Title	**Demonstrate knowledge of botany for commercial forestry**		
Level	**4**	**Credits**	**4**

Purpose	People credited with this unit standard are able to: describe the physiology of plants; describe growth requirements of plants; explain the process of plant propagation; use the taxonomy system for the classification of plants; describe plant species important to New Zealand commercial forestry; and explain tree improvement techniques and describe propagation techniques used in commercial forestry.

Classification	Forestry > Forestry Knowledge

Available grade	Achieved

Guidance Information

References
Colley, M. *Forestry handbook / New Zealand Institute of Forestry Inc.* (4th ed). (2005). Christchurch: New Zealand Institute of Forestry Inc.
McLaren, J.P. *Radiata Pine Growers Manual.* (1993). FRI Bulletin 184. Rotorua, New Zealand: New Zealand Forest Research Institute.
Poole, A.L. and Adams, N.M. *Trees and Shrubs of New Zealand.* (1990). Wellington, NZ: DSIR Publishing.
Raven, P.H., Evert, R.F., Eichhorn, S.E. *Biology of Plants* (7th ed). (2005). New York: W.H. Freeman and Company.

Outcomes and performance criteria

Outcome 1

Describe the physiology of plants.

Performance criteria

1.1 The external parts of a plant are identified and their functions are described in accordance with the reference texts.

Range roots, stem, leaf, bud, node, internode, bark, crown shape and branching in trees.

1.2 Plant components are identified and their functions are described in accordance with the reference texts.

Range stem – xylem, phloem, secondary growth, heartwood, sapwood, reaction growth, cambium;
root – epidermis and root hairs, secondary growth, origin of lateral roots, different roots and types, mycorrhizae;
leaf – internal anatomy;
seed – seed coat, radicle, shoot apex, cotyledons, endosperm, embryo.

1.3 The differences between gymnosperms and angiosperms are described in accordance with the reference texts.

Range flower, seed, stem, leaf.

1.4 The physiological processes of green plants and when and where these processes occur are described in accordance with the reference texts.

Range photosynthesis, respiration, osmosis, transpiration, translocation, absorption.

1.5 The environmental requirements of plants and their impacts on physiological processes are described in accordance with the reference texts.

Range temperature, water, nutrition, light.

Outcome 2

Describe growth requirements of plants.

Performance criteria

2.1 The process of plant growth and the requirements needed for that growth are described in accordance with the reference texts.

2.2 The environmental and internal factors affecting plant and tree growth are described in accordance with the reference texts.

Range climate, altitude, competition, hormones, genetics.

2.3 The effects on the growth of plants of different soils, inadequate rooting, frost hollows, insufficient light, wind exposure, and drought are described in accordance with the reference texts.

Outcome 3

Explain the process of plant propagation.

Performance criteria

3.1 Inheritance through chromosomes and genes is explained in accordance with the reference texts.

3.2 The process of meiosis is explained in accordance with the reference texts.

3.3 The processes of meiosis and mitosis are compared in accordance with the reference texts.

3.4 The results of sexual and asexual reproduction in plants are compared in accordance with the reference texts.

3.5 The reason for using sexual and asexual reproduction in forestry is explained in accordance with the reference texts.

Range costs, benefits.

Outcome 4

Use the taxonomy system for the classification of plants.

Performance criteria

4.1 The framework underlying the systematic arrangement of plant families, the general relationship among plant families and major divisions within the plant kingdom important to forestry is described in accordance with the reference texts.

4.2 Twenty specimens are identified through the use of a key and morphology.

Range leaf form, leaf shape, leaf colour, root systems, inflorescence, seeds, capsules.

Outcome 5

Describe plant species important to New Zealand commercial forestry.

Performance criteria

5.1 The characteristics of commercially important forestry species are described in accordance with the reference texts.

Range Radiata pine, Douglas fir, eucalypts.

5.2 The reasons why different species are commercially important are described in accordance with the reference texts.

Range Radiata pine, Douglas fir, eucalypts.

5.3 Maps are used to locate where the major natural forest types occur in New Zealand.

5.4 The commercial characteristics of hardwoods and softwoods are compared.

Range fibre length, fibre width, wood density, end-product treatability.

5.5 Weed and grass species that have a significant impact on commercial forestry are identified and their impact explained.

Range gorse, broom, buddleia, bracken, pampas grass, pasture grass species.

Outcome 6

Explain tree improvement techniques in commercial forestry.

Performance criteria

6.1 Explanation identifies the desirable traits that are the objectives of tree breeding programmes.

6.2 Description compares and explains the results of the breeding programs of selected species in accordance with the reference texts.

Range Radiata pine, Douglas fir, cypresses, eucalypts.

6.3 The implications of clonal forestry are explained in accordance with the reference texts.

6.4 The relationship between genotypes, phenotypes, and the environment is explained in accordance with the reference texts.

6.5 The process of tree breeding is explained in accordance with the reference texts.

Range progeny trials, seed orchards (open and controlled pollinated).

6.6 Growth and Form (GF) ratings and their implications are explained in accordance with the reference texts.

6.7 Other special breeds of the Radiata pine breeding programme are described in accordance with the reference texts.

Range wood density, long inter-node, Dothistroma resistance.

Outcome 7

Describe propagation techniques used in commercial forestry.

Performance criteria

7.1 The conditions required to initiate germination of a seed are described in accordance with the reference texts.

7.2 The conditions required to enable a seed to retain its germinating power are described in accordance with the reference texts.

Range seed coat, water content, stored food material.

7.3 The process for carrying out various propagation techniques is described in accordance with the reference texts.

Range seed, cutting, grafting, tissue culture.

7.4 The concept of physiological ageing is described in accordance with the reference texts.

7.5 The results of different propagation techniques are compared in accordance with the reference texts.

Range seed, cutting, grafting, tissue culture.

7.6 The cost and timing of different propagation techniques is compared in accordance with the reference texts.

Range seed, cutting, grafting, tissue culture.

Planned review date	31 December 2028

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	28 January 1995	31 December 2017
Review	2	27 May 1998	31 December 2017
Review	3	27 May 2002	31 December 2017
Review	4	16 October 2009	31 December 2017
Revision	5	16 July 2010	31 December 2017
Review	6	10 December 2015	N/A
Rollover and Revision	7	28 May 2020	N/A
Rollover	8	26 April 2024	N/A

Consent and Moderation Requirements (CMR) reference	0173

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Comments on this unit standard

Please contact Muka Tangata - People, Food and Fibre Workforce Development Council qualifications@mukatangata.nz if you wish to suggest changes to the content of this unit standard.