

# Fit Forest Project

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Assessing the growth of important tree species over four decades in different soils and climatical regions of the island of Ireland.

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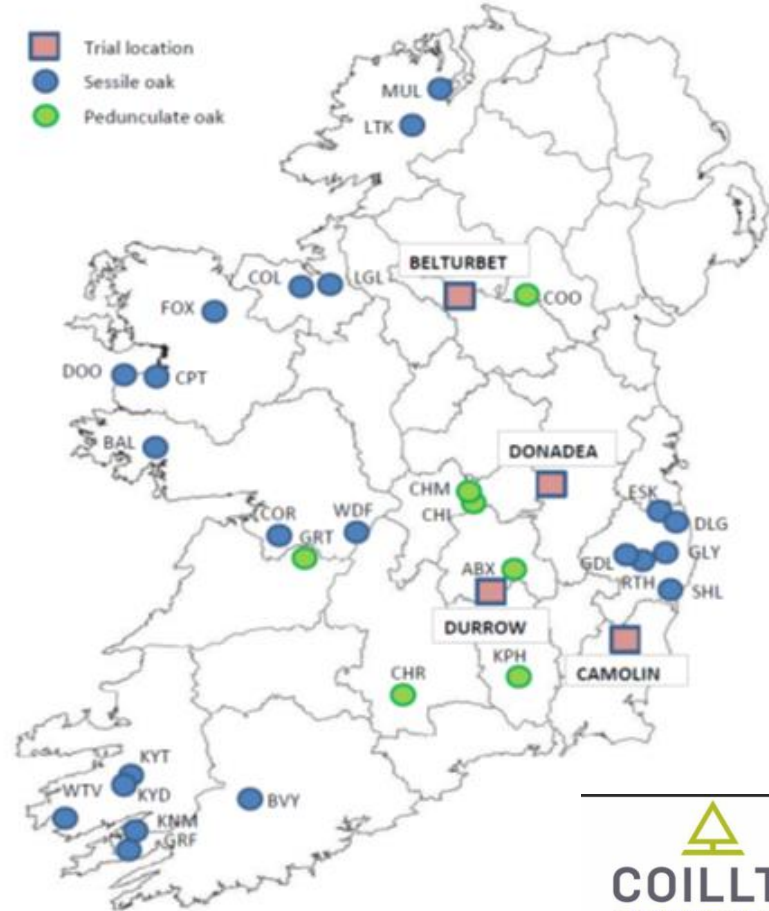
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# Coillte\* Native oak provenance experiment :

- Planted in 1988 at four sites across Ireland
- Oak tree seedlings (3-yr old) from 27 known provenances

(\* Irish State Forestry Company)



# Oak Forest experiment Objectives

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- a) To identify the best seed source of native oak for commercial purposes.
- b) To examine the type of genetic variation that exists between and within the different native oak stands.
- c) To provide a base on which future ecological studies can be carried out.
- d) To create a gene pool in native oak as a safeguard to a threatened genetic resource.

# Details of planting sites

SITE DATA	LOCATION AND EXPERIMENTAL NUMBER			
	Camolin 6/88	Durrow 1/88	Belturbet 3/88,4/88	Donadea 43/88
Comp. No.	17457-C	81108S	71110H	
Elevation	80 m	100 m	80 m	0 m
Aspect	Flat	N-W	NW-SE	Flat
Exposure	Sheltered	Sheltered	Sheltered- Moderate	Moderate
Soil	Acid brown earth	Grey brown podsollic	Agricultur- al brown podsollic	Cut-over peat
Previous crop	NS	SS	NS/SS	-
Vegetation	Briar, grasses	Briar, grasses	Briar, grasses	-

# Experimental details;

Planting densities;

1.69m spacing = 3,500 trees/ha

1.44 m spacing = 4,820 trees/ha

## .3 Establishment Details

TECHNIQUE	Camolin 6/88	Durrow 1/88	Belturbet 3/88, 4/88	Donadea 43/88
Cultivation	Windrowing/ burning	Windrow into lop & top	None	None
Fertiliser	None	None	None	350 kg/P 250 kg/K
Pre-planting herbicide	Roundup	Roundup	Roundup	-
Planting	Pit	Pit	Pit	Pit

## .4 Experimental Design

EXPT. NO.	DESIGN	NO. OF REPS.	NO.OF PLANTS PER PLOT	SPACING	NO.OF TMTS.
Camolin 6/88	Randomised block	3	225 (15x15)	1.69	27
Durrow 1/88	Randomised block	3	221 (17x13)	1.44	19
Belturbet 3/88	Randomised block	3	225 (15x15)	1.69	15
Donadea 43/88	Randomised block	4	144 (12x12)	1.44	11



# Examples of understory at Camolin Oak Trial site



Ivy (*Hedera helix*) on stems



Re-growth shoots from stumps of fallen oak trees

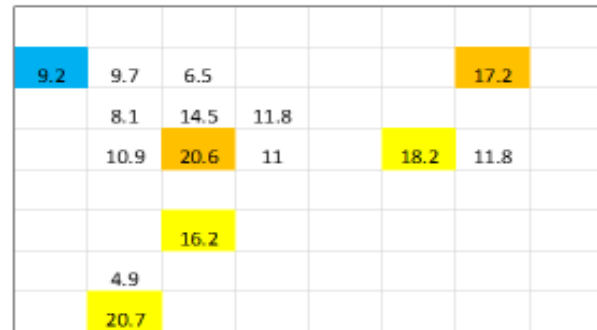
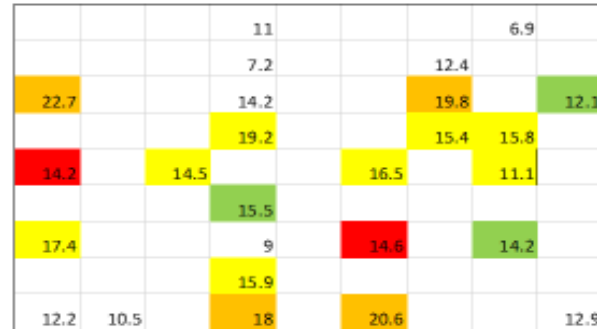
Examples of plot recordings;

Legend



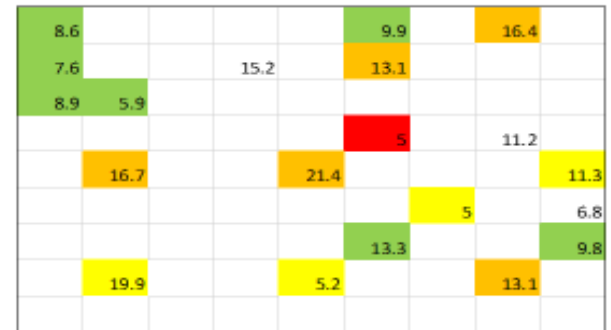
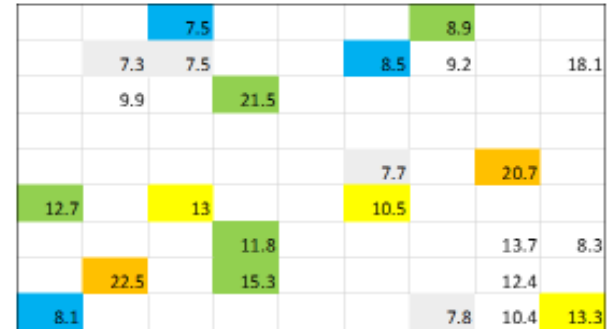
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Camolin Plot 23



Donadea Plot 23

Belturbet Plot 39



Durrow plot 29



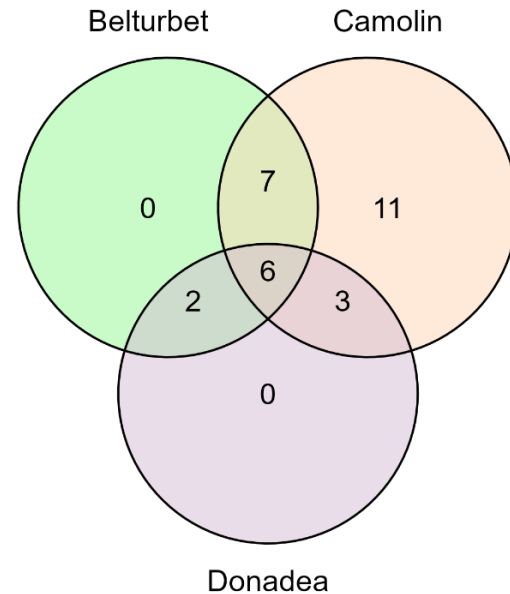
# Oak trial site results (means)

<u>Trial site</u>	<u>Standing stems (%)</u>	<u>DBH (cm)</u>	<u>Height (m)</u>
Belturbet	26.4	19.6	16.6
Camolin	30.4	18.1	14.5
<u>Donadea</u>	<u>29.8</u>	<u>17.3</u>	<u>11.9</u>
stdev	2.16	1.17	2.36

# REML analysis- DBH 6 common provenances

	FPr	Sig (P<0.05)
Provenance name	0.032	*
Forest	0.017	*
Name - Forest	0.496	NS

Number of provenances common across the forests  
Irish Oak Forest Experiment commenced in 1989



Data source: Agri-Food & Biosciences Institute

# NI Forest Service- Inter provenance mixtures of Sitka spruce

- Four Sitka spruce provenances
- Alaska, Washington, Oregon, QCI  
(Queen Charlotte island)
- Origin- north west America
- Planted 1989
- 18 mth old NI grown seedlings



# Experiment Objectives;

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- To compare self thinning of Sitka spruce from;
  - Pure provenance plots
  - 50:50 mixtures of all provenances in;
    - Line by line planted plots
    - Intimate mixture (in-line pairs) planted plots
- Plots layout
  - 8 x 9 trees per plot
  - Planted at 2m spacings
  - (= 2,500 trees/ha)
  - Plots 18m x 20m
  - 3 m racks around plots
  - Total area = 1.73 ha

# Planting site details

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- Former agricultural land- mineral gley soil overlying limestone shale rock
- Stock grazing- soft grasses & rushes (*Juncus effusus*)
- Cultivation- standard forestry practice
- 250 kg/ha coarse rock phosphate applied
- Ground ripped to 45 cm depth at 2m intervals\*

○ \*(Winged mole plough mounted on a tracked D4 CAT).




# Experimental design

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- Four Sitka provenances
- Sixteen treatment
- Four pure plots
- Six plots- alternate line mixtures
- Six plots- alternate pair mixtures
- Three replicated Blocks

1/	Pure Alaska
2/	Pure QCI
3/	Pure Washington
4/	Pure Oregon
5/	Alaska/QCI in alternate lines
6/	Alaska/Washington in alternate lines
7/	Alaska/Oregon in alternate lines
8/	QCI/Washington in alternate lines
9/	QCI/Oregon in alternate lines
10/	Washington/Oregon in alternate lines
11/	Alaska/QCI in alternate pairs
12/	Alaska/Washington in alternate pairs
13/	Alaska/Oregon in alternate pairs
14/	QCI/Washington in alternate pairs
15/	QCI/Oregon in alternate pairs
16/	Washington/Oregon in alternate pairs

# Trial site planting plan and overview photograph (2022)

 N 	48	O	47	I	46	L	45	B
	41	D	42	J	43	M	44	F
	40	H	39	E	38	G	37	N
<b>Block 3</b>	33	K	34	A	35	P	36	C
	32	D	31	E	30	G	29	P
	25	J	26	M	27	B	28	H
	24	A	23	O	22	K	21	F
<b>Block 2</b>	17	I	18	L	19	N	20	C
	16	K	15	G	14	H	13	B
 Slope ~ 5°	9	O	10	I	11	J	12	D
	8	F	7	M	6	L	5	P
<b>Block 1</b>	1	N	2	A	3	E	4	C



# Growth assessment results;

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- Early height (cm) growth

	1990	1991	% gain	1992	% gain
<b>Washington</b>	113.9	166.8	31.7	214.3	28.4
<b>Oregon</b>	101.5	153.3	33.8	194.5	26.9
<b>QCI</b>	93.4	140.3	33.4	178.5	27.2
<b>Alaska</b>	71.0	111.8	36.5	141.2	26.4
<b>mean</b>	95.0	143.1	33.6	182.1	27.3
<b>sd</b>	18.1	23.5	2.0	30.9	0.9



# Felling trees for stem mensuration

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- Permission to fell selected trees
- Only felled from west and east edge rows in each plot
- 96 trees manually felled
- Trees felled into 4m wide racks
- Mensuration of stems & crowns
- Volumetric measurements



# DBH and Height results- 2023

<u>Provenance</u>	<u>Height</u> <u>(m)</u>	<u>DBH</u> <u>(cm)</u>
Washington	28.22	32.6
Oregon	25.82	28.82
QCI	27.34	27.88
Alaska	23.84	27.3
Mean	26.3	29.2
sd	1.9	2.4

- Heights ~62 % of trees >25 m
- ~12 % of trees > 30m
- Tallest tree was a Washington = 31.59 m
- Largest girth was a Washington = 46.2cm
- Alaska showed the highest mortality
- Mixed plots showed higher mortality

Comparison of plot edge and central rows DBH did not find and significant differences overall. Significant differences ( $P < 0.05$ ) were found between pure provenance plots.

# Future work

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- Statistical analysis and interpretation of growth results
- Assessment of other tree species in long term trials
- Collation and alignment of weather & growth records data for all sites
- Modelling of potential growth in different climate scenarios
- Identification of the most resilient tree provenances for different regions

# Acknowledgements

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