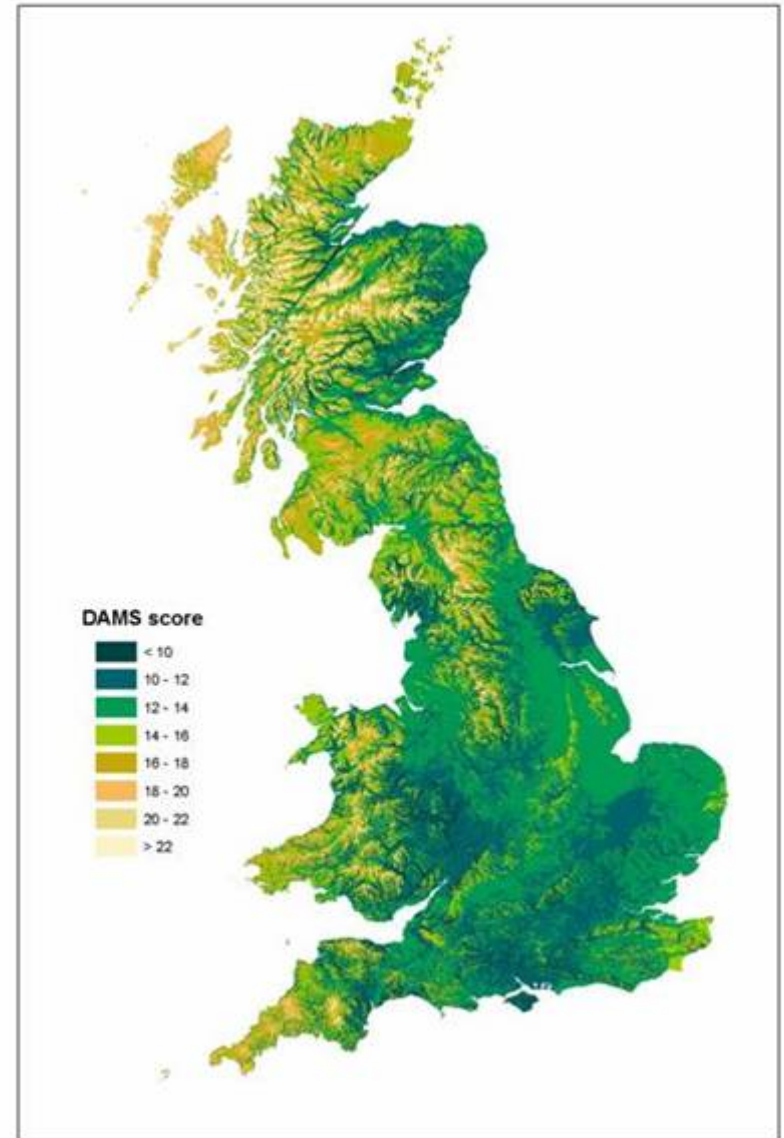
Note: Figures 1 and 2 show average climatic conditions simulated for a 30-year period. Climate projections suggest a significant change in summer rainfall and evaporation in central, eastern and southern Scotland, leading to drier summer conditions and more frequent summer drought. In the northwest of Scotland, the level of summer rainfall is expected to be maintained or to increase. Both Figures are based on projections from the UKCIP High-emissions scenario.

Interpretive table of 5 productive conifers, plotted by their 'Suitability' to grow within a Moisture Deficit (MD) (mm) range.

		Moisture deficit (mm)								
		<20	20 - 60	60 - 90	90 - 120	120 - 140	140 - 160	160 - 180	180 - 200	>200
		WET			MOIST			DRY		
Productive Conifer Species	SP	WEST		NATIVE						
	SS									
	NS									
	EL									
	DF									

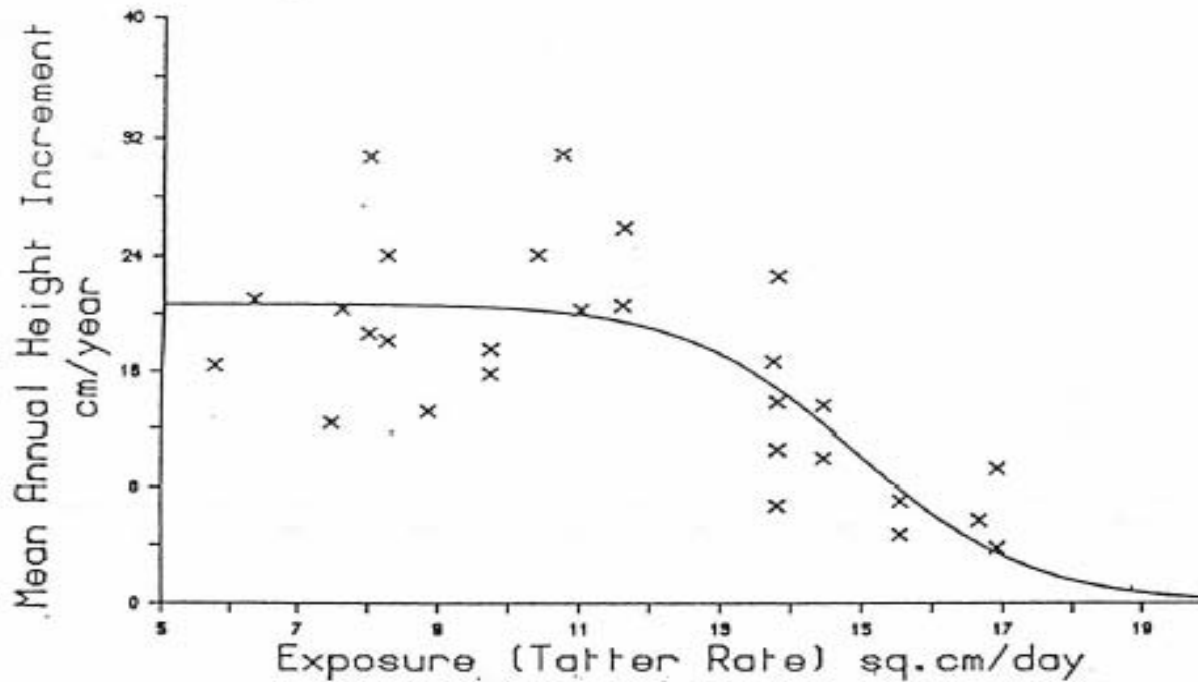
Windiness

- Wind is a limiting factor on growth and stability in Scotland.
- DAMS score
- Based upon data collected using tatter flags



The effect of exposure on the height growth of Sitka spruce

The Effect of Exposure on the Height Growth of Sitka Spruce

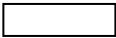







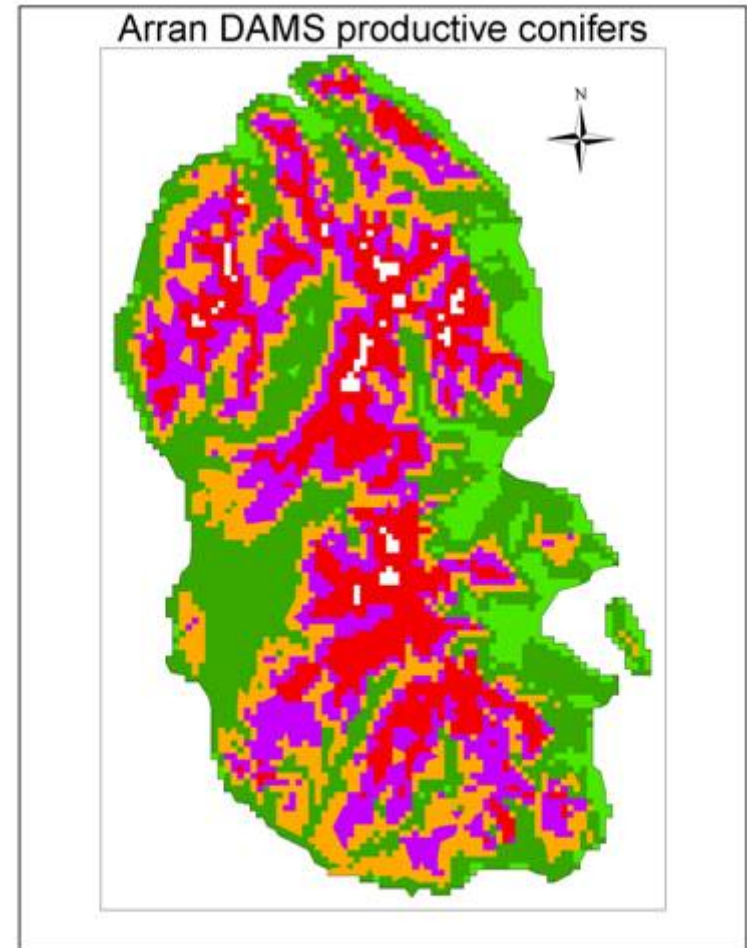
Interpretative table of 5 productive conifers, plotted by their 'Suitability' to grow within the DAMS score range.

		Windiness (DAMS score) [Measure of Exposure]					
		0 - 12	12 - 14	14 - 16	16 - 18	18 - 23	
		Sheltered	Increasingly exposed			Exposed	
Productive Conifer Species	SP	Green			Orange		Red
	SS	Green				Orange	Red
	NS	Green			Orange	Red	
	EL	Green			Orange	Red	
	DF	Green	Orange		Red		

Climate

DAMS map key:



	0	No data
	1 - 12	Any conifer
	12 - 14	Any conifer except DF
	14 - 16	Any conifer - stem form?
	16 - 19	SS/SP only - stem form?
	19 >	No productive conifer



Legend

dams_areas_for_productive_conifers

GRIDCODE

-  0
-  Any conifer.
-  Any conifer except DF.
-  Any conifer - stem form?
-  SS only
-  No productive conifer.

Site Geology - Soil Lithology

- **Defines Topography**
 - Ridges, hollows, outcrops, flats etc.
- **Soil texture**
 - Rock parent material dictates **texture**
- **Soil nutrient**
 - Rock parent material dictates **fertility**

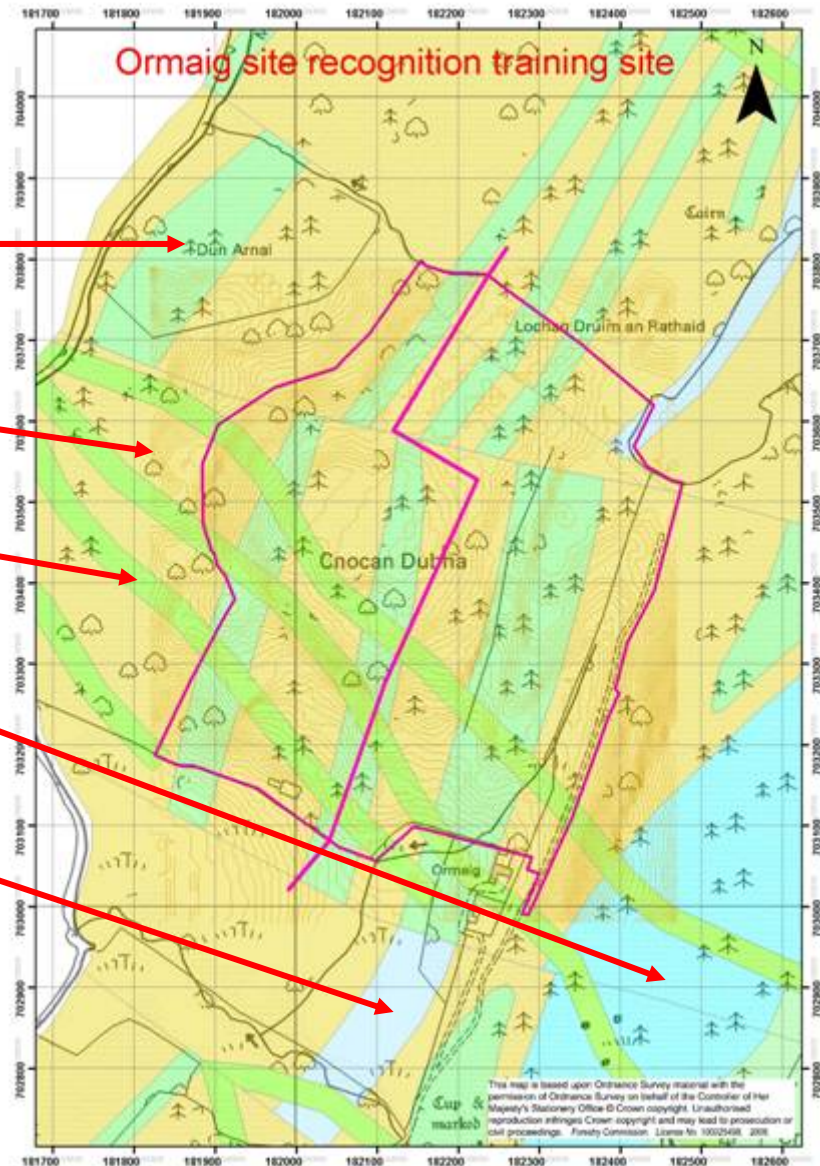
Soil Parent Material - Lithology

The parent material is the material from which a soil is formed, not necessarily the bedrock of a site.

The geographic position of the parent material affects the potential water holding capacity, fertility and texture of a soil.

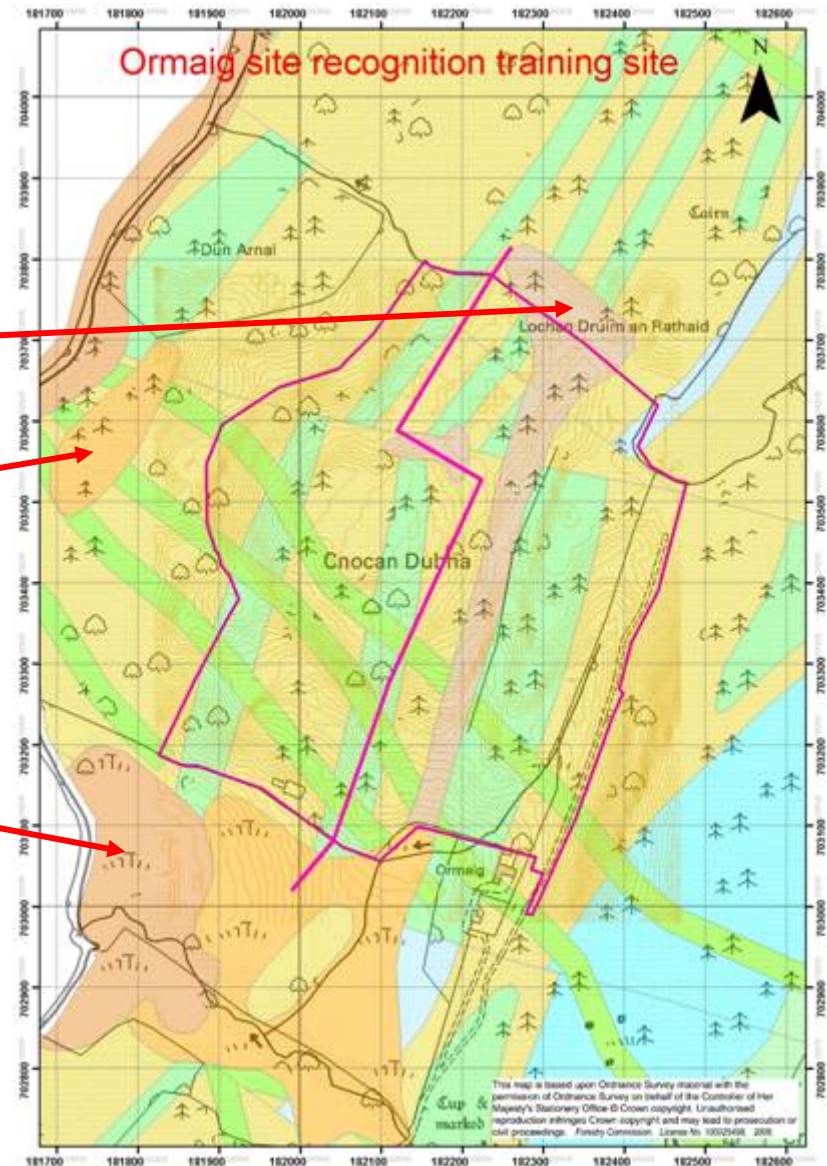
Geology - Topography

- Metabasalt
- Quartzite
- Dolerite
- Metalimestone
- Pelite



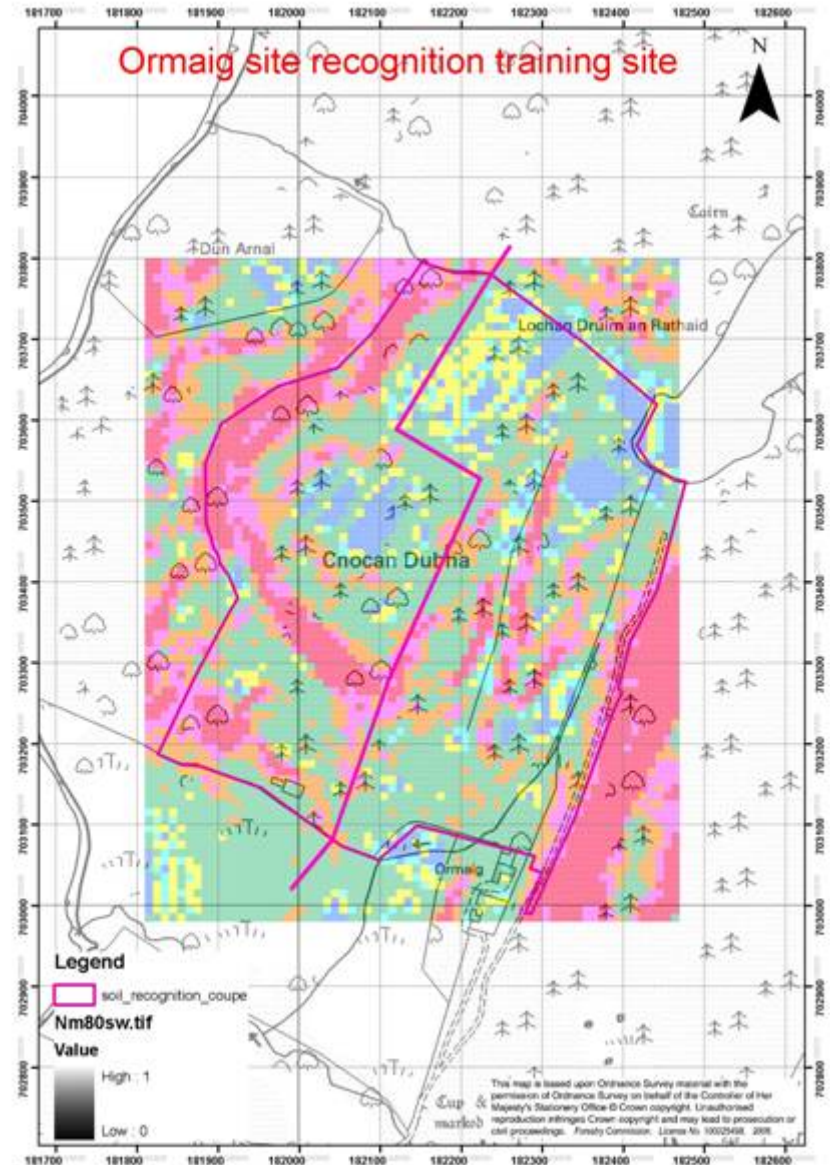
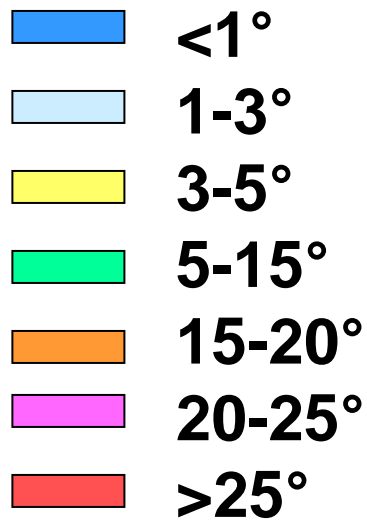
Geology - Topography

- Peat
- Devonian raised marine sand & gravels
- Flandrian raised marine sand & gravels



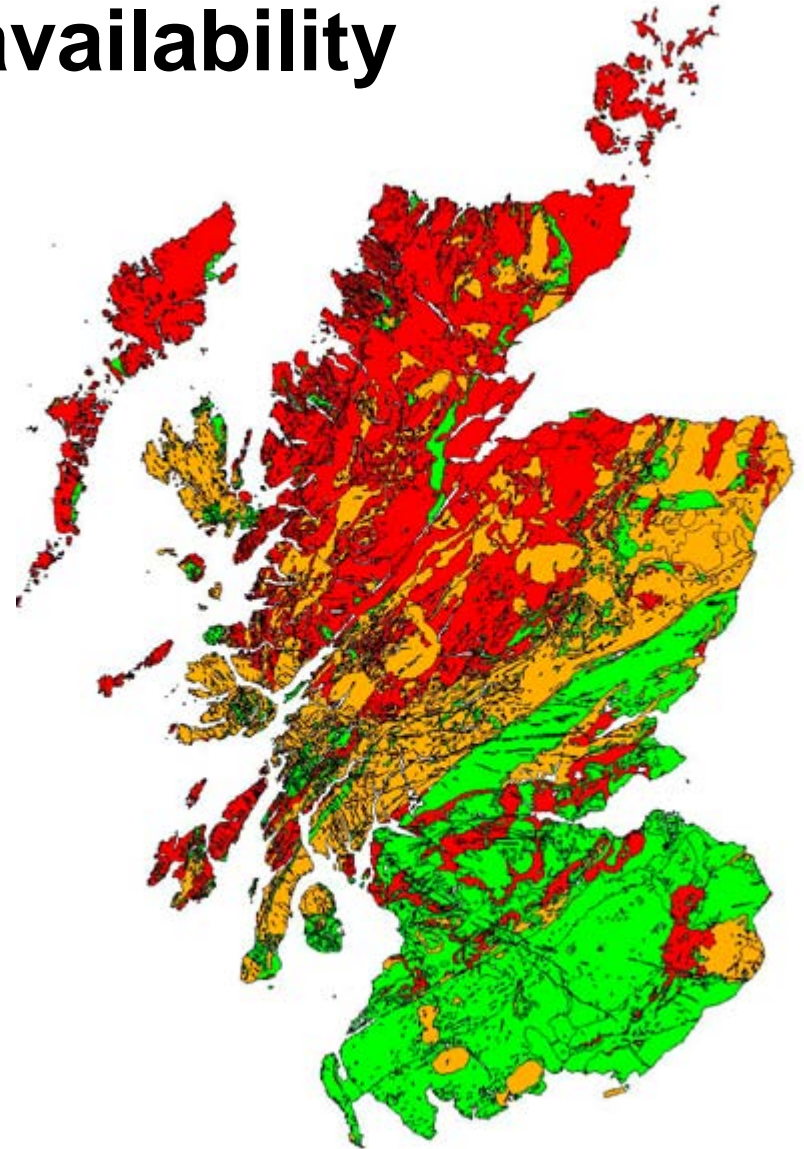
Topography

Slope map key



Geology - Nitrogen availability

- **Red - Low**
 - High quartz rocks and acid granitic
- **Orange - Medium**
 - Basalt, low quartz Granite and Schist
- **Green - High**
 - Sedimentary, with some Calcareous,

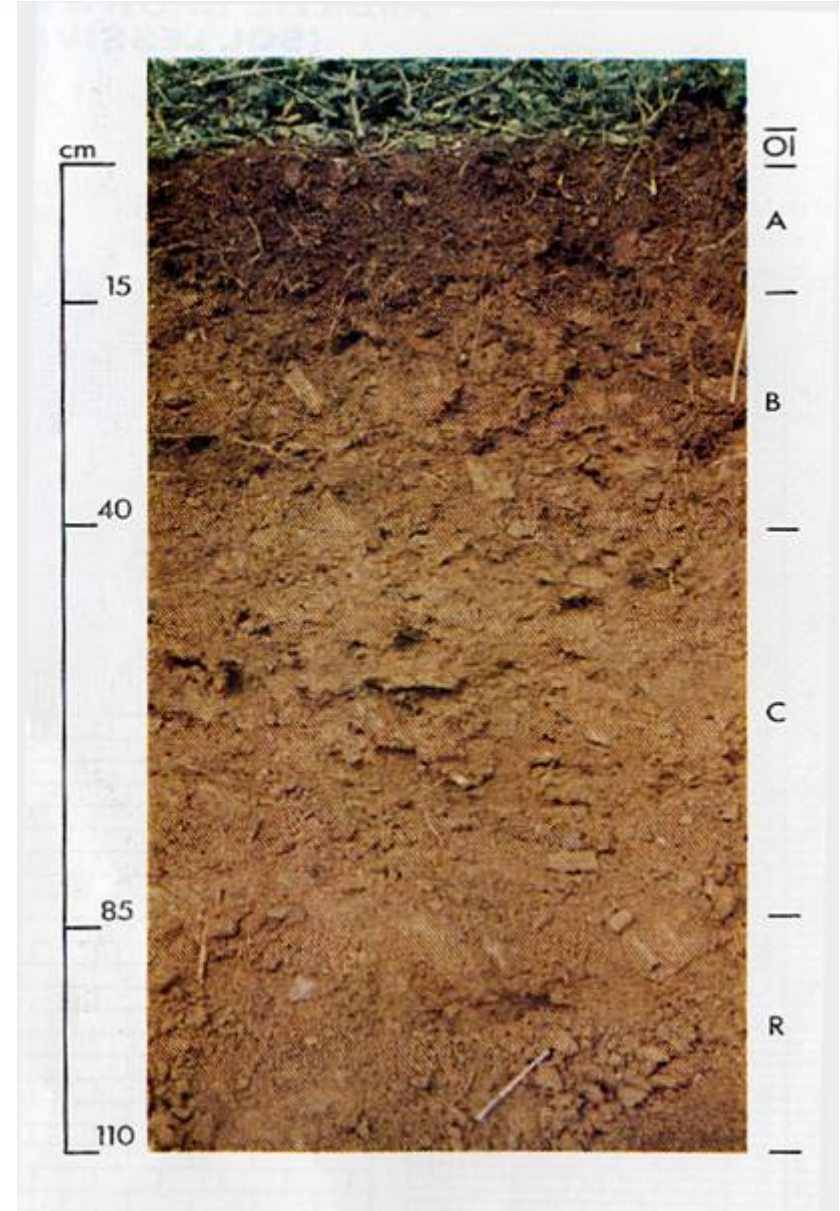


Tree growth limiting site factors which can be modified.

- **Soil compaction**
 - **Soil moisture**
 - **Soil nutrients**
- **Soil temperature**
- **Vegetation competition**
 - **Available light**

Typical brown earth

- Slight podzolisation
- Slight gleying
- Slight build up of partially decomposed vegetation (humus/peat)
- **Rooting is unrestricted** by anaerobic conditions

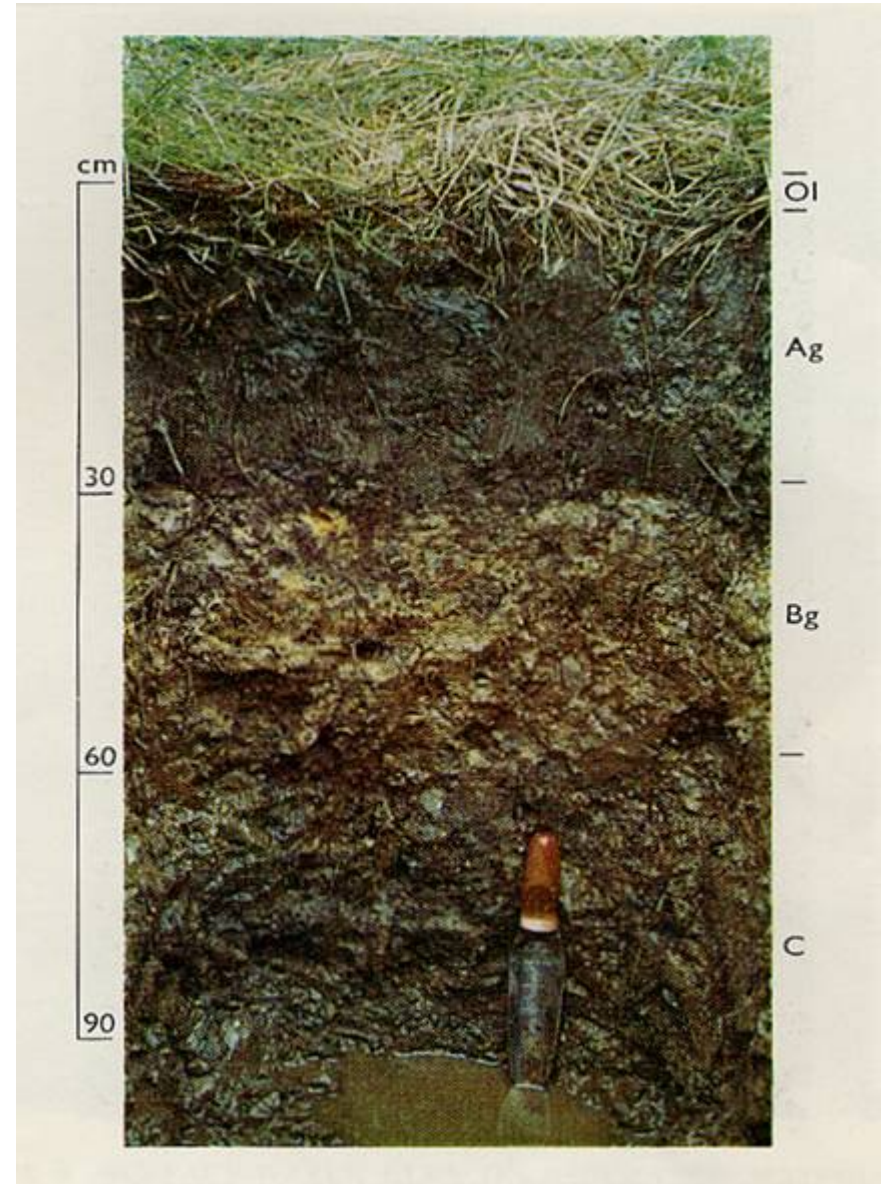


Soil Moisture/Nutrient grid

		Soil Nutrient Regime					
		Very Poor	Poor	Medium	Rich	Very Rich	Carbonate
Humus form		mor	mor, moder	moder, oligomull	oligomull, eumull	eumull	eumull
Soil Moisture Regime	Very Dry	Rankers and shingle					Rendzinas
	Mod. Dry	Gravelly or sandy podzols and ironpan soils	Gravelly or sandy brown earths				
	Sl. Dry						
	Fresh	Loamy podzols and ironpan soils	Loamy brown earths		Loamy brown earths of high base status	Calcareous brown earths	
	Moist						
	V. Moist	Podzolic gleys and peaty ironpan soils	Brown gleys		Brown gleys of high base status	Calcareous brown gleys	
	Wet		Surface-water gleys		Surface-water gleys of high base status	Calcareous surface-water gleys	
	Very Wet	Unflushed peaty gleys and deep peats	Flushed peaty gleys and deep peats		Humic gleys of high base status and fen peats		

Typical surface-water gley

- Waterlogged soil becomes **anaerobic (without oxygen)**.
- Soil loses **bright, ochreous** appearance and takes on a **grey/black** or **mottled grey and yellow/blue/pink** appearance.
- **Rotten stones** are found in the gleyed layers.
- **Rooting is restricted** by the anaerobic conditions.



Soil Moisture/Nutrient grid

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Vegetation Indicators

Common violet

Bracken

Wood sorrel

- Weighted average of all species found
- Dominant species have greatest weight
- Poor to Medium & Moist to Fresh

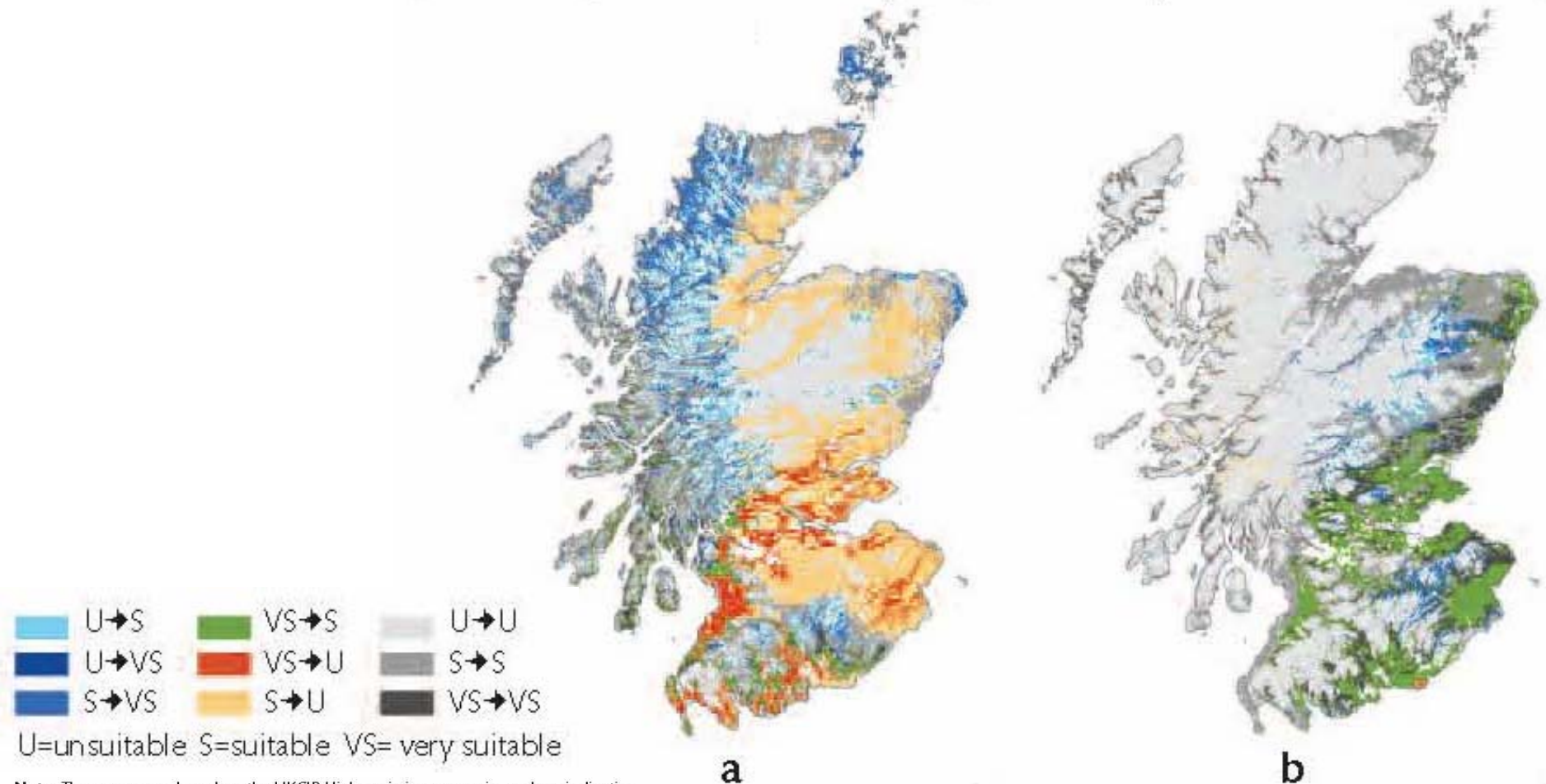
		Soil Nutrient Regime (SNR)				
		Very Poor 2 - 5.7	Poor 5.7 - 7.7	Medium 7.7 - 9.7	Rich 9.7 - 11.7	Very Rich 11.7 - 18
Ellenberg SNR		MOR	MOR - MODER	MODER - MULL	MULL	MULL
HUMUS		MOR	MOR - MODER	MODER - MULL	MULL	MULL
Soil Moisture Regime (SMR)	St. Dry			wood sage		burdock
	Fresh	cowberry, bell heather, heather	wavy hair-grass, common bent, bracken, common violet, great woodrush, slender St. John's wort, tormentil, devils bit scabious	raspberry, holly, greater stitchwort, cow-wheat, chickweed, broom, gorse, bracken, barren strawberry	bluebell (wild hyacinth), hazel, ivy, hawthorn, false-brome, rosebay, willowherb, germander speedwell, wood sedge, pignut, primrose, cocksfoot, red fescue, yarrow	elder, yellow archangel, wood spurge, common hemp-nettle, spear thistle, white clover, false oat-grass, hogweed
	Moist	blaeberry, heather, crowberry, green-ribbed sedge	wood sorrel, scaly male fern, hard fern, heath bedstraw, heath woodrush	biambi, creeping soft-grass, broad hickler fern, wood, a fern, clover, honeysuckle, Yorkshire fog, sweet vernal-grass	tufted hair-grass, male fern, herb robert	dog's mercury, goosegrass (sticky willies), wild garlic, stinging nettle, hedge wound wort, ground ivy, wood avens, enchanter's nightshade, lesser celandine, red campion, wood speedwell, common horsetail, creeping thistle, rough meadow-grass
	V. Moist	mat grass, heath rush	compact rush,	lady fern, yellow pimpernel, creeping buttercup, soft rush	bugle, wild angelica	
	Wet	purple moor-grass, haretail cotton-grass, cross leaved heath, deer grass, lousewort	sharp flowered rush	marsh thistle	wood horsetail, common valarian, meadow sweet, golden saxifrage	
	Very Wet	common cotton-grass, bog myrtle			marsh marigold	

ALL PLANTS MAYBE FOUND IN CONDITIONS ADJACENT TO THE CELL DISPLAYED

N.B.: Plant names in 'red type' are amendments by Scott Wilson, to the published Bulletin 124 _ 15-10-2007

Figure 3

Indicative changes in the suitability of species of tree in Scotland by 2080: a) Stika spruce; b) Scots pine;



Note: These maps are based on the UKCIP High-emissions scenario, and are indicative maps using soil-quality data derived from the Soil Survey of Scotland digital data at a scale of 1:250,000.

Range of SMR and SNR considered 'Very Suitable', for 5 productive conifers species.

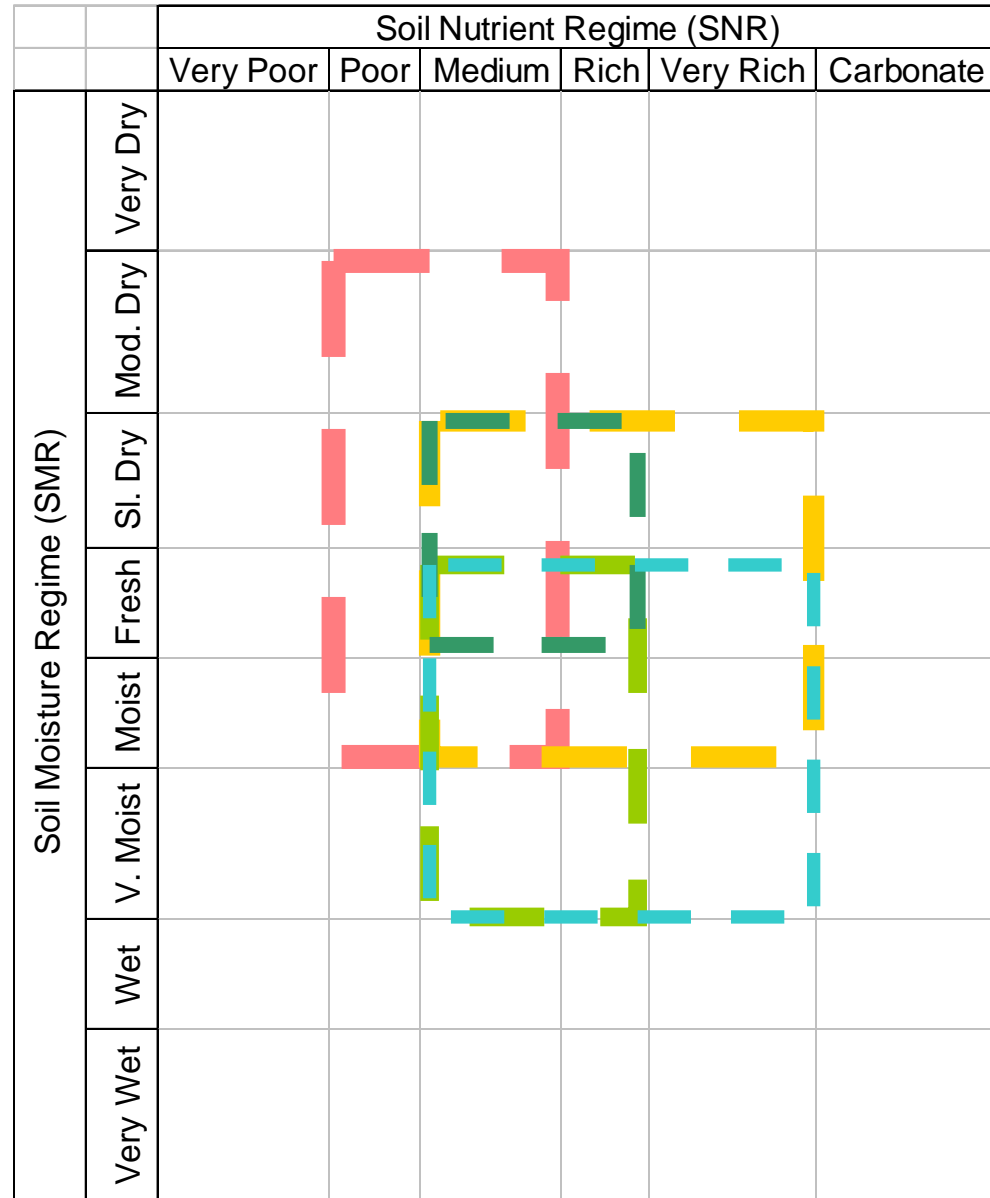
SP

EL

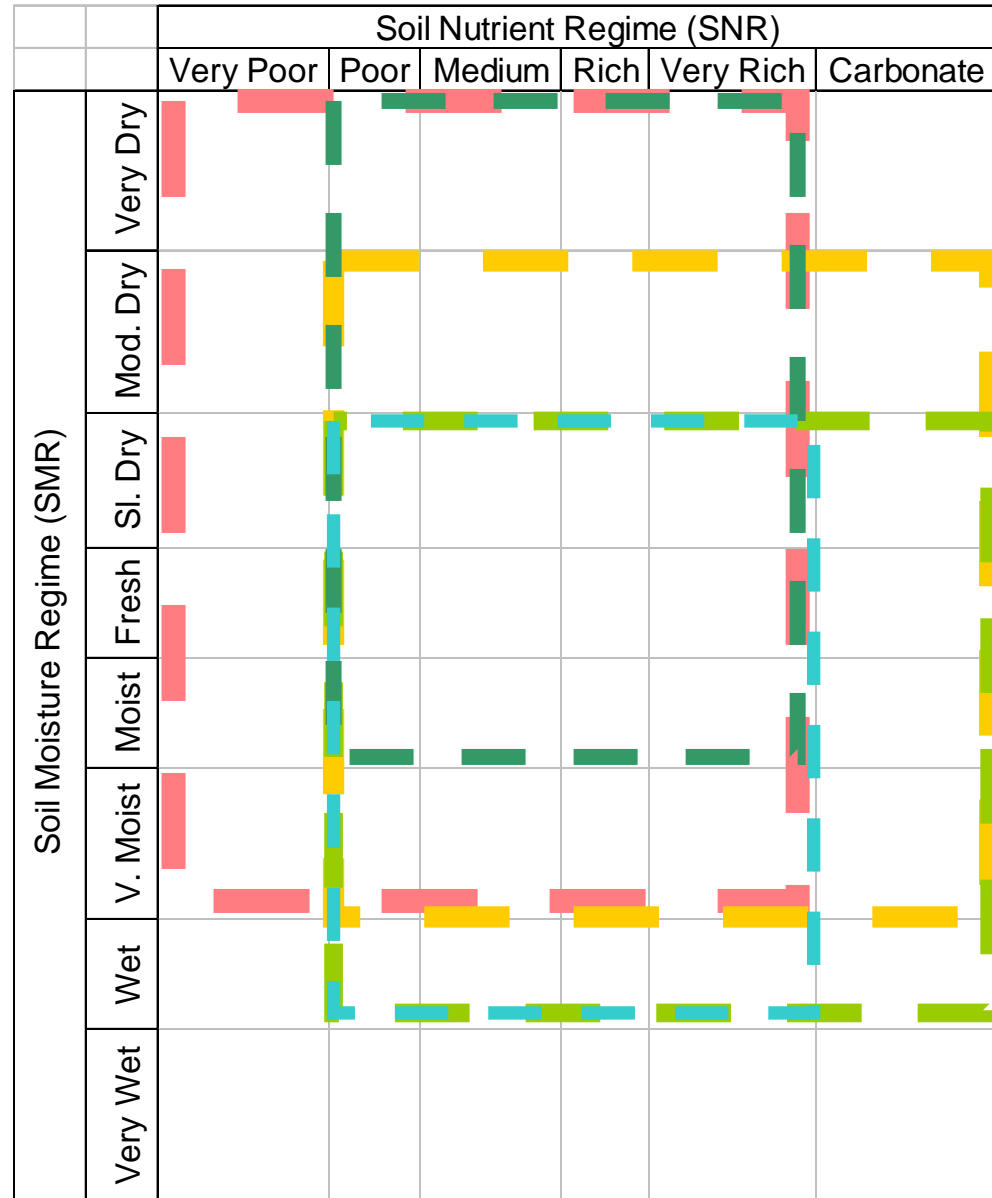
NS

DF

SS



Range of SMR and SNR considered 'Suitable', for 5 productive conifers species.



Summary

ASSESS SITE FACTORS LIMITING TREE GROWTH

- Site factors which cannot be modified:

A desk exercise, with or without a Decision Support System.

- Site factors which can be modified:

A site visit to gather data and interpret the desk exercise data.

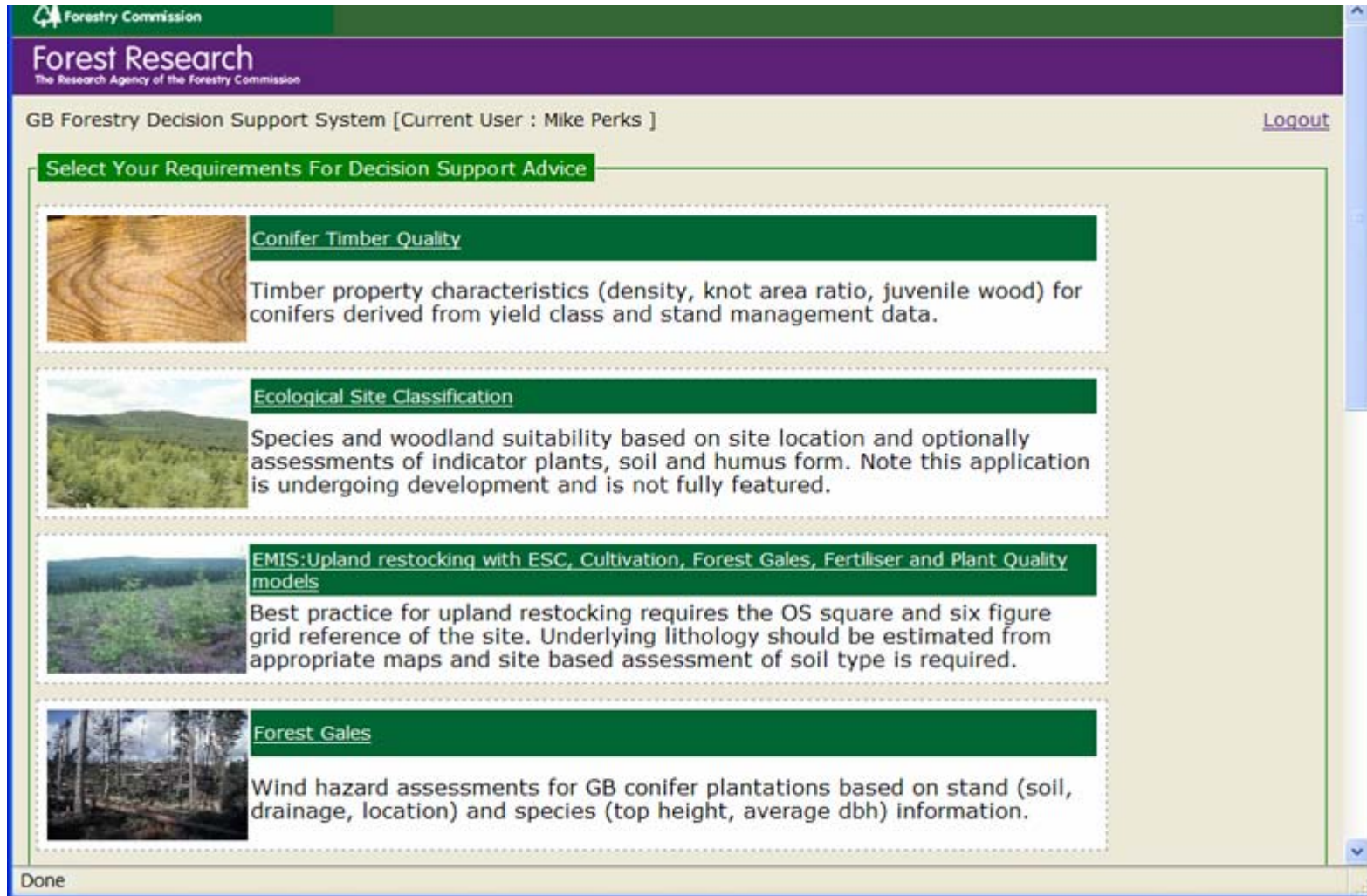
CONCLUSIONS

If you want to grow quality trees, you **must** assess a sites specific silvicultural suitability.

Soil is your basic raw material, when growing quality productive conifers.

FR WEB PORTAL

(GB FORESTRY DECISION SUPPORT SYSTEMS)





Forestry Commission


Forest Research
The Research Agency of the Forestry Commission


GB Forestry Decision Support System [Current User : Mike Perks] [Logout](#)

Select Your Requirements For Decision Support Advice

 **Conifer Timber Quality**
Timber property characteristics (density, knot area ratio, juvenile wood) for conifers derived from yield class and stand management data.

 **Ecological Site Classification**
Species and woodland suitability based on site location and optionally assessments of indicator plants, soil and humus form. Note this application is undergoing development and is not fully featured.

 **EMIS:Upland restocking with ESC, Cultivation, Forest Gales, Fertiliser and Plant Quality models**
Best practice for upland restocking requires the OS square and six figure grid reference of the site. Underlying lithology should be estimated from appropriate maps and site based assessment of soil type is required.

 **Forest Gales**
Wind hazard assessments for GB conifer plantations based on stand (soil, drainage, location) and species (top height, average dbh) information.

Done

EMIS WALKTHROUGH

Additional EMIS 'Walkthrough' features:

- Cultivation: species comparison & machinery
- Species comparison with primary risks
- Detailed wind risk analysis (ForestGales)
- Timber quality (Sitka)
- Suitability for transformation to CCF (FCRIN40)
- Plant quality specification

The 'Walkthrough' allows multi species-site comparisons.

<https://www.eforestry.gov.uk/forestdss/>

Ongoing updates as knowledge and data improves.
Registration required.