Forest Research

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

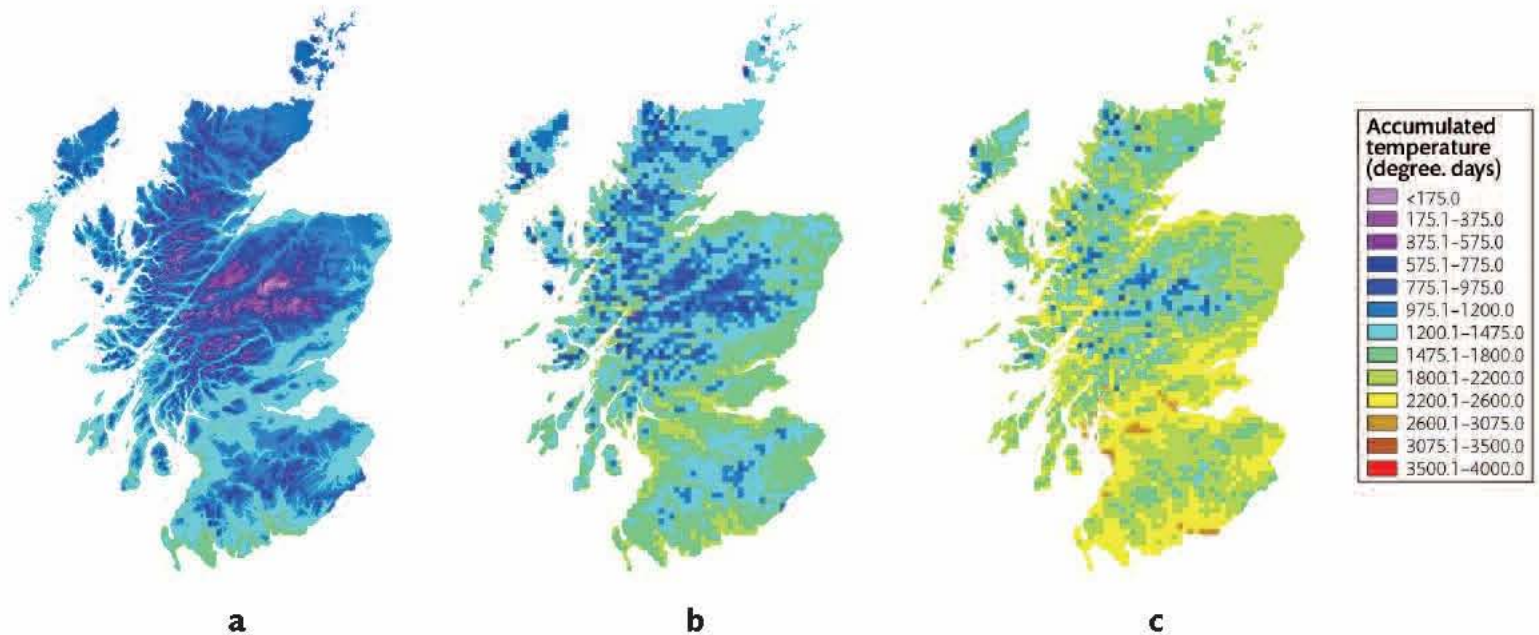
- Exposure
- Waterlogging
- Very poor nutrition
- Cold soil temperatures (>5°C)
- Root competition
- Shade

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 dimatic 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.

Site Assessment & Species Choice

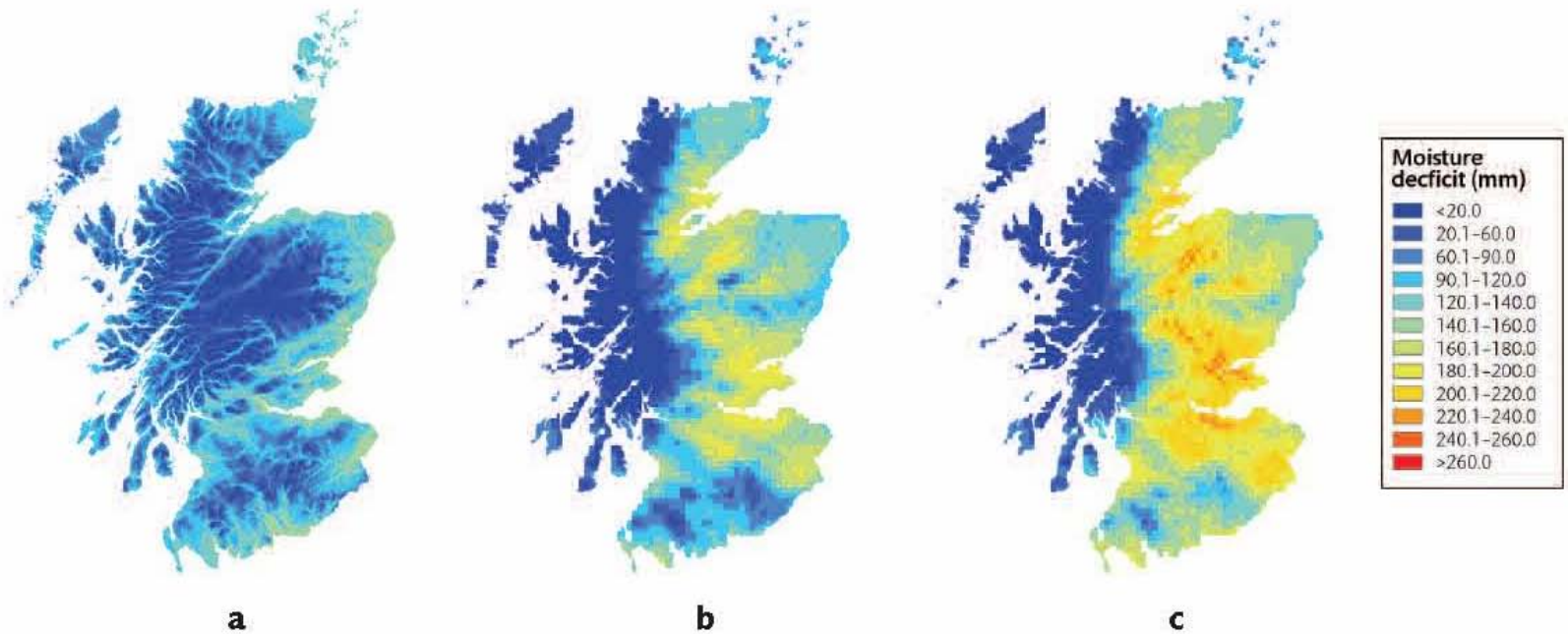
Interpretive table of 5 productive conifers, plotted by their 'Suitability' to grow within the Accumulated Temperature (AT) range.

Productive Conifer Species	Accumulated Temperature (day-degrees >5.0 C)				
	1522 - 1200	1199 - 1100	1099 - 875	874 - 575	574 - 375
	Warm	Cool			Sub-alpine
SP					
SS	WSS, QSS	QSS	QSS		ASS
NS					
EL					
DF					

WSS = Washington seed origin
QSS = Queen Charlotte Island seed origin
ASS = Alaskan seed origin

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.



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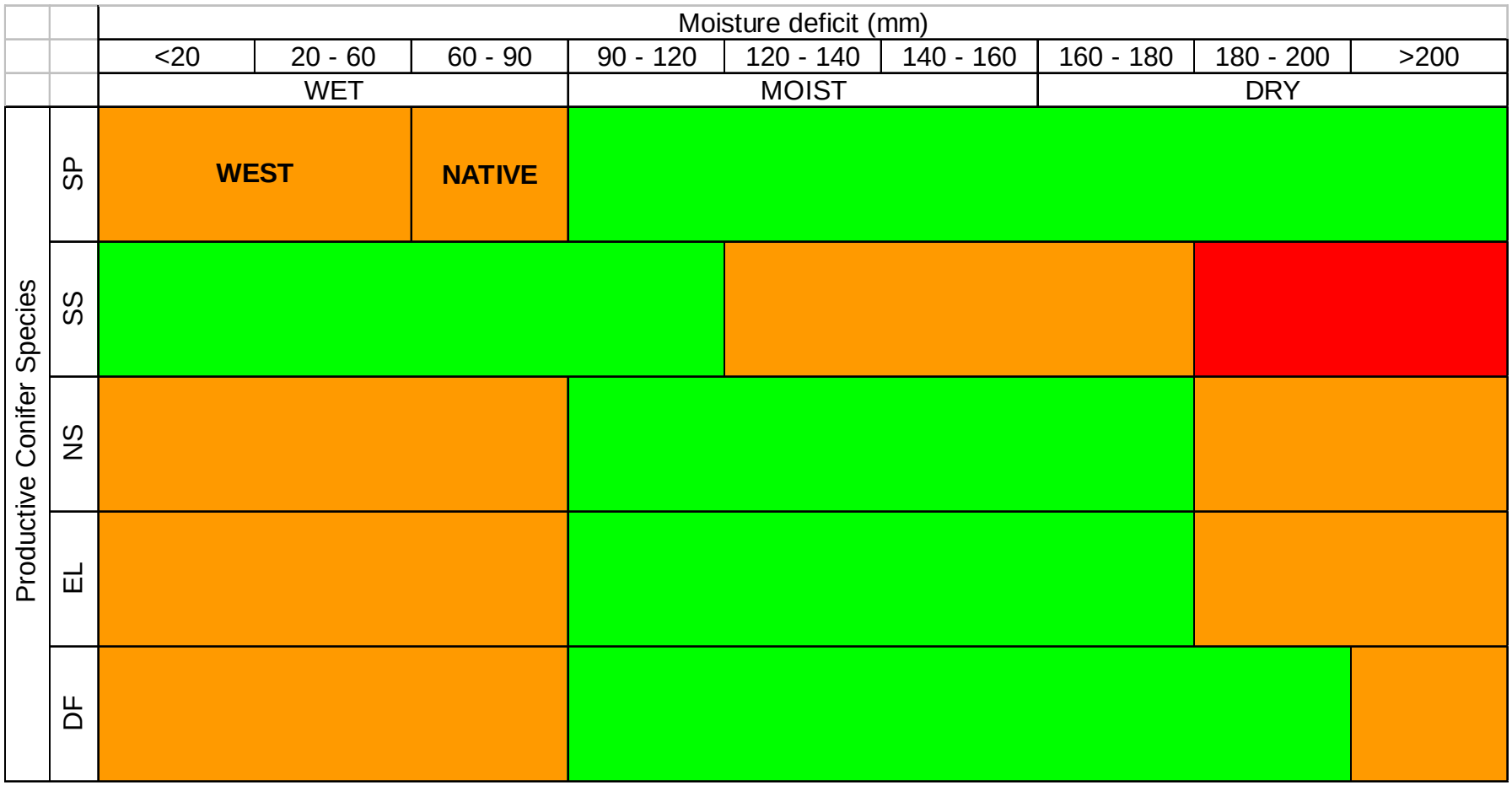
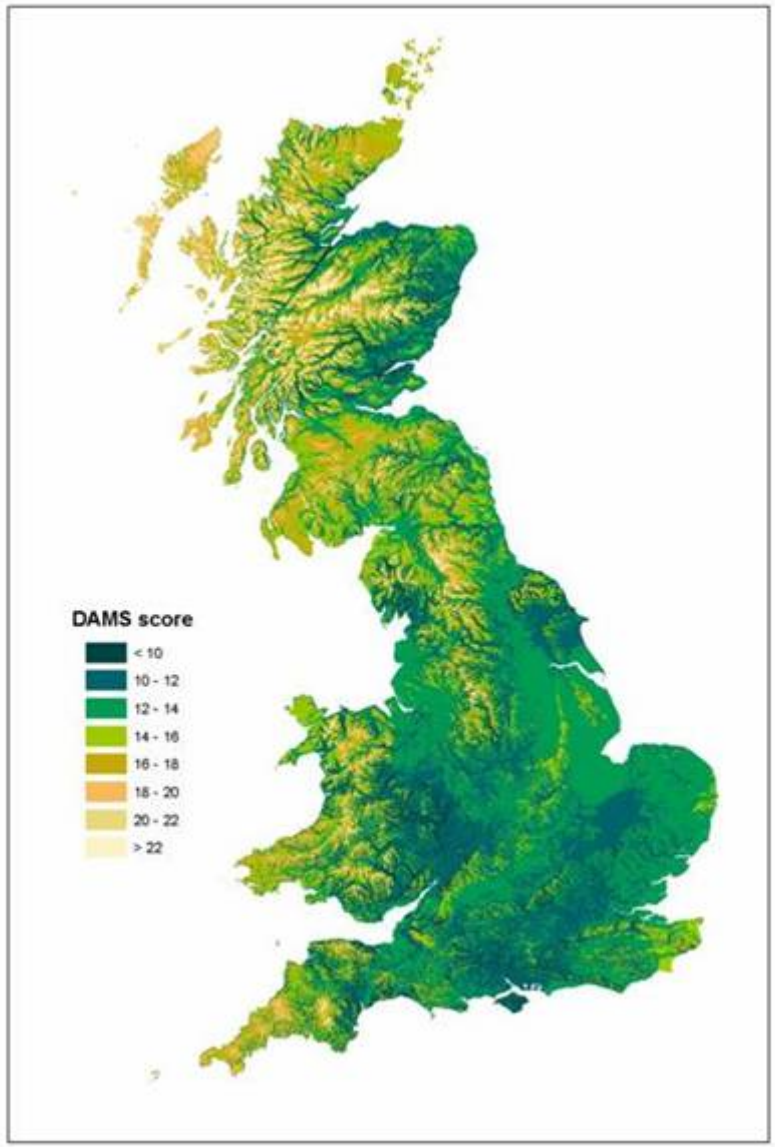
Interpretive table of 5 productive conifers, plotted by their 'Suitability' to grow within a Moisture Deficit (MD) (mm) range.

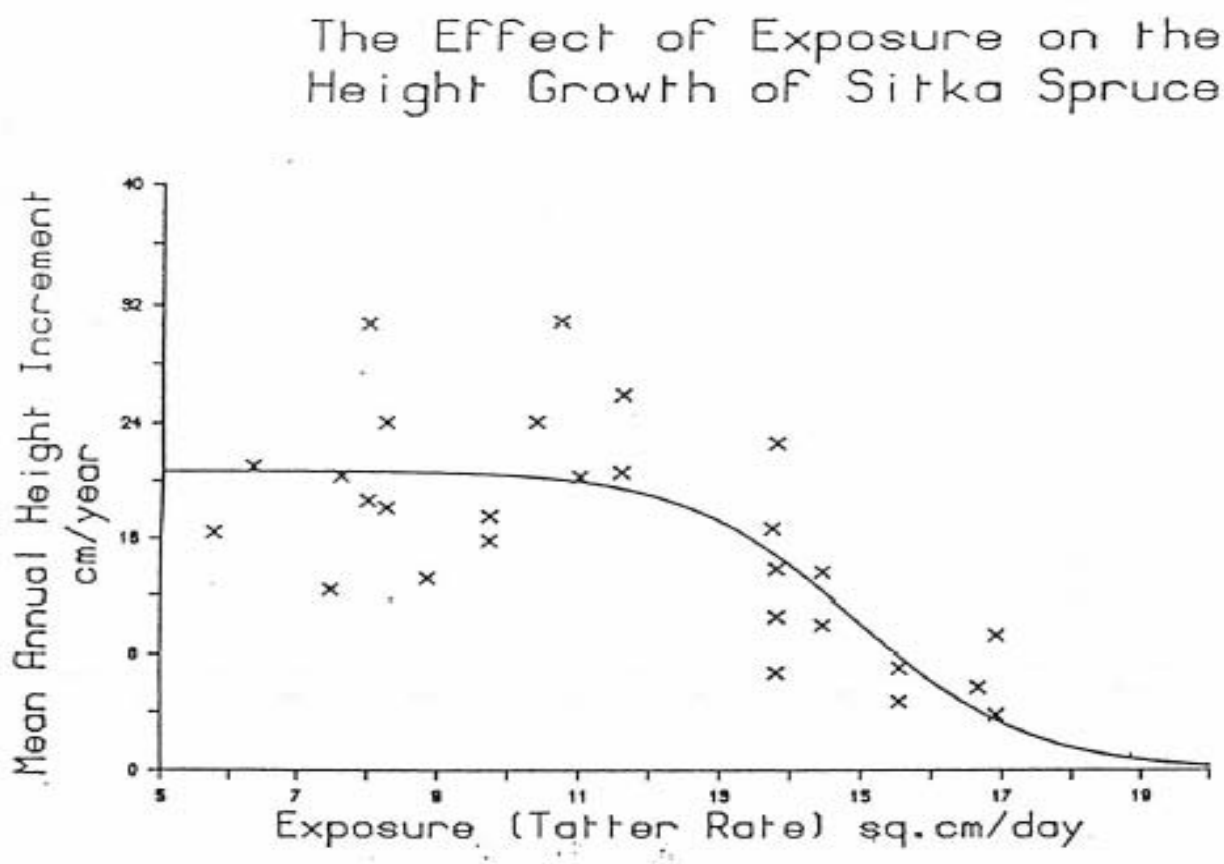


Windiness

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

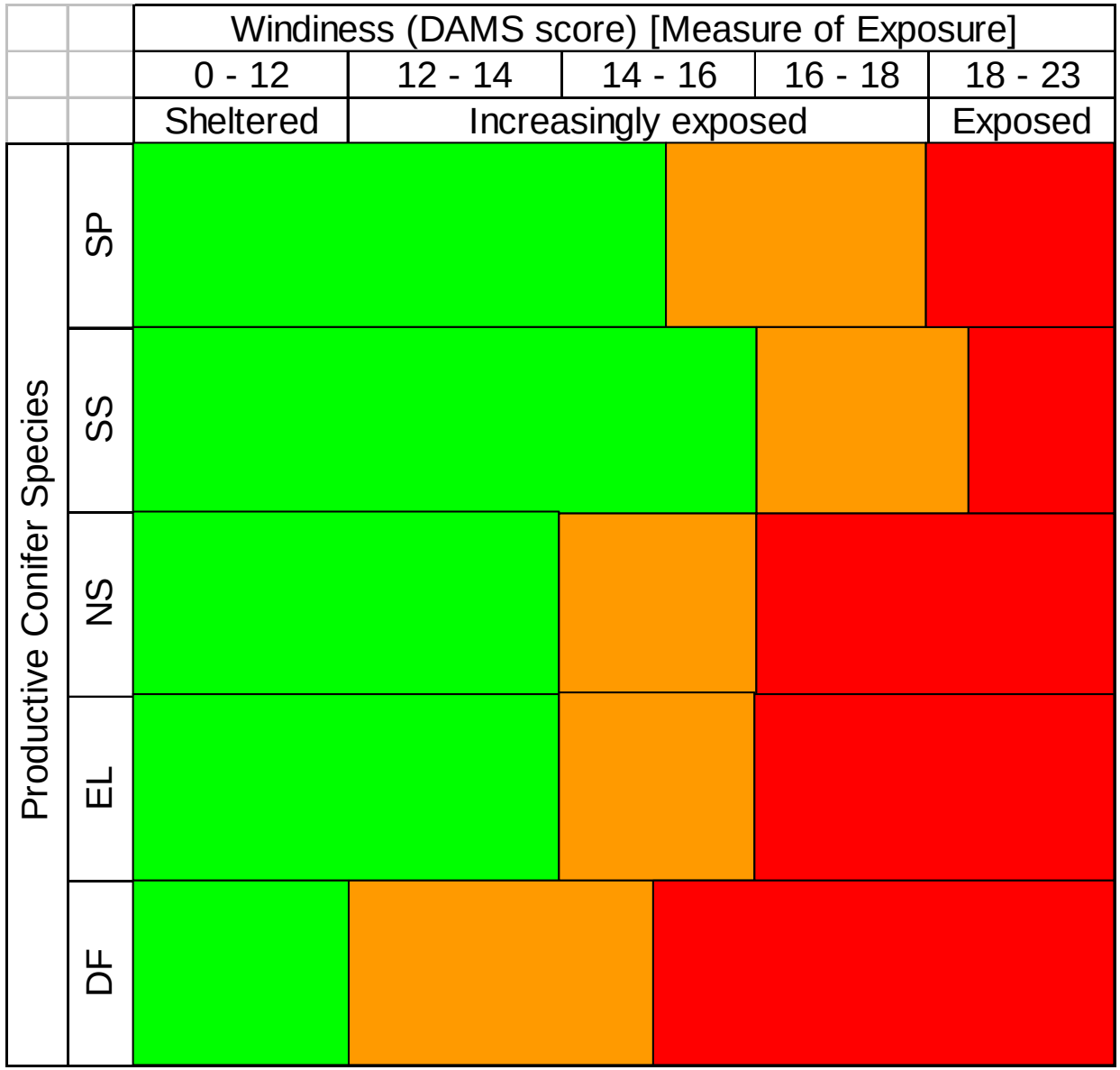


The effect of exposure on the height growth of Sitka spruce



Site Assessment & Species Choice

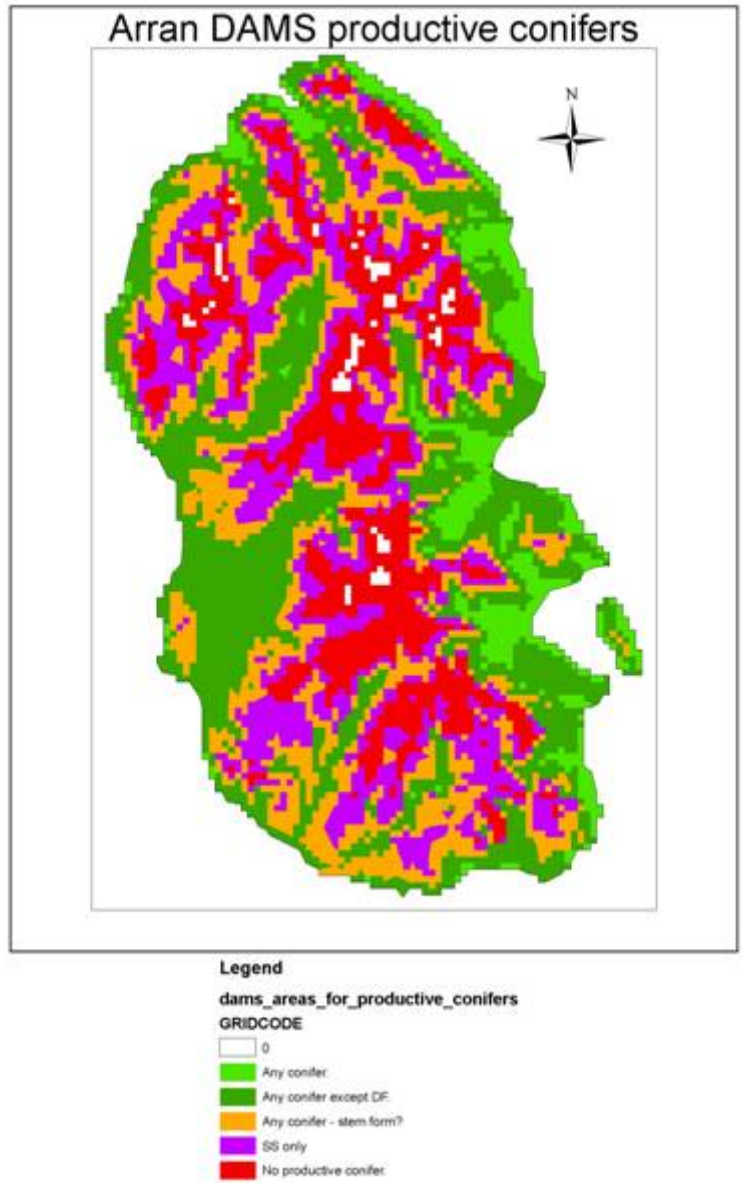
Interpretative table of 5 productive conifers, plotted by their 'Suitability' to grow within the DAMS score range.



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



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**

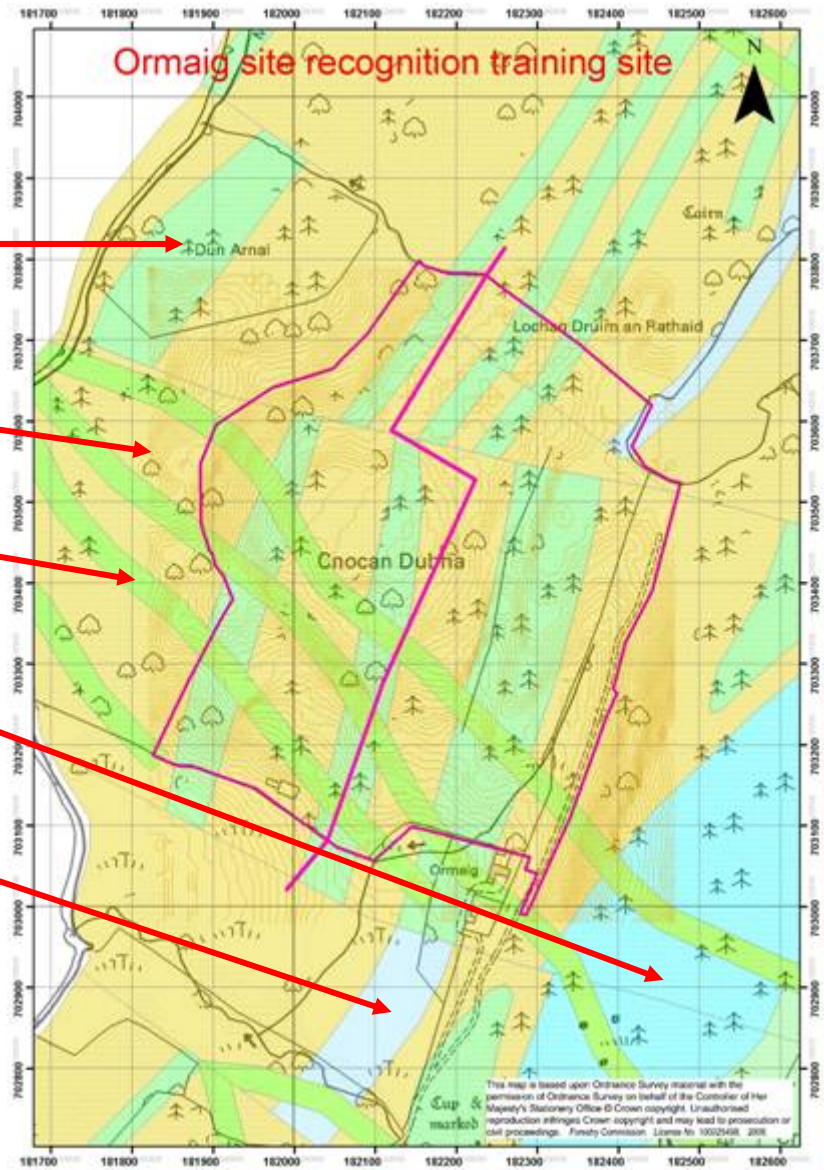
Soil Parent Material - Lithology

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.

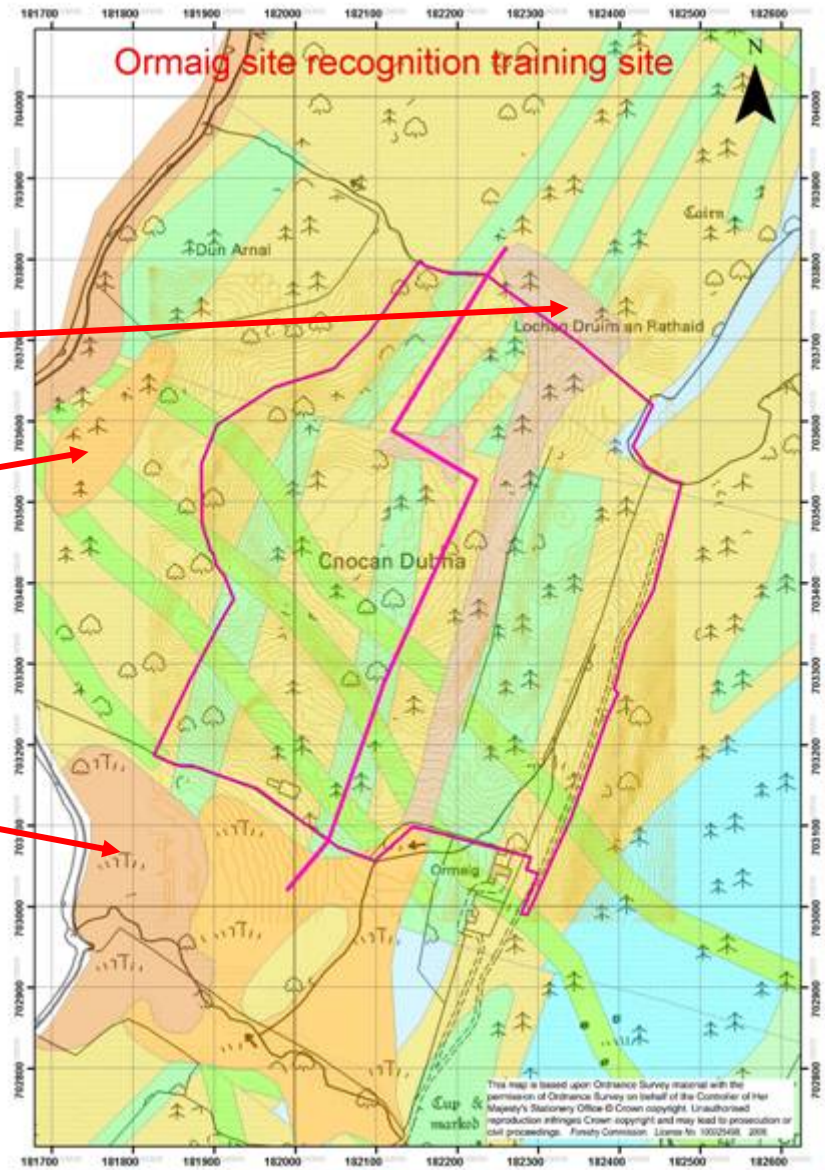
Geology - Topography

- Metabasalt
- Quartzite
- Dolerite
- Metalimestone
- Pelite



Geology - Topography

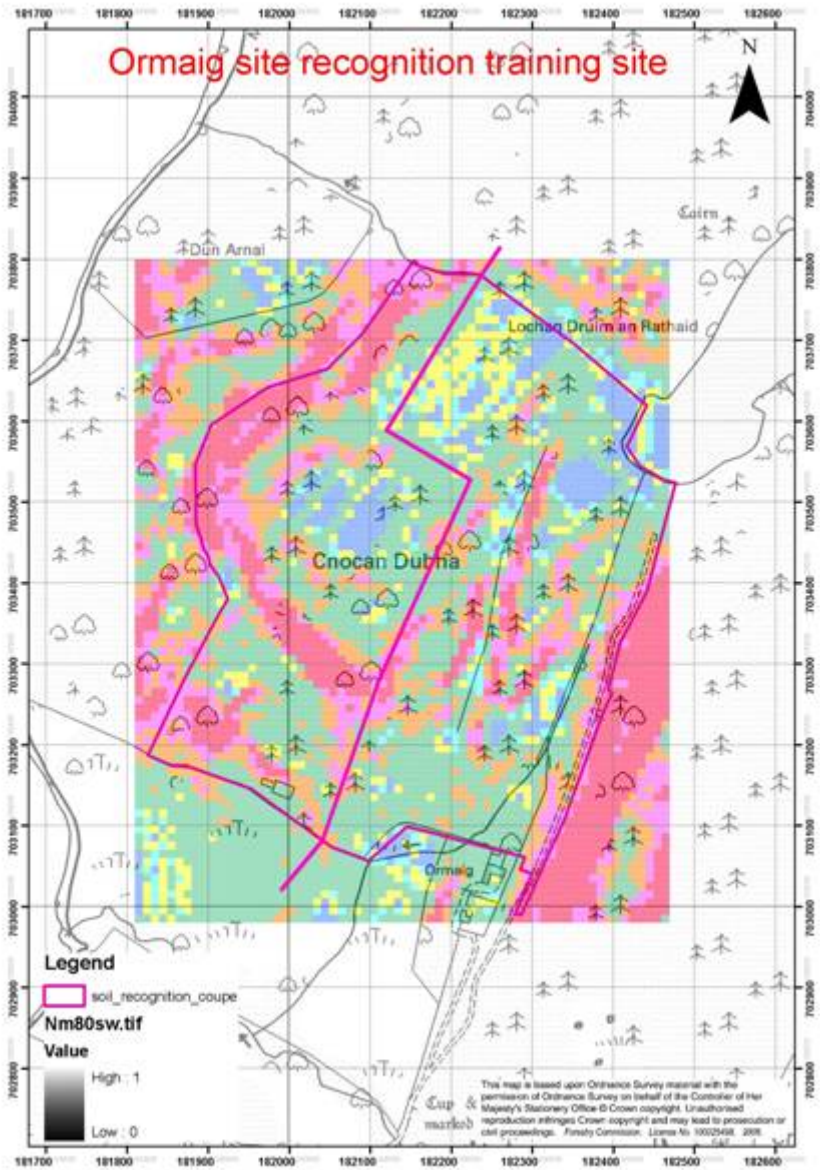
- Peat
- Devonian raised marine sand & gravels
- Flandrian raised marine sand & gravels



Topography

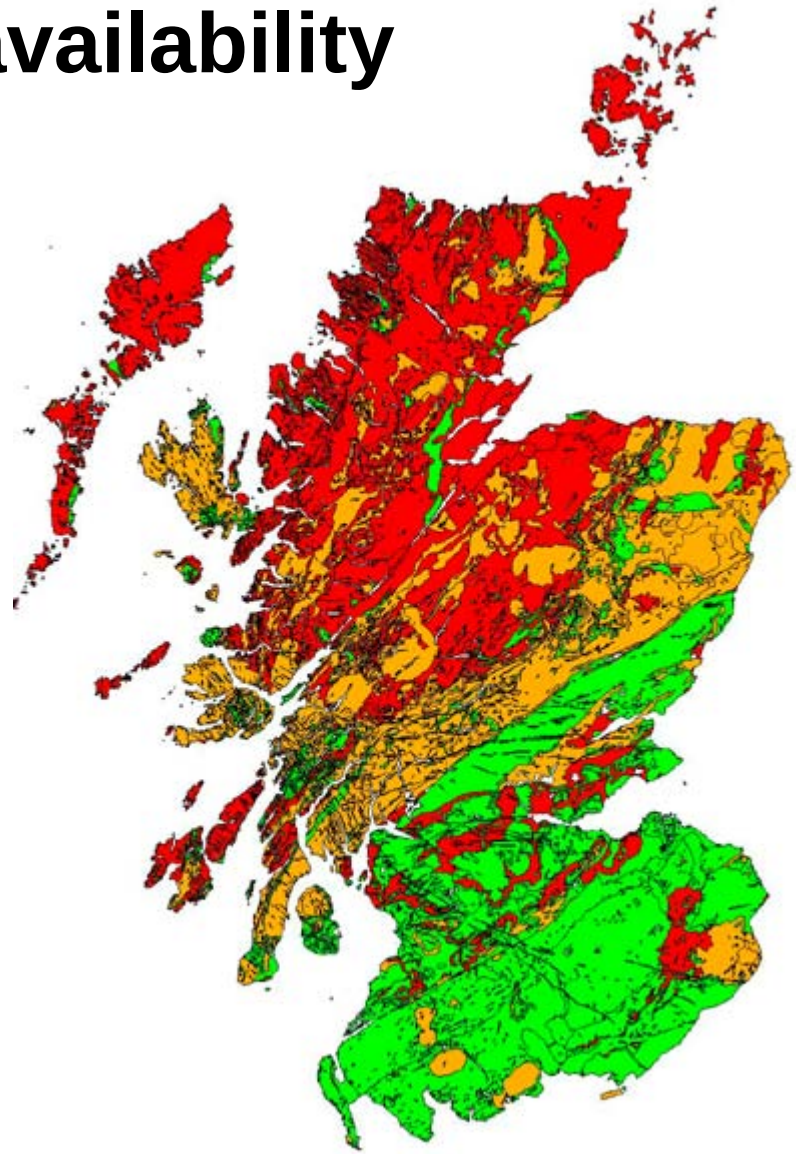
Slope map key

- <1°
- 1-3°
- 3-5°
- 5-15°
- 15-20°
- 20-25°
- >25°



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,

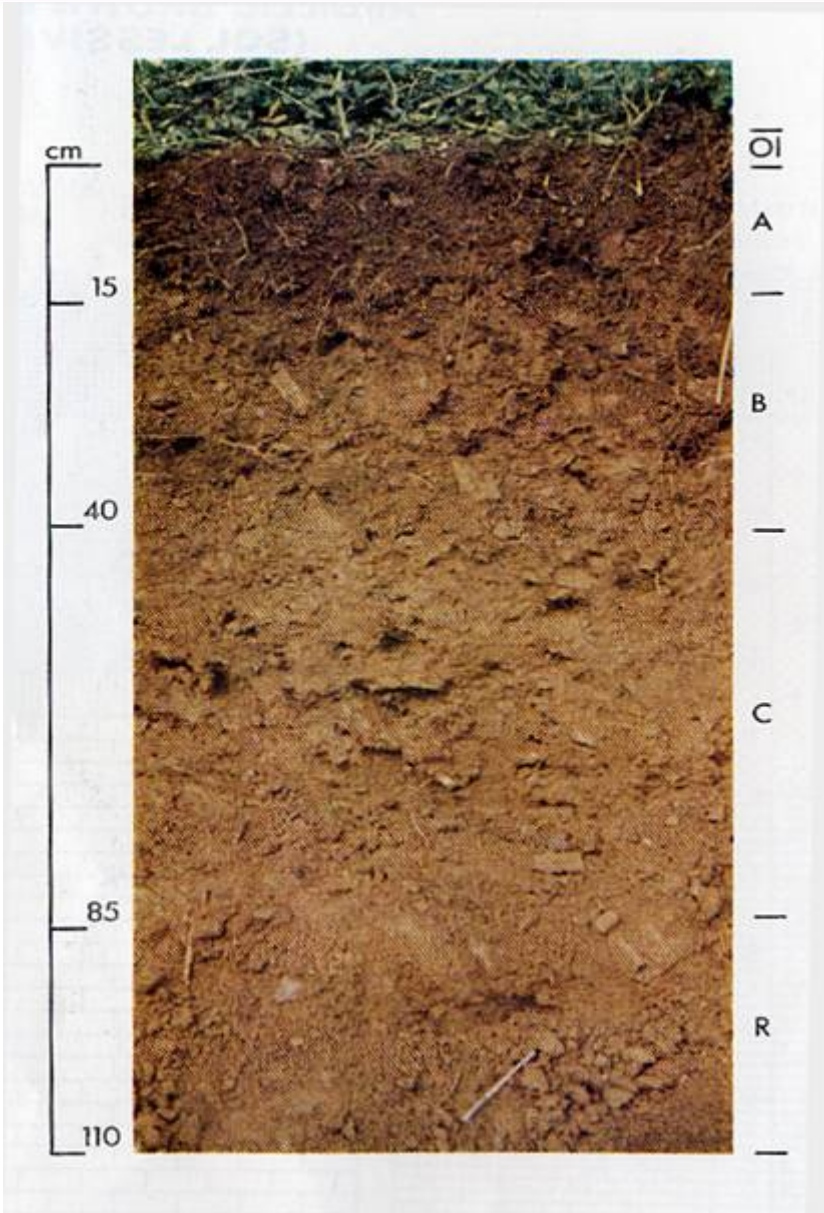


Tree growth limiting site factors which can be modified.

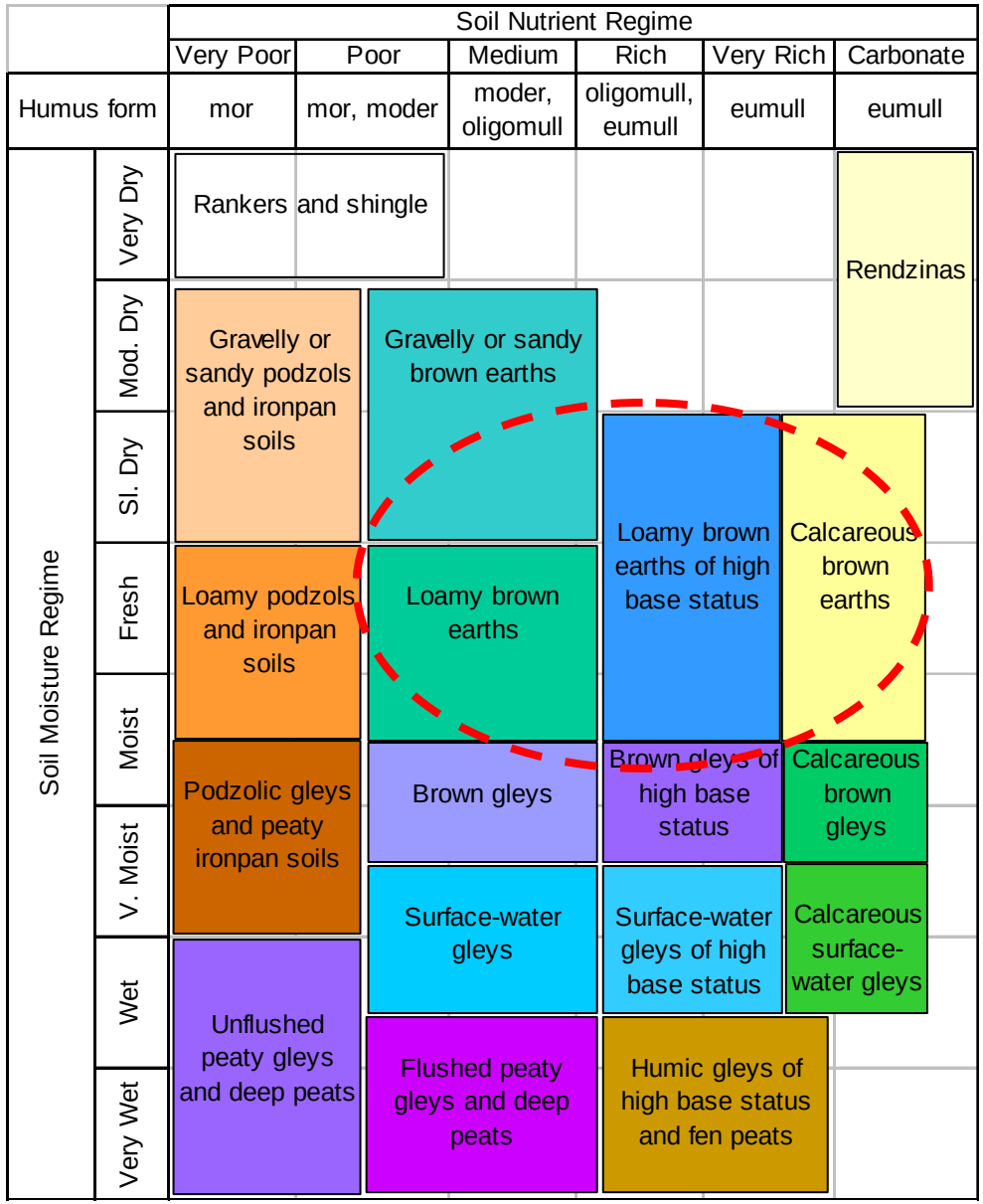
- Soil compaction
- Soil moisture
- Soil nutrients
- Soil temperature
- Vegetation competition
- Available light

Typical brown earth

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

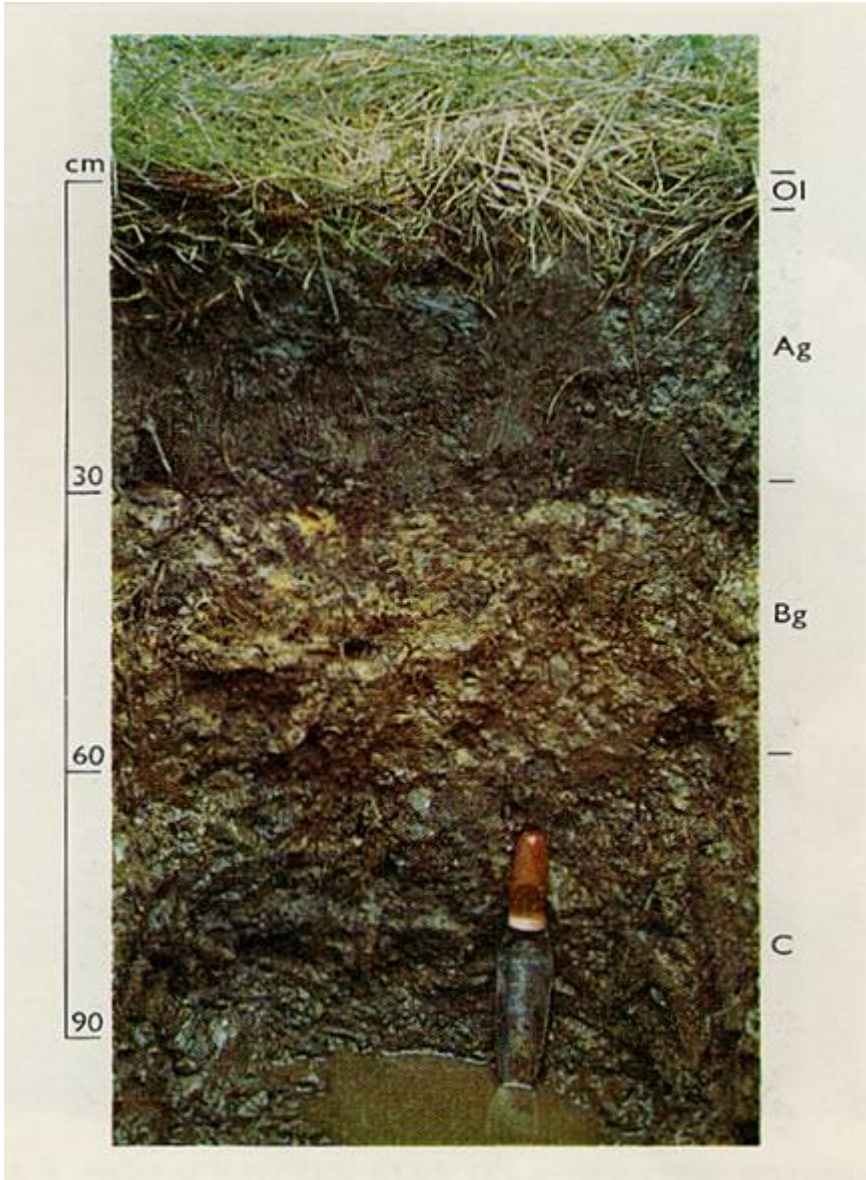


Soil Moisture/Nutrient grid



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.



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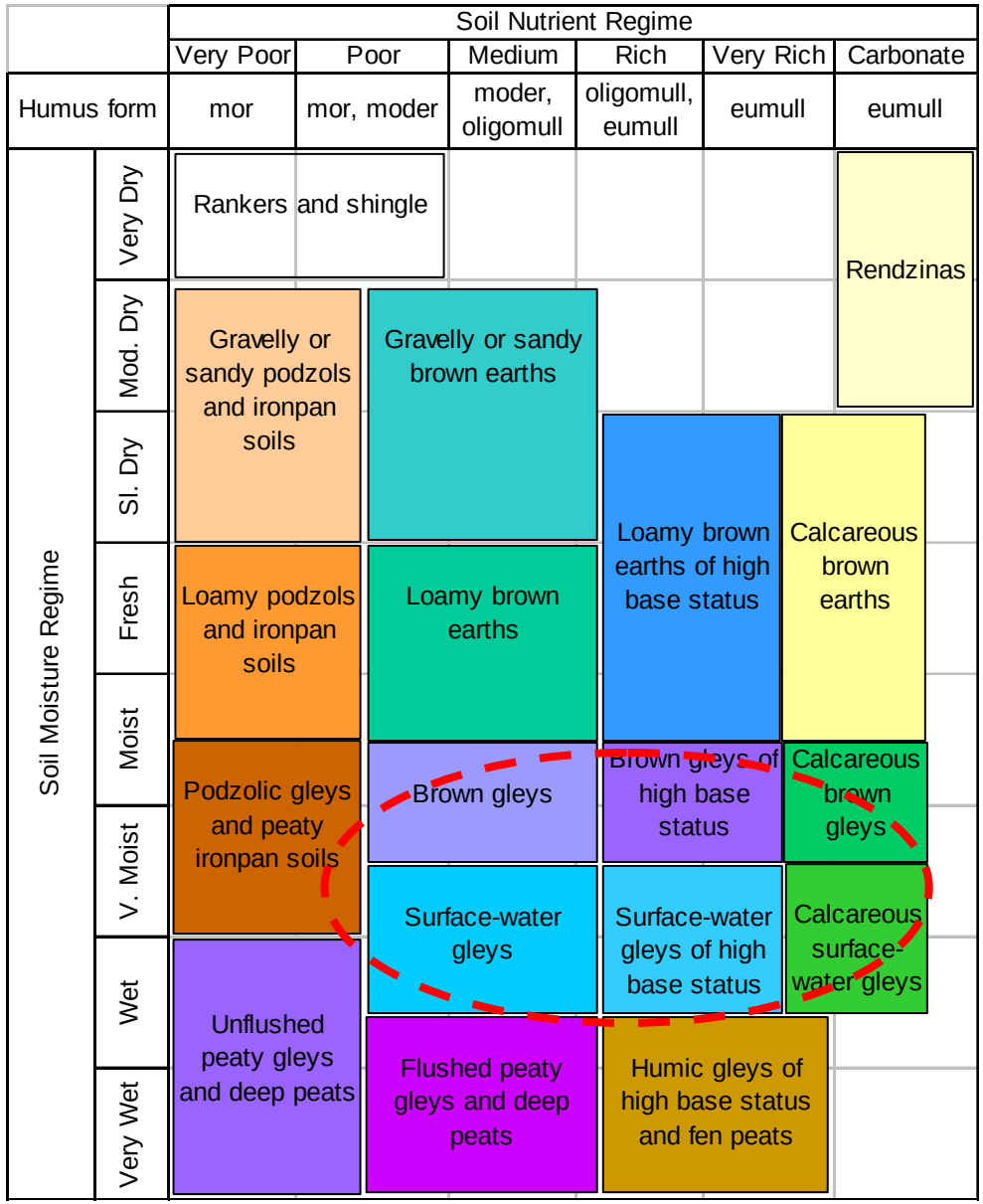


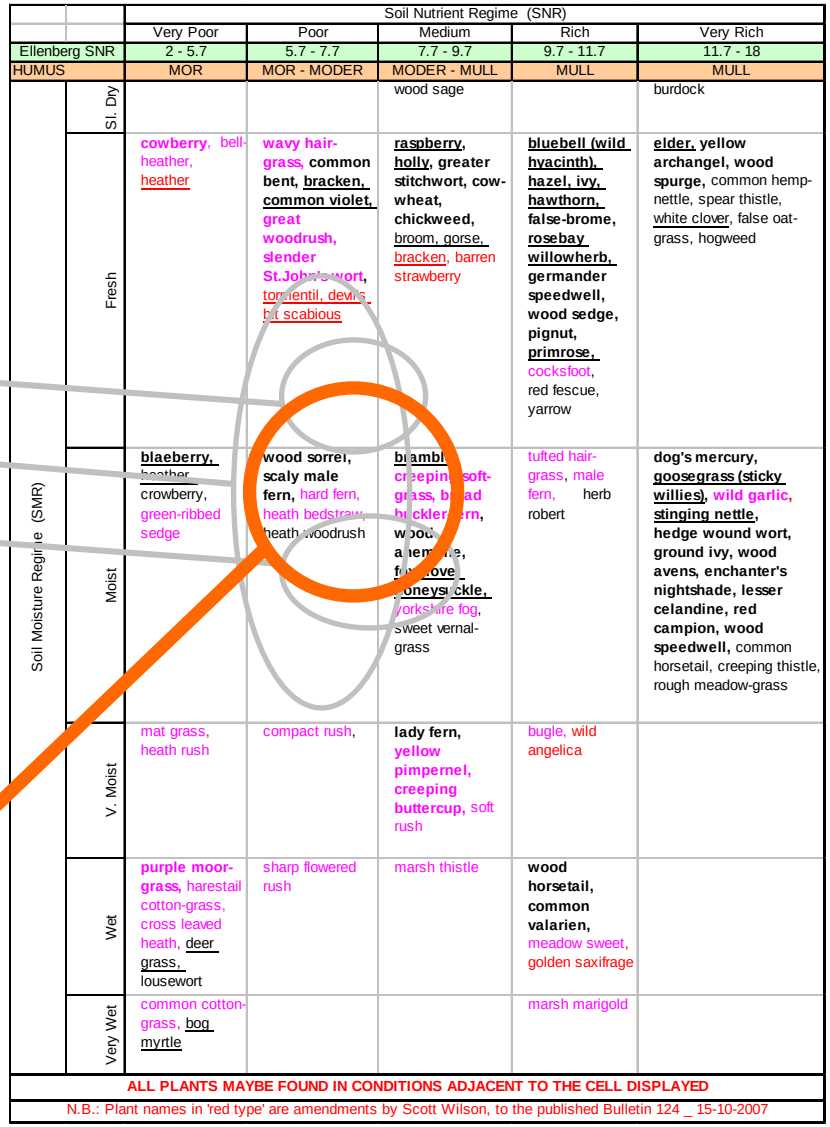
Vegetation Indicators

Common violet

Bracken

Wood sorrel

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



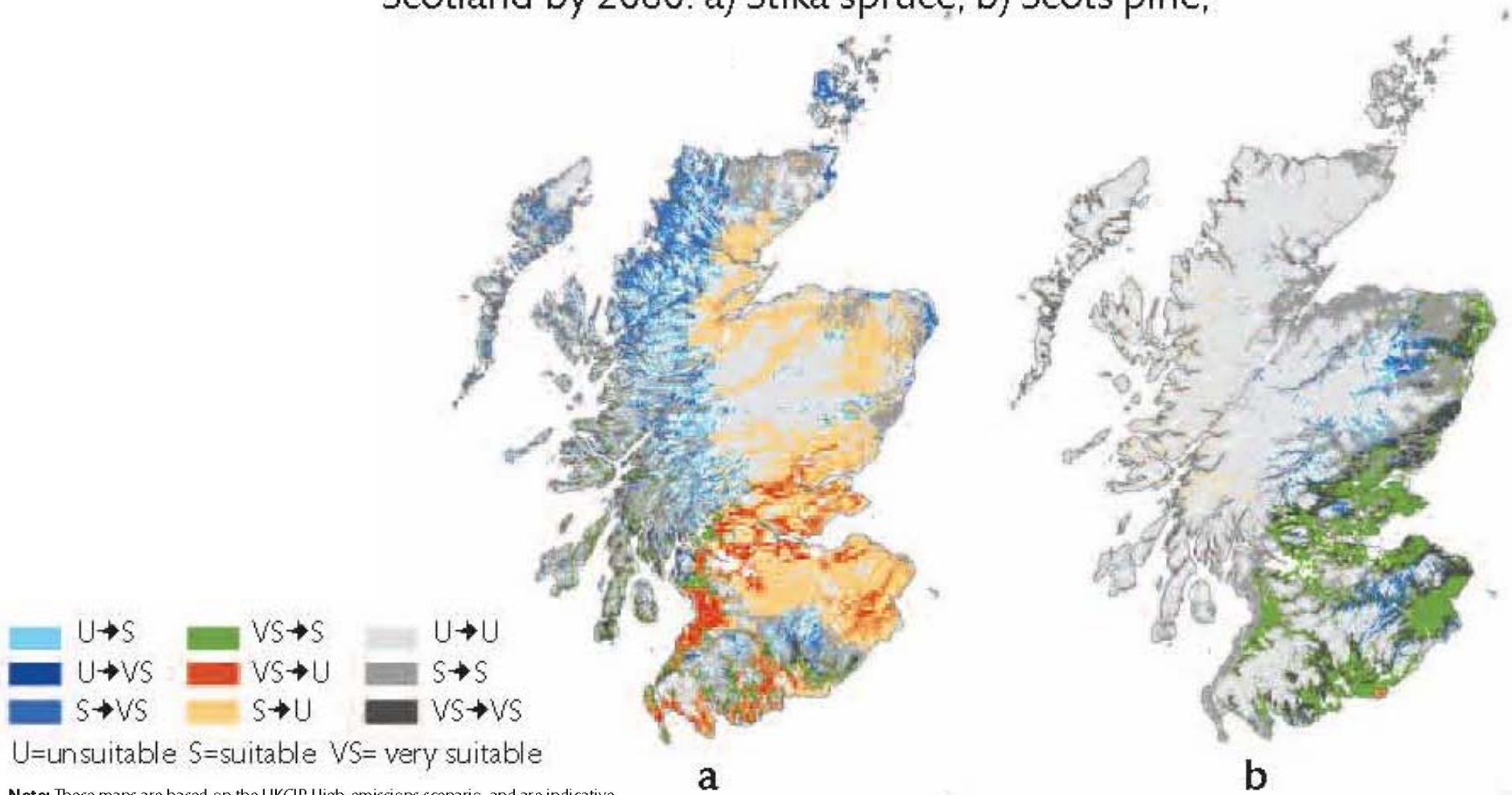
Soil Moisture Regime (SMR)		Soil Nutrient Regime (SNR)				
		Very Poor	Poor	Medium	Rich	Very Rich
Ellenberg SNR		2 - 5.7	5.7 - 7.7	7.7 - 9.7	9.7 - 11.7	11.7 - 18
HUMUS		MOR	MOR - MODER	MODER - MULL	MULL	MULL
	Sl. Dry			wood sage		burdock
	Fresh	cowberry, bell-heather, heather	wavy hair-grass, common bent, bracken, common violet, great woodrush, slender St.John's-wort, tormentil, devil's-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	bramble, creeping soft-grass, broad buckler-fern, wood anemone, foxglove, 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, harestail cotton-grass, cross leaved heath, deer grass, lousewort	sharp flowered rush	marsh thistle	wood horsetail, common valarien, 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.

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

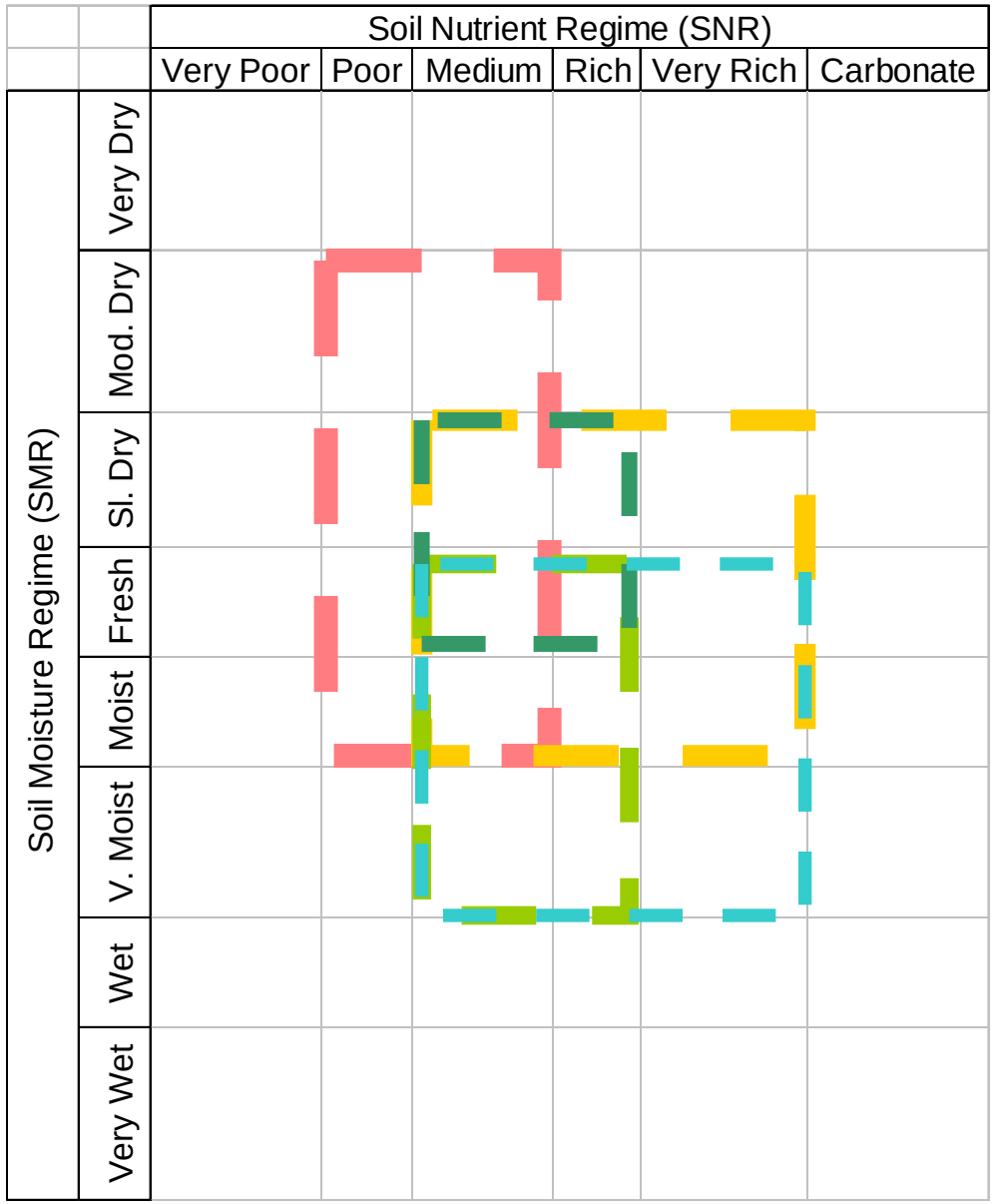
SP

EL

NS

DF

SS



Site Assessment & Species Choice

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

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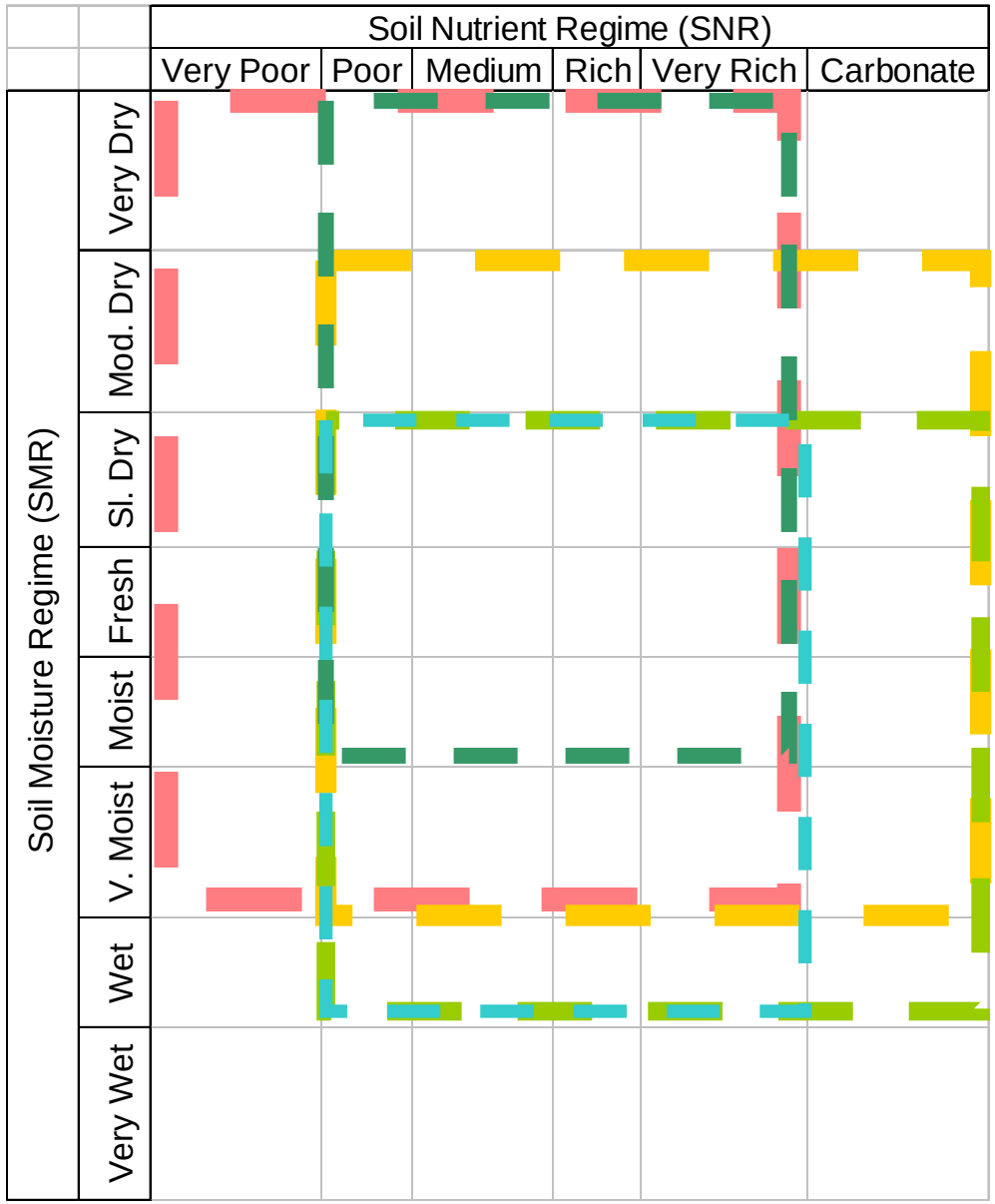


Summary

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.

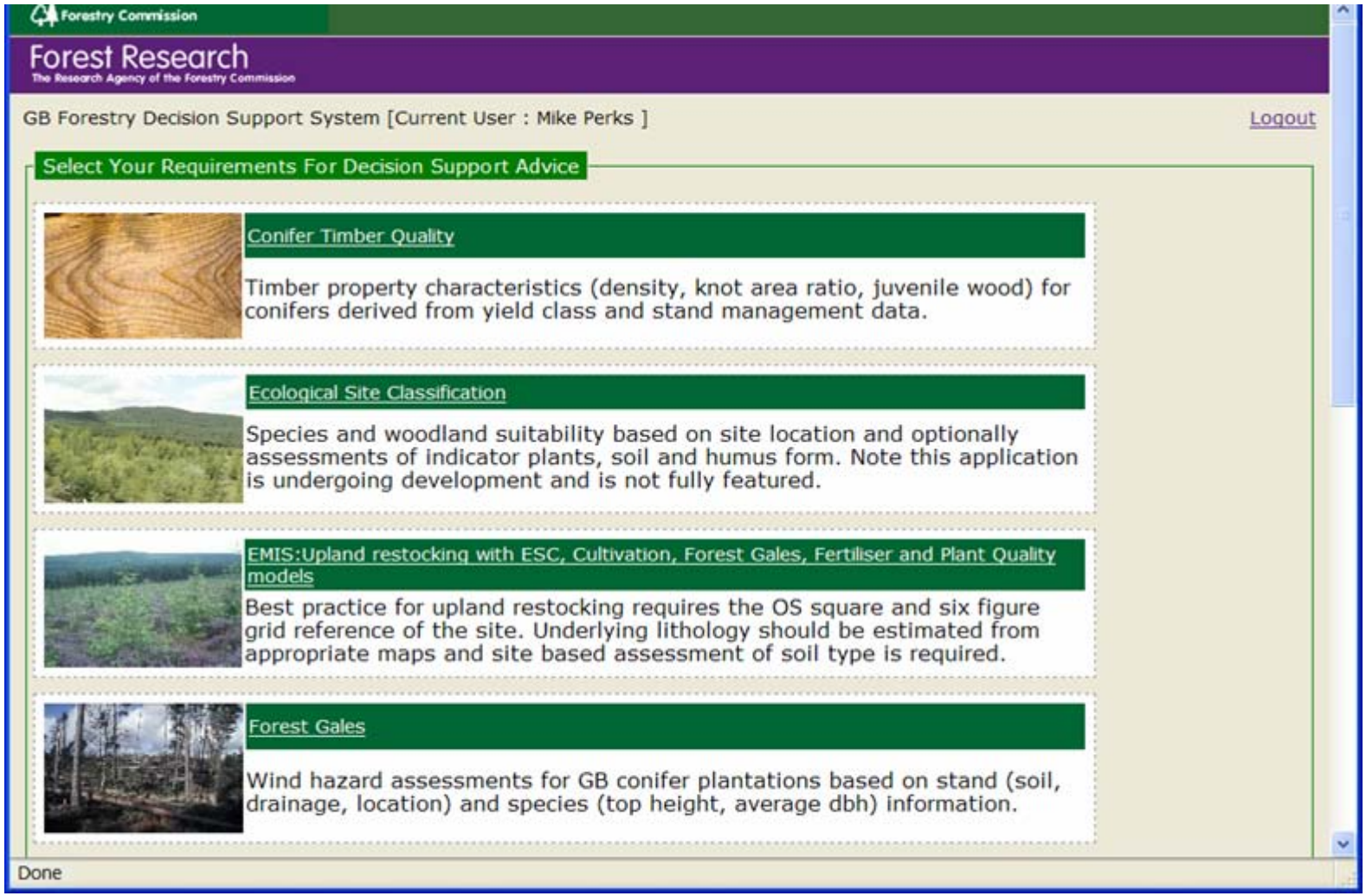
CONCLUSIONS

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)



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.