



Silvicultural education in Ireland: Challenges and opportunities

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Definitions

- EDUCATION: The process of receiving or giving systematic instruction, especially at a school or university
- SILVICULTURE: ~~The art and science of cultivating forest crops~~
 - The art, practice and science of caring for forests and woodlands to meet diverse needs and values of landowners and society on a sustainable basis (Hemery & Skovsgaard, 2018)

Changing context

- (E)State forests (large-scale)



- Private forests (small-scale)

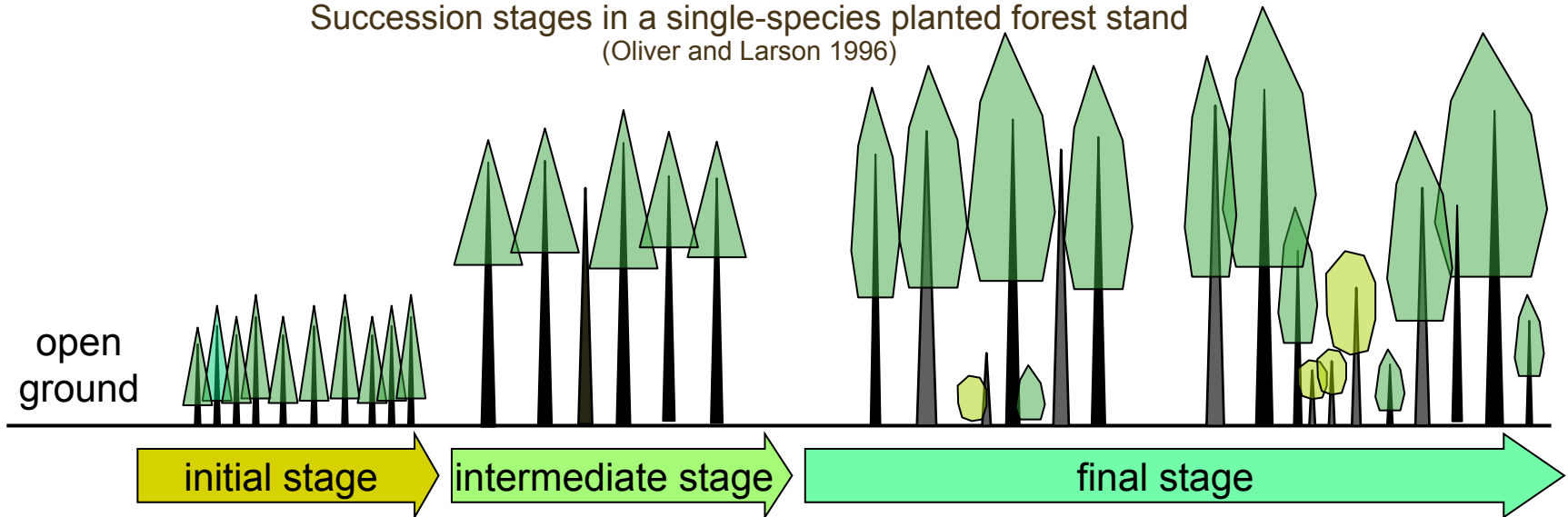
- Preparation for forest management occupation



- Managing natural resources for valued societal and ecosystem relationships

Enhancing resilience

Succession stages in a single-species planted forest stand
(Oliver and Larson 1996)



- Species choice
 - genetics/provenance
- New species introduced
- Wider use of “minor” species
- Mixed species
- Assisted migration of native species

Modify thinning regimes

Natural regeneration

Under-planting

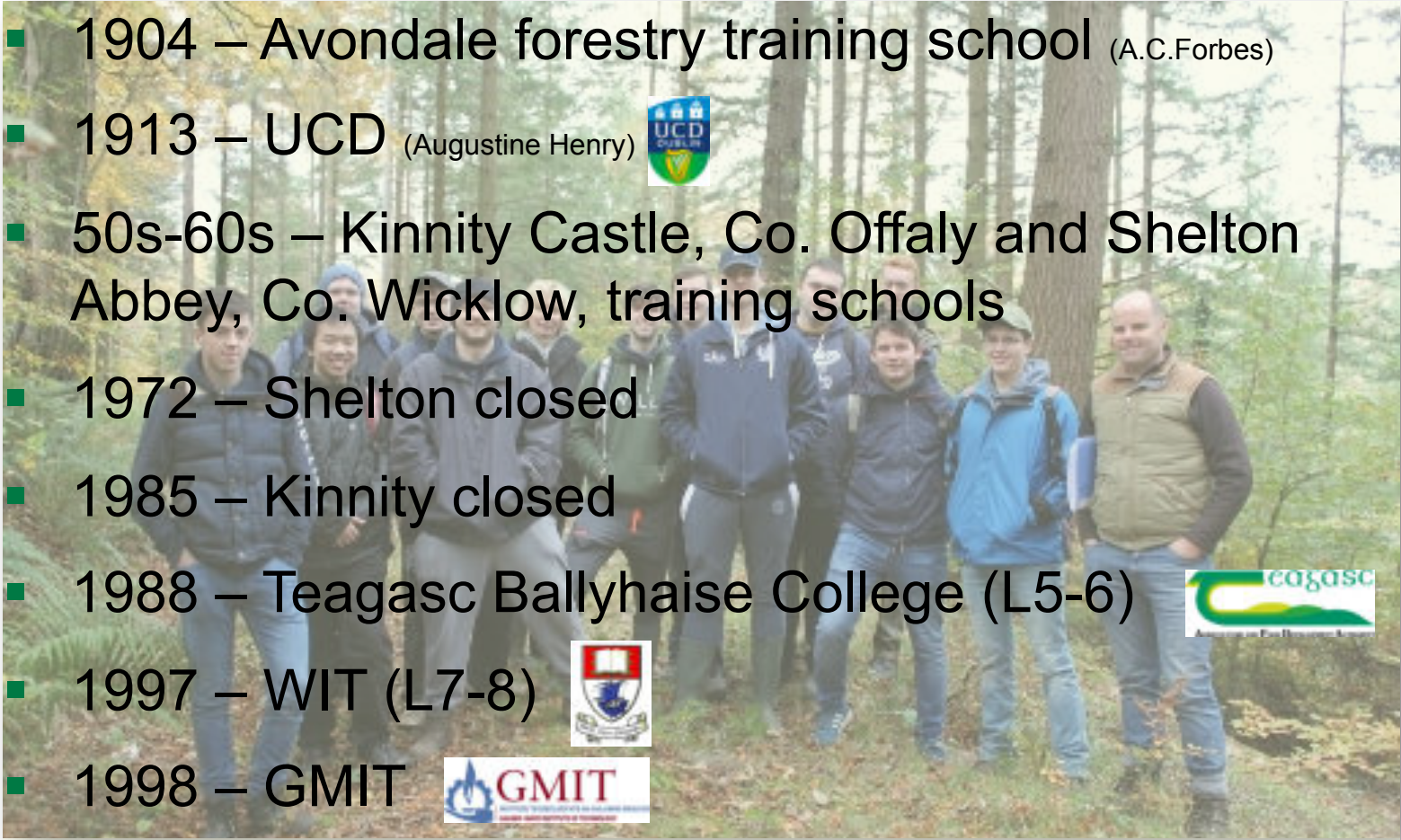
Extend “rotations”

Who needs silviculture education?

- Forest workers
- Forest managers

Formal education

- 1904 – Avondale forestry training school (A.C.Forbes)
- 1913 – UCD (Augustine Henry) 
- 50s-60s – Kinnity Castle, Co. Offaly and Shelton Abbey, Co. Wicklow, training schools
- 1972 – Shelton closed
- 1985 – Kinnity closed
- 1988 – Teagasc Ballyhaise College (L5-6) 
- 1997 – WIT (L7-8) 
- 1998 – GMIT 



Who needs silviculture education?

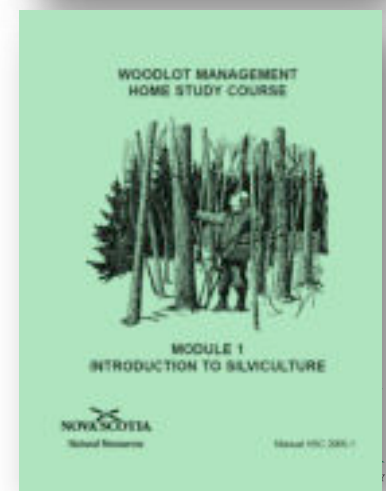
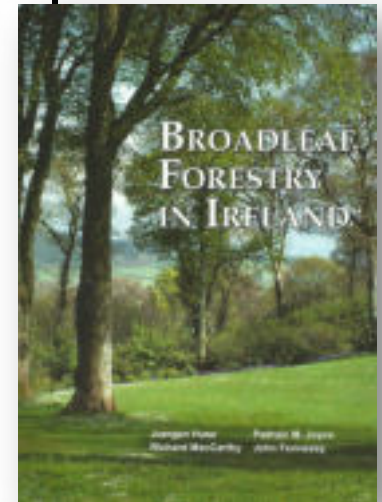
- Forest workers
- Forest managers
- Forest owners
- Policy makers
- General public

Know the audience

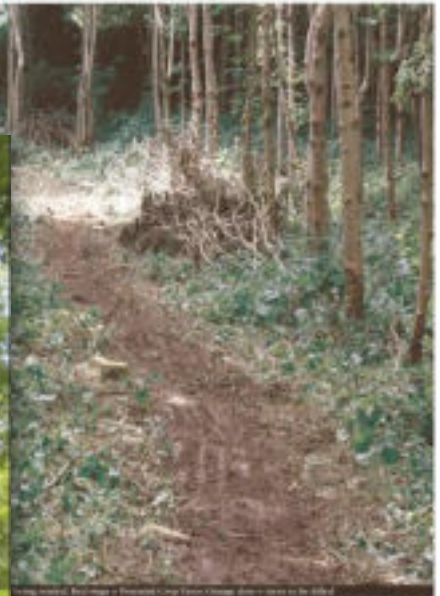
- Journal
- Conference
- Magazine
- E-newsletter
- You-Tube



- Discussion group
- Peer-to-peer
(Oregon Master Woodland Manager)
- Workshop
- Book
- Field-day
- Classroom
- Online course



Know the audience



Silvicultural Guidelines for the Tending and Thinning of Broadleaves

Recommendations for the tending and thinning of:
 Ash, Sycamore, Alder, Norway Spruce, Oak (sessile), Oak (pedunculata), Maple, Birch (Betula) and Beech (Fagus) stands.

Teagasc and COFORD

Selecting and marking Potential Crop Trees

2,371 views

Teagasc
 Published on Oct 23, 2015

POTENTIAL CROP TREES CAN BE SELECTED ON THE BASIS OF FOUR CRITERIA:

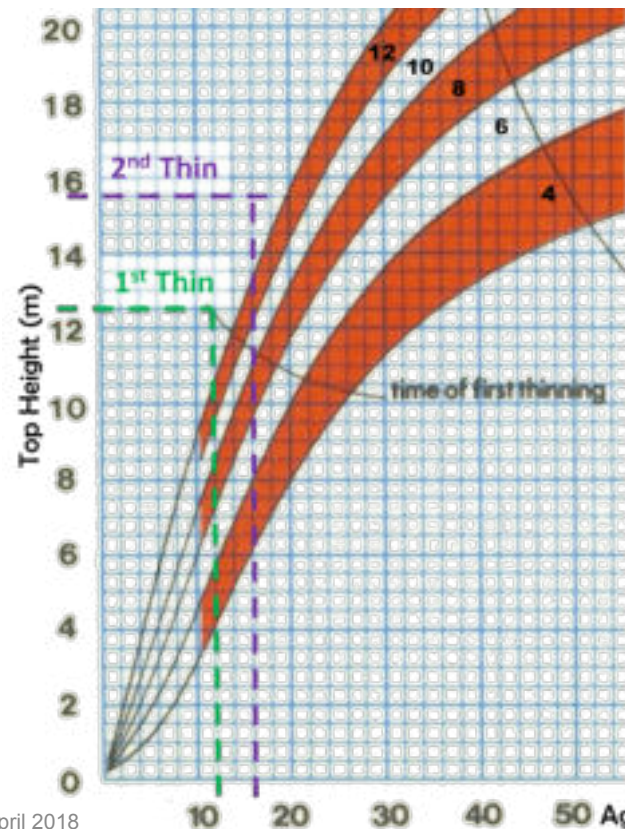
1. Flowering time
2. Relatively good stem form
3. Relatively good height
4. Distribution

Keep It Simple, Stupid ???

- DBH
- Basal Area
- Marginal thinning intensity
- MAI
- CAI
- Yield Class
- Closed forest

- Volume
- Top height

Keeping it too simple for too long??



Tree height

A simple method of measuring tree height



Break a straight stick such that whilst holding one end between your index finger and thumb, the other end is level to your eye with your head erect. Your arm should be outstretched and at right angles from your body (see accompanying photos)



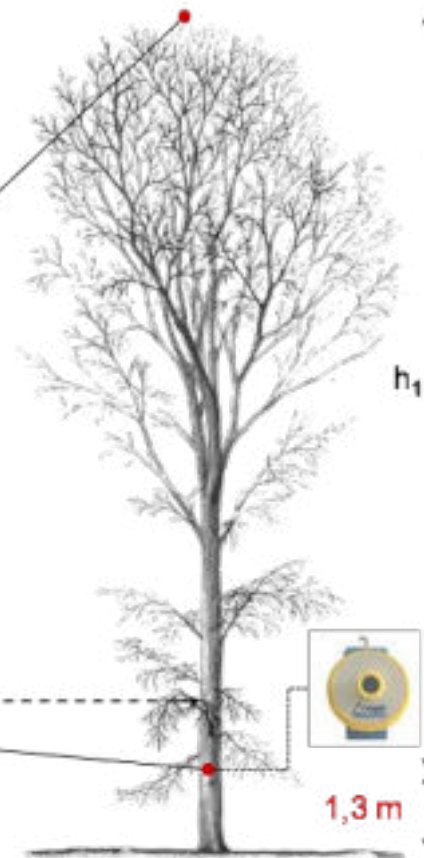
Figure 10. Measuring a tree by the use of a stick to measure tree height



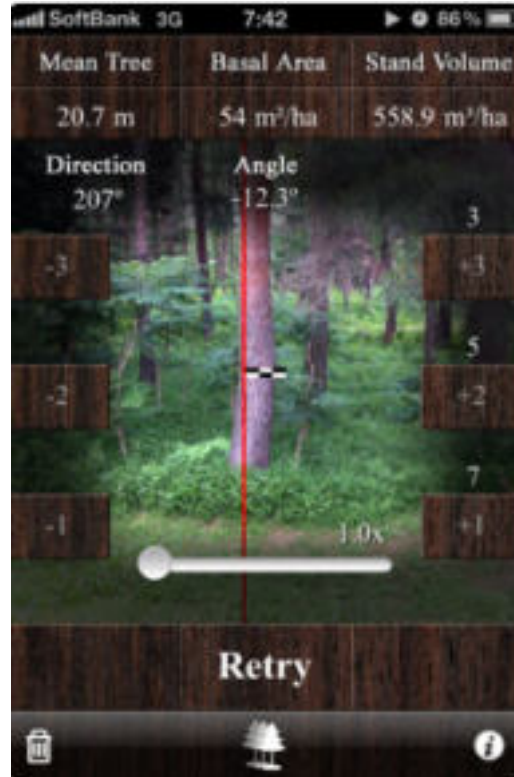
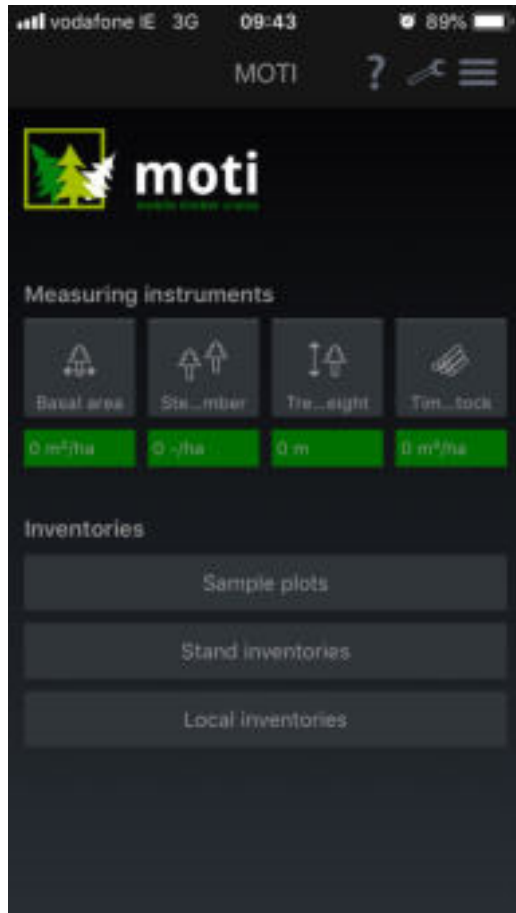
Holding your stick vertically at arm's length and keeping your head still, walk forwards or backwards until the top and base of the tree align with the top and base of your stick.



Then measure the distance from where you are standing to the base of the tree. This is equal to the height of the tree.



Apps




Other

- Teagasc training courses
- Native Woodland Scheme
- Landscape Design
- CoFoRD Workshops
- ITGA
- SIF (CPD)

What should be taught?
What

**should be
taught?**

Forestry higher education should: **All levels of education?**

- Focus on generic & methodical competencies
~~contents & descriptive approaches~~  Tackle novel, complex problems
- Develop competencies to integrate & communicate knowledge across disciplinary borders
- Address challenges e.g. climate change; adaptive ecosystem management; governance systems; gender issues; forests as source of energy; environmental and social impacts; etc.

Silviculture education in Ireland

- From the ground up
 - General public
 - Owners (and owners' children?)
 - Soils
- Flexible
- Future-proofing

Soil

Acid brown earth



- Well drained mineral soil
- Good soil physical properties
- Very productive soil
- Formed from various acidic parent materials
- Highly suitable to broadleaves

Fairly uniform soil profile throughout with little leaching of minerals



Podzol



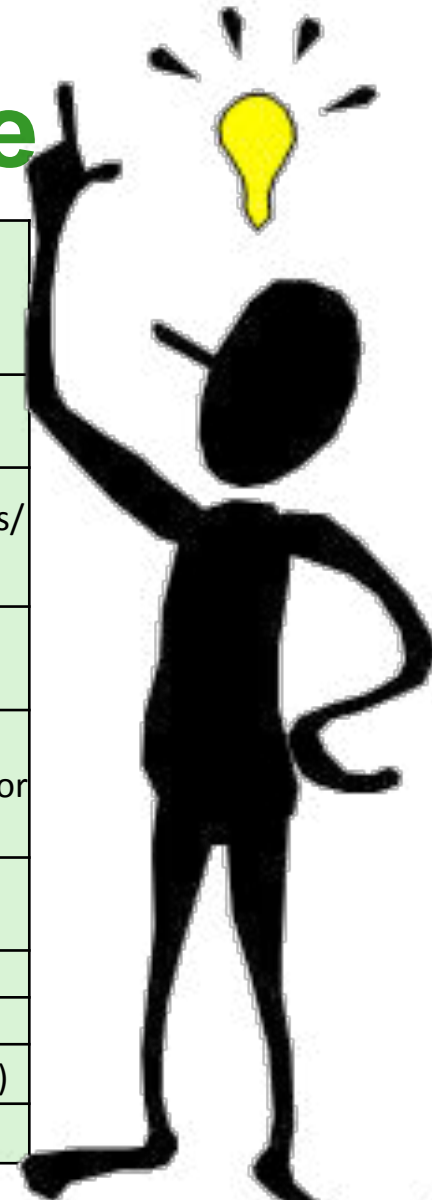
Horizon of leached minerals

- Well drained acid mineral soil
- Subject to intense leaching of minerals
- Have a distinct leached soil horizon
- Located mainly on hill-land areas
- Limited to certain species e.g. birch

Soil type – species choice

Species	Soil type										
	A	B	C	D	J	K	L	M	P	Q	
Alder (common)	Green	Light Green	Red	Yellow	Green	Light Green	Red	Light Green	Yellow	Light Green	Yellow
Alder (grey)	Green	Green	Light Green	Yellow	Light Green	Yellow	Red	Red	Yellow	Yellow	Yellow
Alder (Italian)	Green	Green	Light Green	Yellow	Light Green	Yellow	Red	Red	Yellow	Light Green	Yellow
Ash	Green	Light Green	Yellow	Red	Yellow	Light Green	Red	Red	Yellow	Yellow	Yellow
Beech (European)	Green	Green	Light Green	Yellow	Light Green	Yellow	Red	Red	Yellow	Yellow	Yellow
Beech (Southern)	Green	Green	Red	Yellow	Light Green	Yellow	Red	Red	Yellow	Yellow	Yellow
Birch (downy)	Green	Green	Light Green	Yellow	Green	Light Green	Red	Light Green	Yellow	Green	Light Green
Birch (silver)	Green	Green	Light Green	Yellow	Light Green	Yellow	Red	Red	Yellow	Yellow	Yellow
Cherry	Green	Green	Light Green	Yellow	Light Green	Yellow	Red	Red	Yellow	Yellow	Yellow
Hornbeam	Green	Green	Light Green	Yellow	Green	Light Green	Red	Red	Yellow	Yellow	Yellow
Lime	Green	Light Green	Yellow	Light Green	Yellow	Light Green	Red	Red	Yellow	Yellow	Yellow
Maple (Norway)	Green	Green	Light Green	Yellow	Light Green	Yellow	Red	Red	Yellow	Yellow	Yellow
Oak (pedunculate)	Green	Green	Red	Light Green	Light Green	Yellow	Red	Red	Yellow	Light Green	Light Green
Oak (red)	Light Green	Green	Red	Yellow	Light Green	Yellow	Red	Red	Yellow	Yellow	Yellow
Oak (sessile)	Light Green	Green	Red	Yellow	Light Green	Yellow	Red	Red	Yellow	Yellow	Yellow
Rowan	Light Green	Green	Light Green	Yellow	Light Green	Yellow	Red	Red	Yellow	Yellow	Yellow
Spanish chestnut	Yellow	Light Green	Red	Yellow	Light Green	Yellow	Red	Red	Yellow	Yellow	Yellow
Sycamore	Green	Green	Light Green	Yellow	Light Green	Yellow	Red	Red	Yellow	Yellow	Yellow

A	Alkaline brown earth and free-draining deep grey-brown podzolics
B	Acid brown earths and brown podzolics
C	Rendzinas/shallow brown earths/shallow grey-brown podzolics
D	Podzolics/peaty podzols +/- weakly developed iron pan
J	Gleys/peaty gley (mottled) and gleyed grey brown podzolics (A or B fertility)
K	Gleys/peaty gleys (blue/grey profile) (B fertility)
L	Gleys/peaty gleys (C fertility)
M	Flushed blanket peat
P	Cutaway raised bogs (post 1980)
Q	Cutaway raised bogs (pre 1980)

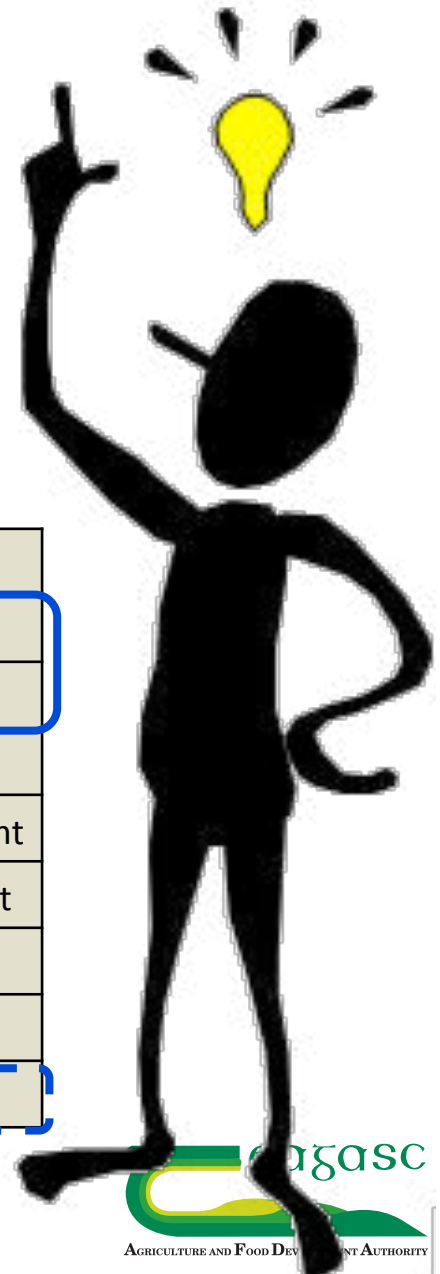


Species characteristics

Species	Characteristic								
	A	B	C	D	E	F	G	H	I
Alder (common)	Green	Green	Yellow	Red	Red	Red	Red	Green	Green
Alder (grey)	Green	Green	Yellow	Red	Red	Red	Red	Green	Green
Alder (Italian)	Yellow	Red	Red	Yellow	Yellow	Red	Red	Green	Green
Ash	Green	Red	Red	Red	Red	Red	Red	Red	White
Beech (European)	Green	Red	Red	Yellow	Yellow	Red	Green	Green	Green
Beech (Southern)	Green	Red	Red	Yellow	Yellow	Red	Red	Yellow	White
Birch (downy)	Yellow	Green	Yellow	Red	Red	Yellow	Yellow	Red	Green
Birch (silver)	Yellow	Green	Red	Red	Green	Red	Red	Red	Green
Cherry	Green	Red	Red	Red	Yellow	Red	Red	Red	White
Hornbeam	Green	Green	Red	Red	White	Yellow	Green	Green	Green
Lime	Green	Yellow	Red	Red	Yellow	Red	Yellow	Red	Green
Maple (Norway)	Yellow	Red	Red	Green	Green	Red	Red	Green	White
Oak (pedunculate)	Yellow	Red	Red	Yellow	Red	Red	Red	Green	Green
Oak (red)	Green	Yellow	Red	Yellow	Yellow	Yellow	Yellow	Green	Green
Oak (sessile)	Yellow	Red	Red	Yellow	Yellow	Red	Red	Green	White
Rowan	Green	Green	Yellow	Green	Yellow	Red	Red	Green	Green
Spanish chestnut	Green	Red	Red	Red	Red	Red	Red	Green	Green
Sycamore	Green	Green	Yellow	Green	Yellow	Red	Red	Green	White

Silvics
Ecophysiology

A	Easy to establish
B	Tolerant of spring frost
C	Tolerant of exposure
D	Tolerant of salt spray
E	Low moisture requirement
F	Low nutrient requirement
G	Shade bearer
H	Deep rooting depth
I	Soil improver



Redrawn from Horgan *et al.* (2003) A guide to forest tree species selection and silviculture in Ireland

Mixtures

- “Which way can you *most* benefit plantation at the *least* expense?”

- “By SHELTER.” Pontey, 1808; p. 190

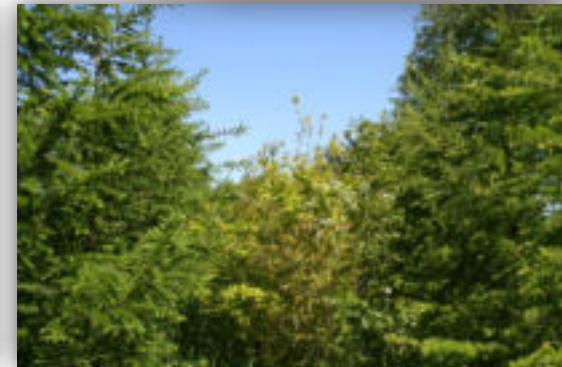
- Establish shelter in advance of main crop?

- Nurse species

- Stem form
- Frost
- Nutrition

- Resilience

- “The best prophylactic measure against the occurrence and spread of epidemics is the cultivation of mixed forest crops.” Hartig, 1882



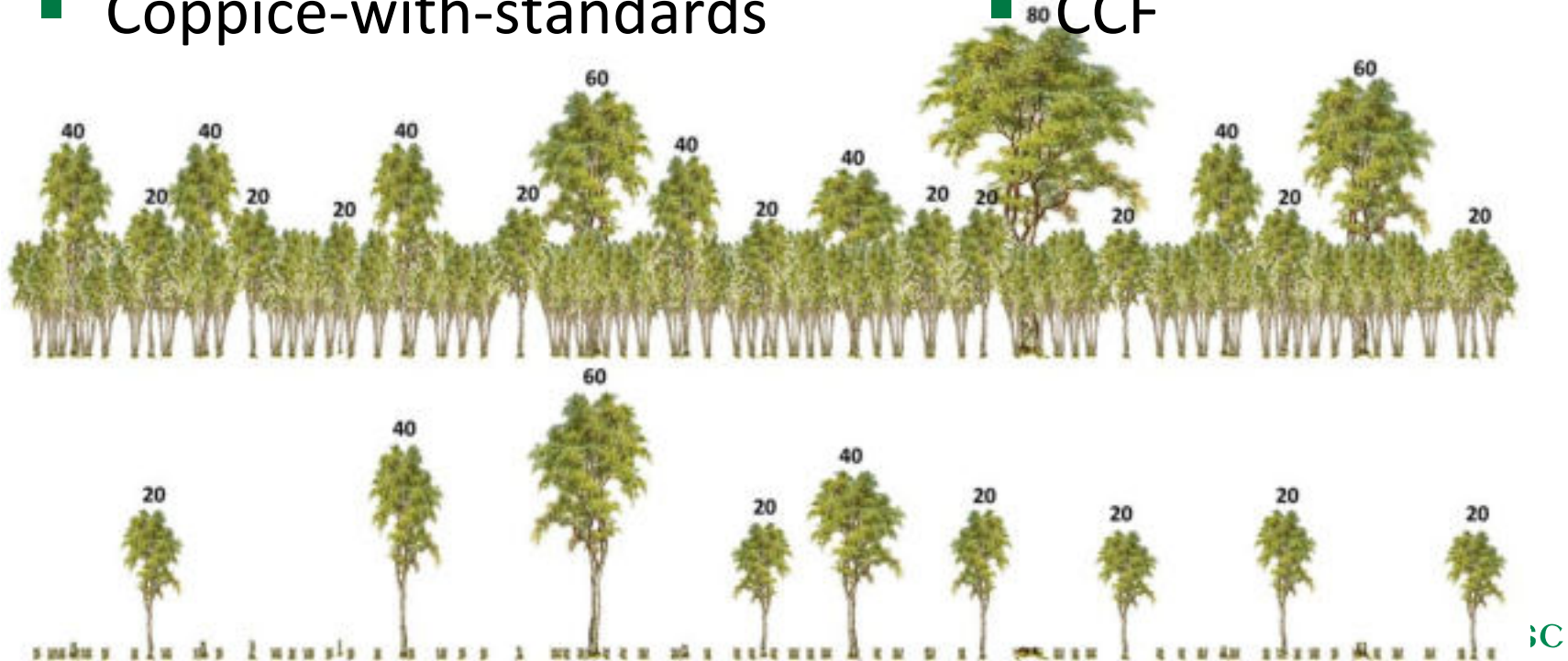
Establishment of mixtures

- Anderson squares
- Alternate lines
- Bands
- Intimate
- How many species?
- How many provenances?
- Silviculture more complex
- Natural regeneration



Alternative systems

- Free-growth
- Shelterwood
- Coppice-with-standards
- Agroforestry
- Selection
- CCF



Management

- Thinning
- Transformation
- Natural regeneration
- Pests / Invasives control (+ ecology)
- Ecosystem services and functions
- Financial
- Technology tools (e.g. GIS; Remote sensing)
- Management Plan

Timber value

French oak

6 m = 85%

6-12 m = 11%

Crown = 4%

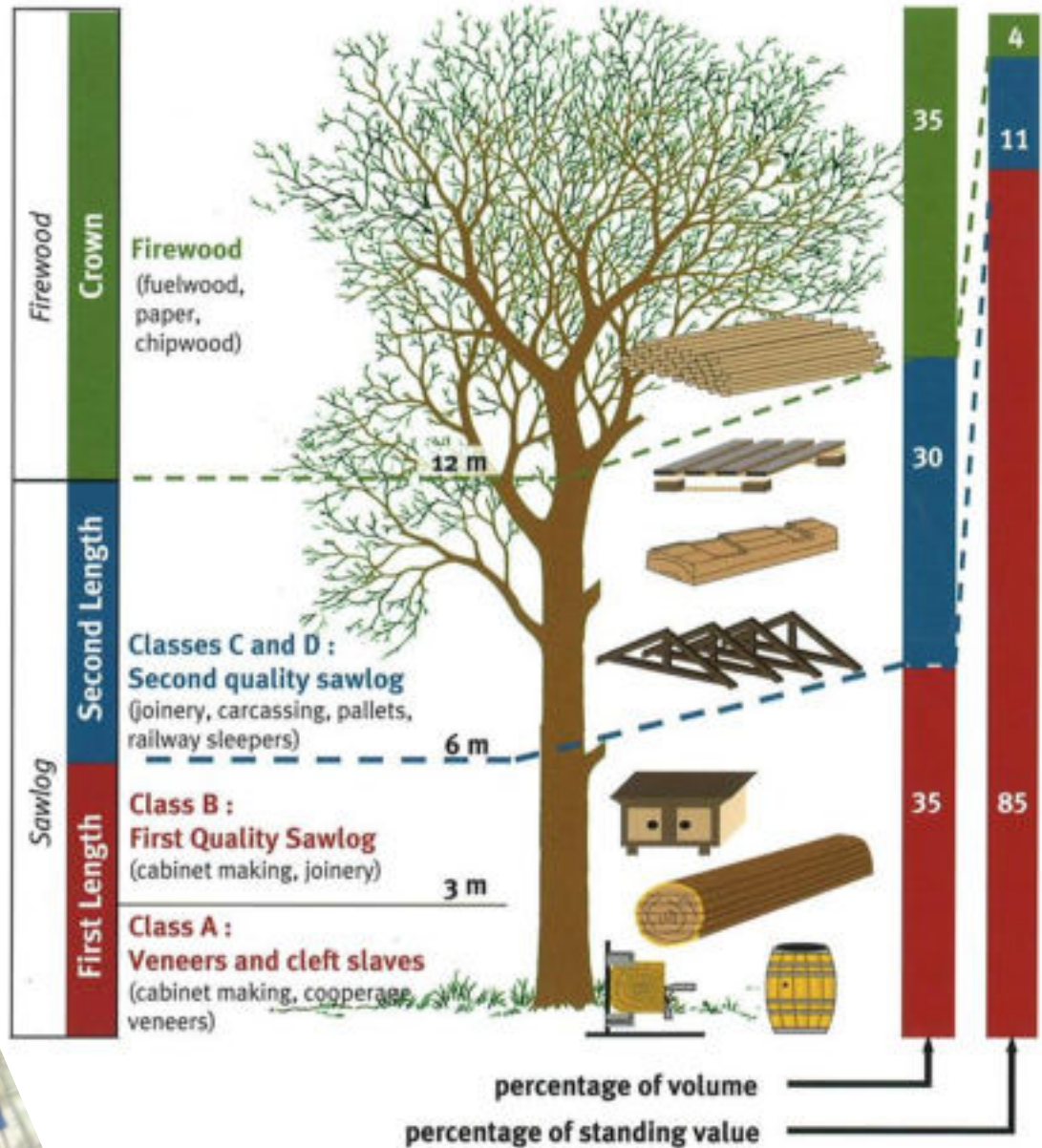


Figure 5 - Comparison of volume and value in a good quality oak sawlog

Compulsory education

- Registered forester
 - Degree (L7)
- SIF Technical Membership
 - Degree (Management Plan)
- Grant requirement
 - Native Woodland Scheme (forester)
 - DAERA Environmental Farming Scheme
 - » (Higher) Designated sites (planners & owners)
 - » (Wider) (owners)
 - » Training is Option Specific

NWS Silvicultural Standards

Registered Foresters are required to do a course


Native Woodland Establishment

If...


Location: upland valley slopes & hillsides on free-draining slopes.

Soil: Podzols (acid, infertile soils), average pH c.4.5.

Main habitats & vegetation:
Greenfield containing bracken, bilberry, heathers & gorse, with Molinia grass on flushed sites.
Semi-natural woodland dominated by / hedgerows containing: sessile oak, downy birch, rowan & holly, with bilberry, ling heather & woodruff.




Scenario 1: Podzols / Oak-Birch-Holly Woodland




Most appropriate Major Native Woodland Type: G1 Sessile oak-woodruff.

Predominant trees & shrubs: Sessile oak, downy birch, rowan & holly.


Predominant ground flora: Bilberry, ling heather, woodruff, hard fern, broad buckler-fern & honeysuckle.



Planting mixture: Sessile oak (30%) and Scots pine (30%), with Downy birch (15%), rowan (15%) and holly (10%).
Sessile oak planted in predominantly pure groups, with Downy birch (3%), holly (2%) & rowan (2%) scattered intimately throughout oak. Scots pine planted in small pure groups, focusing on parts of the plot with free-draining soil (if present) and away from any watercourses adjoining or crossing the plot. Remaining rowan (13%), Downy birch (12%) and holly (8%) planted as an intimate mixture in remaining areas of the plot.



Relevant GPC: GPC 9 for enclosed / improved sites
[GPC 1 for unenclosed / unimproved sites – see Scenario 2]



A typical upland greenfield site (sandwiched between two sessile oak/downy birch-dominated native woodlands) where the soil type on the slope is predominantly podzols.

G1 Sessile oak-woodruff

G2 Birch

G3 Rowan

G4 Holly

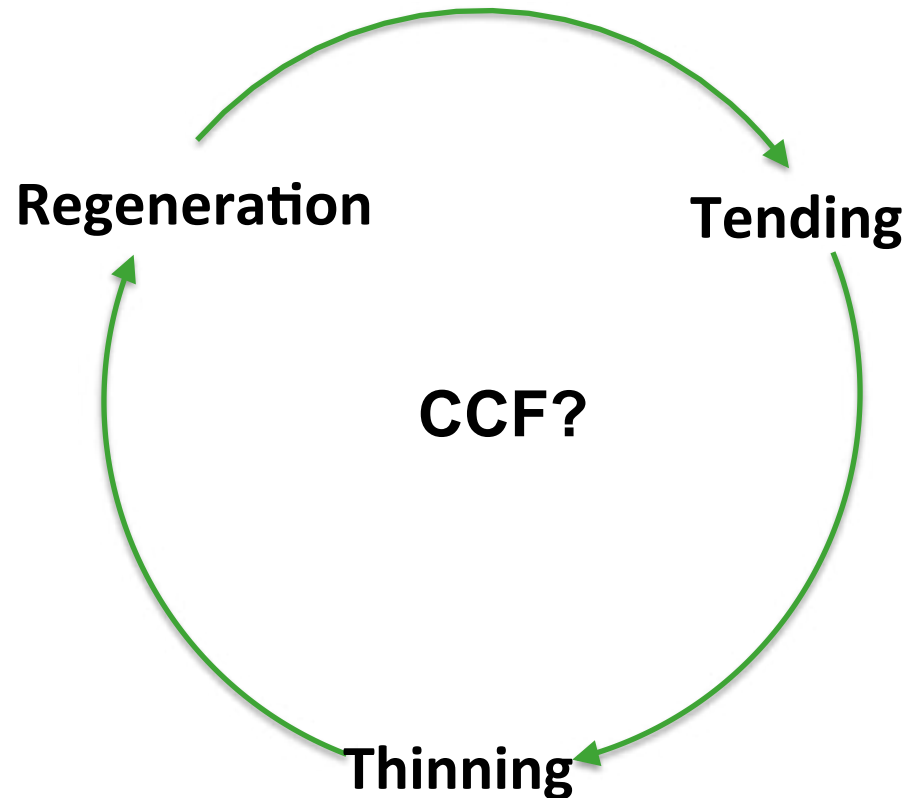


A podzol profile with a topsoil comprising an acid, peaty, fibrous upper layer that overlies a leached, grey/white, infertile mineral layer. The subsoil is dark brown & iron-rich, with organic matter derived from the leached topsoil. The subsoil overlies the parent material from which the soil is derived.



G1, Sessile oak-woodruff woodland, Derrynag Nature Reserve, Co. Galway.

Critical times for provision?



Afforestation?

- Significant investment
 - Owner
 - State
- Prior to planting decision?
- Subsequent to planting?



Broadleaf Thinning?

Owner educated prior to receiving grant?

Course / Meeting?

Online course?

Video?

Publication?

Ash / Sycamore / Norway Maple / Alder Tending Recommendations
(initial stocking = 3,300 stems / ha)

1. 3300 stems per ha (2m x 1.5m) → 8m tall
Mark 350 PCTs per ha

2. Mark racks 1:10 – 1:7 lines
Some PCTs present in rack
Approx. 300 PCTs remain

3. Mark at least 2 competitors per PCT
Mark wolves & diseased

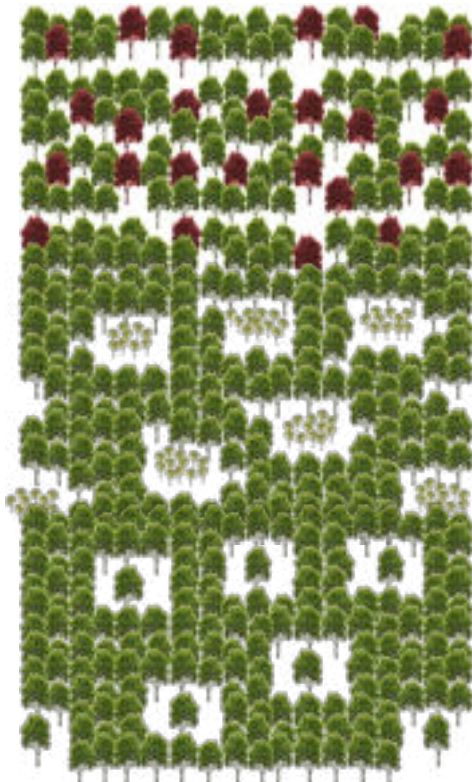
4. Fell racks, cut wolves and diseased
High prune PCTs to 1.5m height as required

Additional Guidelines for the quantity and timing of thinning

carraig

Felling Licence?

Training prior to receiving Felling Licence?



Department of Agriculture, Food and the Marine

Application for a Licence to Fell Trees (please refer to Guidance Notes)

Part 1 – Applicant who will

The Applicant can be the Owner or Occupier. (Please complete with)

Where there is more than one to which the licence should be issued, please indicate the applicant.

1a Individual

Surname: Duggle
 Address: Churchtown, 1
 Postcode: A65 83GF

Please enter your Felling Licence No. if the applicant does not follow to facilitate registration
 FO No: _____

1b Legal Entity

Legal Entity Name: _____
 Address: _____
 Postcode: _____
 CRD No: _____

If the applicant does not follow to facilitate registration
 the Felling Licence database

Land ownership status: Free

Part 2 – Agent Details (See guidance notes for details of the agent – the agent) (if you do not have Felling Licence Agent on the Felling Licence database)

Surname: _____
 Legal Entity Name: _____
 Address: _____
 Postcode: _____ Telephone: _____

Please enter your Felling Licence No. if you do not have Felling Licence Agent on the Felling Licence database

Form: Felling Application 2 (2017 August 2017)

Department of Agriculture, Food and the Marine

Part 3 – Trees Proposed to be Felled (please refer to Guidance Notes)

Location of trees:

Townland	Electoral Division	County
<u>KILAHINNA, Uppur</u>	<u>KATHALOGUE</u>	<u>Wicklow</u>

Felling Information:

Plot No. ¹	Plot Details			Name	Canopy (%)	Species Details		Fell Year	Fell Age	Estimated volume (m ³)
	Land Use Type	Harvest Type	Total Area (ha)			No. of Trees to be felled ²	Per hectare			
1	WHF	TH2	3.40	SP	30	250	-	2017	33	28
1	WHF	TH2	3.40	DAE	30	650	-	2017	33	31
1	WHF	TH2	3.40	SP	30	280	-	2014	27	49
1	WHF	TH2	3.40	DAE	30	680	-	2014	27	38
2	CHP	CF	0.84	S.S	100	370	-	2017	3P	420

¹ Plot numbers provided in this table should correspond to the map submissions element of this felling licence application.
² Where the harvest type is Single Trees or Line of Trees, the actual number of trees to be felled must be stated. For all other harvest types (such as clearfell), an accurate estimate of the number of trees per hectare to be felled for each species must be stated.
³ Where the harvest type is Single Trees or Line of Trees, the estimated volume of all trees to be felled must be stated for each species. For all other harvest types (such as thinning or clearfell), an accurate estimate of the volume per hectare to be felled for each species must be stated on the application form.

Form: Felling Application 2 (2017 August 2017) Page 2 of 6

Silviculture education leading to greater:

- Flexible and adaptable productive industry
 - e.g. site-specific / owner specific silviculture
- Resiliency
- Enhanced forest owner satisfaction
 - Owner objectives
- Enhanced public approval
 - State/Public objectives

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THANK YOU!