22514VIC Diploma of Applied Horticultural Science

This course have been accredited under Part 4.4 of the Education and Training Reform Act 2006.

Accredited for the period: 01/05/2019 to 30/04/2024

THE EDUCATION STATE
VICTORIA State Government | Education and Training

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Table of Contents

Section A: Copyright and course classification information

1. Copyright owner of the course	Copyright of this course is held by the Department of Education and Training, Victoria **© State of Victoria (Department of Education and Training) 2019**
2. Address	Executive Director Engagement, Participation and Inclusion Higher Education and Skills Group Department of Education and Training (DET) GPO Box 4367 Melbourne Vic 3001 Organisational Contact: Manager Training Products Higher Education and Skills Group Telephone: (03) 7022 1619 Email: course.enquiry@edumail.vic.gov.au Day to day contact: Curriculum Maintenance Manager – Primary Industries Melbourne Polytechnic 77-91 St Georges Rd, Preston, VIC 3072 Email: annewiltshire@melbournepolytechnic.edu.au Telephone: (03) 9269 1063
3. Type of submission	The course is submitted for re-accreditation. It replaces 22260VIC Diploma of Applied Horticultural Science.
4. Copyright acknowledgement	Copyright of the following units of competency from nationally endorsed training packages is administered by the Commonwealth of Australia and can be accessed from Training.gov. (More information is available here) • AHC Agriculture, Horticulture and Conservation and Land Management Training Package - AHCBUS508 Prepare and monitor budgets and financial reports - AHCPCM401 Recommend plants and cultural practices - AHCPCM501 Diagnose plant health problems - AHCPCM504 Design and maintain a specialised landscape - AHCPGD501 Manage plant cultural practices - AHCWRK403 Supervise work routines and staff performance - AHCWRK503 Prepare reports - AHCWRK507 Implement professional practice • BSB Business Services Training Package - BSBPMG522 Undertake project work
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Copies of this publication can be downloaded free of charge from the DET website (More information is available here)</td></tr>
<tr><td>6. Course accrediting body</td><td colspan="2">Victorian Registration and Qualifications Authority</td></tr>
<tr><td rowspan="4">7. AVETMISS information</td><td colspan="2">AVETMISS classification codes</td></tr>
<tr><td>ANZSCO [Australian and New Zealand Standard Classification of Occupations]</td><td>362211 Gardener (general)</td></tr>
<tr><td>ASCED Code – 4 digit
(Field of Education)</td><td>0503 Horticulture and viticulture</td></tr>
<tr><td>National course code</td><td>22514VIC</td></tr>
<tr><td>8. Period of accreditation</td><td colspan="2">1 May 2019 to 30 April 2024</td></tr>
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Section B: Course Information

1. Nomenclature	***Standard 1 AQTF Standards for Accredited Courses***
1.1 Name of the qualification	22514VIC Diploma of Applied Horticultural Science
1.2 Nominal duration of the course	1310-1420 nominal hours
2. Vocational or educational outcomes	***Standard 1 AQTF Standards for Accredited Courses***
2.1 Purpose of the course	The Diploma of Applied Horticultural Science supports the development of skills and knowledge to work in a range of technical roles in the horticultural industry such as a supervisor or manager of public open spaces, Curator of Gardens, Lead Horticulturalist, Horticulture Technical Officer, Horticultural Research Assistant, Landscape Designer, Horticultural Consultant and Nursery Manager.
3. Development of the course	***Standards 1 and 2 AQTF Standards for Accredited Courses***
3.1 Industry /enterprise/ community needs	Victoria has a strong heritage in parks and gardens with significant historical, aesthetic and amenity values. The availability and variability of water supply and other climatic issues has a significant impact on these parks and gardens. The horticulture industry has identified the need to respond to the emerging challenges from a changing climate by creating, building and adapting horticultural practices. The introduction of new methods in sustainable work practices and plant selection will allow horticulturalists to remain competitive and plan ahead to ensure the long term viability of the highly significant horticultural assets for which Australia is renowned. To meet these emerging needs, high level technical skills underpinned by knowledge of plant sciences relating to botany, plant physiology, plant identification, soil science and plant health are required. Feedback from the Project Steering Committee & Skills and Knowledge Survey conducted in November 2018 ranked plant identification, plant physiology, soils and soil amelioration, plant selection, plant based environmental management and the sustainable use of water, energy and resources between very important and critical. 'Plantsmanship' is a word used in the industry to describe a skilled horticulturalist with knowledge of botany, plant taxonomy, plant diversity (including rare and unusual plants) and plant physiology. Industry members from the Diploma of Applied Horticultural Science Project Steering Committee reported that employers have difficulty filling horticultural positions with skilled staff who have higher levels of plant science knowledge. They do receive applicants who are experienced and skilled in horticultural practices, often through the apprenticeship route, but they do not have the scientific depth of knowledge required for solving more complex issues or a deeper understanding of plant taxonomy. They need staff who can deal with problems by knowing what questions to ask, what evidence to look for, when to bring in specialists, what solutions may be applied and to be able to work with others to implement plans are in demand.

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	They therefore require highly developed problem solving skills, high levels of communication and the full range of employability skills (see Appendix A page 15) to effectively operate in the job roles available. The Diploma of Applied Horticultural Science was first accredited in 2013 to fill skills and knowledge gaps in relation to the plant sciences identified at diploma level in the AHC Agriculture, Horticulture and Conservation and Land Management Training Package (botany, plant physiology, taxonomy, soil science). The AHC diploma qualifications in Horticulture did not effectively address the higher-level technical plant based competencies that are essential to the horticulture industry. Plant science develops a deep understanding of plant diversity and classification, plant form and function, plant responses to and interactions with the environment and the practical application of science to horticultural practices. This allows participants to analyse and plan approaches to technical problems or management requirements such as the implementation of a pruning program, tree or lawn maintenance program and in the preparation of comprehensive reports for a horticultural setting. A number of activities were undertaken in the reaccreditation process for this course to establish the current and projected need for the course and included: • preliminary mapping of the 22260VIC Diploma of Applied Horticultural Science against qualifications against current AHC diploma qualifications • consultation with the sole provider of the course • review of the currency of imported endorsed training Package units • review of enrolment data • review of a survey of stakeholders to identify skills and knowledge outcomes Since its first accreditation the Diploma of Applied Horticultural Science in 2013 has had consistent enrolment numbers (as did the earlier Diploma of Ornamental Horticulture 2009 – 2013). Currently one provider offers the Diploma and enrolments over the past three years have grown, demonstrating a need and support for the qualification. • 36 (2015) • 47 (2016) • 68 (2017) The reaccreditation was guided by a Project Steering Committee who also provided advice on, and validation of a skills knowledge profile. The PSC consisted of the following members: Michael Warner (Chair) Warners Nurseries Kirsten Raynor, University of Melbourne Debra Nette, Melbourne Polytechnic

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	David Reid, Nursery and Garden Industry Victoria John Fordham, John Fordham Horticultural Services In Attendance: Anne Wiltshire, Primary Industries Curriculum Maintenance Manager, Course Developer Belinda Watson-Noblet, PICMM Project Officer The 22514VIC Diploma of Applied Horticultural Science does not duplicate by title or coverage the outcomes of an endorsed training package qualification or skill set.
3.2 Review for re-accreditation	*Standards 1 and 2 for Accredited Courses* As per the Standards for Accredited of courses, a mid-cycle review was conducted in 2017. Feedback showed a high level of satisfaction with the current structure. Further to this a skills and knowledge profile was developed for the reaccreditation in order to review and validate the core skills required for employment in the industry. The survey was distributed broadly to through horticultural industry, training and other stakeholder groups. The respondents were from a range of industry groups including: • Local government • Historic Gardens • Botanic Gardens • Nursery • Other (horticultural consultants, community group members and business owner) The survey findings gave the Project Steering Committee direction in determining which competencies should be included in the core. Key areas of skills and knowledge embedded in the Diploma of Applied Horticultural Science and identified in the survey as important include: • plant identification and taxonomy • plant physiology (internal functioning of plants) • plant selection • soils and soil amelioration • biosecurity requirements in horticulture • principles and methods of pruning • sustainable horticultural work practices and the use of water and energy The 22514VIC Diploma of Applied Horticultural Science replaces and is equivalent to the 22260VIC Diploma of Applied Horticultural Science. The following table identifies the relationship between units from the previous course and current course.

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Units from superseded course		Units in current course	Relationship
VU21515	Apply the science of botany to horticultural practices	VU22734 Apply the science of botany to plant identification	Equivalent
VU21516	Apply plant physiology to horticultural practices	VU22735 Apply knowledge of plant physiology to horticultural practices	Equivalent
VU21517	Identify and select plants to enhance sustainability	VU22736 Select plants for use in sustainable horticulture	Equivalent
VU21518	Manage sustainable horticultural practices	VU22737 Apply sustainable horticultural practices	Equivalent
VU21519	Manage soils to enhance sustainability	VU22738 Manage soils and growing media to enhance sustainability	Equivalent
VU21520	Develop and implement a pruning program	VU22739 Develop and implement a pruning program	Equivalent
VU21521	Develop and implement a propagation program	VU22740 Develop and implement a propagation program	Equivalent
VU21522	Manage the care and maintenance of trees	VU22741 Manage the care and maintenance of trees	Equivalent
VU21523	Plan, establish and maintain lawns and lawn alternatives	VU22742 Plan, establish and maintain lawns and lawn alternatives	Equivalent
VU21524	Select, use and apply geographical information system technology (GIS)	VU22743 Select, use and apply geographical information system (GIS) technology	Equivalent
AHCBUS508A	Prepare and monitor budgets and financial reports	AHCBUS508 Prepare and monitor budgets and financial reports	Equivalent
		AHCPCM401 Recommend plants and cultural practices	New
AHCPCM501A	Diagnose plant health problems	AHCPCM501 Diagnose plant health problems	Equivalent
AHCPCM504A	Design specialised landscape	AHCPCM504 Design specialised landscape	Equivalent
AHCPGD501A	Manage plant cultural practices	AHCPGD501 Manage plant cultural practices	Equivalent
AHCWRK403A	Supervise work routines and staff performance	AHCWRK403 Supervise work routines and staff performance	Equivalent
AHCWRK503A	Prepare reports	AHCWRK503 Prepare reports	Equivalent
AHCWRK507A	Implement professional practice	AHCWRK507 Implement professional practice	Equivalent
BSBPMG522A	Undertake project work	BSBPMG522 Undertake project work	Equivalent

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Units from superseded course	Units in current course	Relationship
4. Course outcomes	***Standards 1, 2, 3 and 4 AQTF Standards for Accredited Courses***	
4.1 Qualification level	*Standards 1, 2 and 3 AQTF Standards for Accredited Courses* This course is consistent with the criteria and specifications of the AQF Level 5 as outlined in the Australian Qualification Framework Second Edition January 2013. The Diploma qualifies individuals who apply integrated technical and theoretical concepts in a broad range of contexts to undertake advanced skilled or paraprofessional work and as a pathway for further learning such as a Horticultural Curator who has the responsibility to maintain a specific plant collection, using knowledge of botany, taxonomy, physiology to make plant choices. **Knowledge** Graduates of a Diploma will have technical and theoretical knowledge, with depth in some areas within a field of work and learning in horticulture. **Skills** Graduates of a Diploma will have: • cognitive and communication skills to identify, analyse, synthesise and act on information from a range of sources such as identifying and surveying trees for signs of physiological limb decline, recommending and taking action to address the problem • cognitive, technical and communication skills to analyse, plan, design and evaluate approaches to unpredictable problems and/or management requirements such as with the development and implementation of a tree maintenance plan for particular species following a disease outbreak within a heritage garden • specialist technical and creative skills to express ideas and perspectives such as selecting plants for a garden landscape designed for minimal water use and low maintenance costs • communication skills to transfer knowledge and specialised skills to others and demonstrate understanding of knowledge such as developing and undertaking a sustainability audit for maintaining a garden **Application of knowledge and skills** Graduates of a Diploma will demonstrate the application of knowledge and skills: • with depth in some areas of specialisation, in known or changing contexts such as using technology to map, record, and store and data, then interpret the data to monitor changes in vegetation over time • to transfer and apply theoretical concepts and/or technical and/or creative skills in a range of situations by using botanical and taxonomic knowledge to recommend plants for difficult sites or limited resources • with personal responsibility and autonomy in performing complex technical operations with responsibility for own outputs in relation to broad parameters for quantity and quality such as improving the health of soil through investigation of soil conditions, planning and implementing a soil improvement strategy.	

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Units from superseded course	Units in current course	Relationship
	Volume of learning The volume of learning for the Diploma of Applied Horticultural Science is typically two years. It incorporates structured delivery training and unstructured learning activities. • Structured training activities such as applying knowledge of botany to the identification and selection of plants • Unstructured activities such as research activities into plants and horticultural practices, work experience and/or industry based learning.	
4.2 Employability skills	*Standard 4 AQTF Standards for Accredited Courses* Refer to Appendix A for the Employability Skills Summary.	
4.3 Recognition given to the course (if applicable)	*Standard 5 AQTF Standards for Accredited Courses* Not applicable.	
4.4 Licensing/ regulatory requirements (if applicable)	*Standard 5 AQTF Standards for Accredited Courses* At the time of accreditation no licensing or regulatory requirements apply.	

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5. Course rules *Standards 2, 6, 7 and 9 AQTF Standards for Accredited Courses*

5.1 Course structure

To be eligible for the award of 22514VIC Diploma of Applied Horticultural Science, learners must successfully complete a total of 15 units comprising:

- 10 core units
- 5 elective units

Elective units may be selected from the list below or from units first packaged at an AQF level 4 or 5 in any other accredited course or endorsed training package qualification. Electives selected must be consistent with the vocational outcomes of this qualification and should not duplicate the outcomes of core units.

Learners who do not successfully complete all the required units for the qualification will be issued with a Statement of Attainment for completed units.

Unit / Module Code	Field of Education code	Unit /module title	Pre-requisite	Nominal hours
Core units (10)				
VU22734	050301	Apply the science of botany to plant identification		60
VU22735	050301	Apply knowledge of plant physiology to horticultural practices		60
VU22736	050301	Select plants for use in sustainable horticultural practices		100
VU22737	050301	Apply sustainable horticultural practices		70
VU22738	050301	Manage soils and growing media to enhance sustainability		100
AHCPCM501	050301	Diagnose plant health problems		120
AHCPCM504	050901	Design and maintain a specialised landscape		150
AHCPGD501	050301	Manage plant cultural practices		200
AHCWRK503	100705	Prepare reports		60
AHCWRK507	080305	Implement professional practice		100
Sub-total				**1020**

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Elective units (select 5)				
VU22739	050301	Develop and implement a pruning program		60
VU22740	050301	Develop and implement a propagation program		60
VU22741	050301	Manage the care and maintenance of trees		60
VU22742	050301	Plan, establish and maintain lawns and lawn alternatives		60
VU22743	020399	Select, use and apply geographical information system (GIS) technology		60
AHCBUS508	080101	Prepare and monitor budgets and financial reports		140
AHCPCM401	050301	Recommend plants and cultural practices		80
AHCWRK403	080303	Supervise work routines and staff performance		50
BSBPMG522	080315	Undertake project work		60
		Nominal duration	**1310-1420**	

5.2 Entry requirements	*Standard 9 AQTF Standards for Accredited Courses* There are no entry requirements for the Diploma of Applied Horticultural Science. The following is a general guide to entry in relation to the language, literacy and numeracy skills of learners aligned to the Australian Core Skills Framework (ACSF), details of which can be accessed at Department of Education and Training. Learners are best equipped to achieve the course outcomes in the Diploma of Applied Horticultural Science if they have minimum language, literacy and numeracy skills that are equivalent to Level 3 of the ACSF. Learners with language, literacy and numeracy skills at lower levels than those suggested will require additional support to successfully undertake the qualification.
6. Assessment	***Standards 10 and 12 AQTF Standards for Accredited Courses***
6.1 Assessment strategy	*Reference: Standard 10 AQTF Standards for Accredited Courses* All assessment, including Recognition of Prior Learning (RPL), must be compliant with the requirements of: • Standard 1 of the AQTF: Essential Conditions and Standards for Initial/Continuing Registration and Guidelines 4.1 and 4.2 of the VRQA Guidelines for VET Providers, or • the Standards for Registered Training Organisations 2015 (SRTOs) or

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	• the relevant standards and Guidelines for RTOs at the time of assessment. Identify course assessment strategies which: • are consistent with the Assessment Conditions in the relevant training package/s where nationally endorsed units of competency are used • are consistent with assessment requirements in the relevant accredited course/s where units from the course/s are used • ensure that workplace and regulatory requirements, where relevant, are met • justify mandatory workplace assessment, or assessment through simulation if these are to be used and include advice on how they may be achieved • identify any special arrangements that may facilitate Recognition of Prior Learning. Assessment strategies for the course should: • be grounded in a relevant context and not be culturally biased • utilise a variety of different processes/sources, such as written, oral, observation, projects appropriate to assess knowledge and performance • comprise a clear statement of both the criteria and assessment process • use assessment tools to suit the needs of learners • gather sufficient evidence to judge achievement of progress towards determining competence • recognise achievement of elements/competencies regardless of where the enabling learning took place • foster a collaborative and co-operative relationship between the learner and assessor • be flexible in regard to the range and type of evidence provided by the learner • allow a reasonable period of time to complete a task and allow for preparation and re-drafting as appropriate to the task • provide opportunity for the learner to challenge assessment provisions and participate in reassessment • not unnecessarily restrict the progress of a learner through the course • be equitable and fair to all learners A variety of assessment methods and evidence gathering techniques may be used with the overriding consideration being that the combined assessment must stress

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	demonstrable performance by the student. Assessment tools must take into account the requirements of the unit in terms of skills, knowledge and performance. The Evidence Guide of each unit provides information specific to the outcomes of each unit. Assessment of units of competency from accredited courses and nationally endorsed training packages must comply with the assessment requirements detailed in the relevant Training Package or Accredited Course Documentation.
6.2 Assessor competencies	*Standard 12 AQTF Standards for Accredited Courses* Assessment must be undertaken by a person or persons in accordance with: • Standard 1.4 of the AQTF: Essential Conditions and Standards for Initial/Continuing Registration and Guidelines 3 of the VRQA Guidelines for VET Providers, or • the Standards for Registered Training Organisations 2015 (SRTOs), or • the relevant standards and Guidelines for RTOs at the time of assessment. Units of competency imported from training packages or accredited courses must reflect the requirements for assessors specified in that training package or accredited course.
7. Delivery	***Standards 10 and 12 AQTF Standards for Accredited Courses***
7.1 Delivery modes	*Standard 11 AQTF Standards for Accredited Courses* All units of competency in the courses may be delivered in a variety of modes - classroom delivery, workplace projects, practical work, self-paced learning and case studies. Delivery options, including grouping of learners and learning activities, should recognise the varying learning needs, educational backgrounds, preferred learning styles and constraints of the individual learner and the specific requirements of each unit. Some areas of content may be common to more than one unit and therefore integration may be appropriate. Delivery strategies should actively involve the learner and learning should be experiential, relevant and age appropriate. Providers should be flexible in the way the training is delivered to ensure they meet the needs of the client group.
7.2 Resources	*Standard 12 AQTF Standards for Accredited Courses* Training must be undertaken by a person or persons in accordance with:

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	• Standard 1.4 of the AQTF: Essential Conditions and Standards for Initial/Continuing Registration and Guideline 3 of the VRQA Guidelines for VET Providers, or • the Standards for Registered Training Organisations 2015 (SRTOs), or • the relevant standards and Guidelines for RTOs at the time of assessment Access is required to classrooms, laboratory (soil/plant), library, horticultural references and computers with a range of relevant computer software. Access is required to current industry materials, technology, equipment, machinery and facilities as listed in the resource requirements within each unit of competency.
8. Pathways and articulation	***Standard 8 AQTF Standards for Accredited Courses***
	There are no formal articulation arrangements in place at the time of accreditation. The course may enable individuals to enter further education with a horticulture focus. Examples of further training include: • AHC60216 Advanced Diploma of Horticulture • Associate Degree in Environmental Horticulture • Bachelor of Applied Science (Horticulture) Learners who complete units of competency from endorsed training/packages or accredited course will be eligible for credit into other qualifications that contain those units.
9. Ongoing monitoring and evaluation	***Standard 13 AQTF Standards for Accredited Courses***
	Ongoing monitoring and evaluation of the course is the responsibility of the Primary Industries Curriculum Maintenance Manager (PICMM) A formal review will take place once during the period of accreditation and will be informed by feedback from users of the curriculum and will consider at a minimum: • any changes required to meet emerging or developing needs • changes to any units of competency from nationally endorsed training packages or accredited curricula Any significant changes to the courses will be notified to the VRQA.

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Appendix A

22514VIC Diploma of Applied Horticultural Science

Employability Skill	This qualification includes the requirement to:
Communication	• listen to clients • articulate and clarify instructions and job requirements directly to clients and work colleagues • read and interpret workplace related documentation on chemicals, fertilisers, • present and customise written information and reports based on audience needs • interpret the need of internal/external customers • apply numeracy skills to develop job and time based costings and pricings • establish and use networks through local and international organisations • share information with colleagues • negotiate responsively with external clients
Team Work	• work as an individual and a team member in carrying out work tasks • work with diverse individuals and client groups • apply knowledge of own role as a part of a team • apply teamwork skills to a range of situations • assess and use staff capability against implementation and maintenance requirements
Problem Solving	• develop practical and creative solutions to plant selection for specific environments • show interdependence and initiative in identifying plant health problems • solve problems individually or in teams to remedy plant health problems • apply a range of strategies in the identification of plants • use numeracy skills to solve problems • test assumptions and take context into account when modifying growing conditions
Initiative and Enterprise	• adapt to new situations caused by climate change • develop creative contingencies in response to workplace challenges • identify opportunities that might not be obvious to others by

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	comparing observations with expected results • generate a range of options in response to workplace matters • translate ideas into actions by promoting sustainable practices • develop a strategic, creative long-term vision for sustainable horticultural practices
Planning and Organising	• collect, analyse and organise information on plant cultural requirements • use basic business systems for planning and organising • develop a professional practice plan • take initiative and make decisions within workplace role • participate in continuous improvement and planning processes • work within or establish clear project goals and deliverables • determine or apply required resources to enhance sustainable horticultural practices • allocate people and other resources to workplace requirements and maintenance tasks • manage time and priorities when allocating tasks and resources • adapt resource allocations to cope with contingencies
Self-management	• take responsibility at the appropriate level • take responsibility for quality of own work • evaluate and reflect on own work performance
Learning	• define own learning needs • carry out independent learning to improve capability by undertaking research
Technology	• use technology and related workplace equipment • use technology to collect, organise and analyse data

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Section C: Units of competency

Core units

VU22734 Apply the science of botany to plant identification

VU22735 Apply knowledge of plant physiology to horticultural practices

VU22736 Select plants for use in sustainable horticultural practices

VU22737 Apply sustainable horticultural practices

VU22738 Manage soils and growing media to enhance sustainability

AHCPCM501 Diagnose plant health problems

AHCPCM504 Design and maintain a specialised landscape

AHCPGD501 Manage plant cultural practices

AHCWRK503 Prepare reports

AHCWRK507 Implement professional practice

Elective units

VU22739 Develop and implement a pruning program

VU22740 Develop and implement a propagation program

VU22741 Manage the care and maintenance of trees

VU22742 Plan, establish and maintain lawns and lawn alternatives

VU22743 Select, use and apply geographical information system (GIS) technology

AHCBUS508 Prepare and monitor budgets and financial reports

AHCPCM401 Recommend plants and cultural practices

AHCWRK403 Supervise work routines and staff performance

BSBPMG522 Undertake project work

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Unit code	VU22734
Unit title	Apply the science of botany to plant identification
Unit Descriptor	This unit describes the performance outcomes, skills and knowledge required to apply the science of botany, including botanical terminology, plant morphology, plant taxonomy, identification techniques and nomenclature to the identification of plants. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability skills	This unit contains Employability Skills
Application of the Unit	This unit is applicable to persons working in all sectors of the horticulture industry.

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*
1 Research plant taxonomy	1.1 Research ***plant taxonomy*** to categorise plants into groups including ***plant kingdom divisions***, ***major plant families*** and genera
	1.2 Research and identify plant ***morphological features*** and other characteristics used in the taxonomic classification of plants
	1.3 Use botanical terminology to describe plant morphological features used in the classification of plants into taxonomic divisions
	1.4 Use morphological and other characteristics to classify a range of plants according to plant kingdom divisions
	1.5 Research and use the rules of ***plant nomenclature*** to name a range of plants
2 Use botany to identify plants	2.1 Research and identify ***plant keys*** and/or other references or resources used for the identification of plants
	2.2 Identify and describe detailed morphological features and other characteristics of plants required to use plant keys and other references or resources for the identification of plants to species level
	2.3 Identify a range of plants used in horticulture to species level, using plant keys and/or other references and resources where required

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REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required Skills:

- using appropriate authoritative references and resources for plant classification
- classifying plants according to accepted taxonomic divisions
- describing plant morphology using botanical terminology
- identifying plants using plant keys and/or references and resources
- applying rules of plant nomenclature to name plants

Required Knowledge:

- plant morphology
- plant taxonomy
- botanical terminology
- plant nomenclature according to the rules and recommendations of the International Code of Botanical Nomenclature (ICBN) and the International Code of Nomenclature for Cultivated Plants (ICNCP)

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

Plant taxonomy may include:	• the classification of plants into different categories, as cited in the International Code of Binomial Nomenclature and International Code of Nomenclature for Cultivated Plants and includes class, subclass, order, family, sub family, tribe, sub-tribe, genus, species, variety, form, cultivar and subspecies
Plant kingdom divisions may include:	• non-vascular plants including bryophytes • vascular plants including pterophytes, gymnosperms, angiosperms, monocotyledons, basal dicotyledons and eudicotyledons
Major plant families may include:	• Myrtaceae, Mimosaceae , Proteaceae, Rosaceae, Asteraceae, Orchidaceae, Poaceae, Fabaceae, Rutaceae, Liliaceae and Lamiaceae
Morphological features of plants may include:	• leaf characteristics including leaf surfaces, shapes and margins and their attachments and arrangements; stems and their characteristics • flower structures, shapes and inflorescences, types of presentation and arrangements • fruits and their structures from development to maturity • specialisations and modifications of leaves, stems, roots, flowers and fruits

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Plant nomenclature may include:	• the formal method of naming plant species according to the rules and recommendations of the ICBN and ICNCP
Plants keys may include:	• tools for the classification and identification of plants to species level utilising visible plant morphological characteristics

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Curriculum.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Assessment must confirm the ability to:

- identify the external structures of plants
- use botanical terminology to describe the morphological features of plants
- apply plant taxonomy to classify a range of plants according to plant kingdom divisions
- identify a range of plant species using plant keys
- apply binomial nomenclature when naming plants

Context of and specific resources for assessment

Assessment must ensure:

- access to a wide range of plants that grow in a horticultural setting, microscopes, computers, taxonomic keys and botanical references and publications

Methods of assessment

The knowledge required in this unit underpins a wide range of horticultural skills and knowledge applicable to other areas of horticulture.

The following assessment methods are suitable for this unit:

- assignment/s related to plant taxonomy
- practical demonstration to assess skills in using plant keys for plant identification
- oral and/or written questioning to assess understanding of botanical taxonomy
- portfolio of herbarium specimens

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Unit code	VU22735
Unit title	Apply knowledge of plant physiology to horticultural practices
Unit Descriptor	This unit describes the performance outcomes, skills and knowledge required to be able to examine plant physiology according to a wide range of horticultural practices. It includes the ability to research and evaluate information and to transfer and apply knowledge of plant physiology to a range of horticultural situations. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability Skills	This unit contains Employability Skills.
Application of the Unit	This unit is applicable to persons working in all sectors of the horticulture industry

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*
1 Research plant structures	1.1 Identify and categorise ***plant cell structures,*** the organisation of cells into ***primary tissues*** and ***plant structural features***
	1.2 Determine the functions of plant cells, primary tissues and plant structural features in relation to plant growth
	1.3 Explain the physiological processes of photosynthesis, cellular respiration, transpiration and translocation in plants, including their role in plant function
2 Investigate plant growth responses to horticultural practices	2.1 Analyse physiological plant responses to ***physical and environmental conditions,*** including the ***horticultural practices*** that may impact on plant functioning
	2.2 Examine the role of plant growth regulators on plant growth and function
	2.3 Evaluate information on ***plant growth responses*** for the occurrence or addition of ***plant growth regulators*** and the ***implications*** for application to horticultural practices
	2.4 Research and describe methods to manipulate the physical and environmental conditions to achieve desired plant growth responses in horticultural practices
3 Analyse plant	3.1 Identify the physiological processes of ***asexual*** and

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reproduction for horticultural practices	***sexual reproduction*** of plants
	3.2 Describe the methods of ***seed and propagule dispersal*** used by plants
	3.3 Research and evaluate plant reproduction information for a range of plants

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- researching and evaluating information
- identifying and explaining the functions of internal and external plant structures
- applying knowledge of plant responses to physical and environmental conditions to manipulate plants for desired horticultural outcomes

Required knowledge:

- internal and external plant structures
- plant function, including diffusion, osmosis, photosynthesis, respiration, transpiration and translocation
- physical and environmental conditions and horticultural practices that may impact on plant function
- the role of plant growth regulators in plant responses
- manipulation of physical and environmental conditions for desired plant growth outcomes
- the application of plant reproduction processes for use in horticultural practices

RANGE STATEMENT

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

Plant cell structures may include:	• plant cell components including cell wall, cell membrane, nucleus, vacuole, cytoplasm, mitochondrion, chloroplasts and other organelles
Primary tissues may include:	• xylem, phloem, cuticle, epidermis, cortex, vascular cambium, vascular rays, stomata, parenchyma, sieve tubes and meristem
Plant structural features may refer to:	• the different parts of plants including roots, stems, leaves, flowers and fruit
Physical and environmental conditions may include:	• light (quantity, quality and duration), availability of water, temperature range, frost, wind and air quality • soil conditions including availability of a range of mineral nutrients, compaction and drainage • presence of competing plants, diseases and pests • influence of building, walls and paving

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Horticultural practices may include:	• plant protection, the manipulation and management of growing environments, propagating and disbudding, growing of plants, tree management and maintenance, plant selection and general management and maintenance of parks and gardens • pruning techniques (e.g. crown reduction, thinning and root pruning) • creation of artificial microclimates and growing environments • use of soil ameliorants and mulches • fertilising and watering regimes • location of plants in relation to light, moisture, air pollutants and competition with other plants
Plant growth responses may include:	• plant tropic responses including phototropism, geotropism, hydrotropism and thigmotropism
Plant growth regulators may include:	• plant hormones including gibberellin, cytokinin, auxin, abscisic acid and ethylene gas
Implications may include:	• promoting seed germination • siting of trees to increase shade • manipulation of growing environments to increase day length • propagating plants from cuttings • disbudding to promote better blooms from the remaining buds • controlling the shape of the plant and fruit maturation
Asexual may include:	• natural vegetative reproduction • propagation of plants with the same genetic composition thorough horticultural practices of stem, leaf and root cuttings, division, grafting and layering
Sexual reproduction may include:	• the development of gametes, pollination, fertilisation and embryo development, seed and fruit development • transmission of genes from one generation to the next
Seed and propagule dispersal may include:	• the range of dispersal characteristics of seeds and other propagules including size, shape, structure, dispersed by wind, water or vector

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Curriculum.

Critical aspects for assessment and evidence required to demonstrate	Assessment must confirm the ability to: • explain the role internal and external plant structures in relation to the physiology of plants and application to a range of horticultural practices

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competency in this unit	• describe the effect of environmental factors and plant growth regulators on the physiology of plants • describe methods to manipulate plant growth for horticultural purposes • evaluate information on plant reproduction for use in a range of horticultural practices
Context of and specific resources for assessment	Assessment must ensure: Access to a wide range of plants that grow in a range of horticultural settings, microscopes, computers and botanical and biological references and publications
Methods of assessment	The knowledge required in this unit underpins a wide range of horticultural skills and knowledge applicable to other areas of horticulture. The following suggested assessment methods are suitable for this unit: • oral and/or written questioning to assess understanding of plant function • assignment on the impact of environmental conditions on plant function • report on the manipulation of physical and environmental factors to achieve optimum plant health • practical demonstration of using growth hormones in plant propagation

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Unit code	VU22736
Unit title	Select plants for use in sustainable horticultural practices
Unit Descriptor	This unit describes the performance outcomes, skills and knowledge required to select plants for use in sustainable horticultural practices. It requires knowledge of environmental conditions and their effect on plant distribution and how plants adapt to their natural environment. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability skills	This unit contains Employability Skills.
Application of the Unit	This unit is applicable to persons working in all sectors of the horticulture industry.

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*
1 Research plants and their environment	1.1 Analyse the relationship between ***environmental factors*** and the distribution of plant communities for a range of plants used in horticulture
	1.2 Describe the impact of environmental factors on ***plant growth*** and determination of the natural growing season
	1.3 Explain ***plant adaptations*** as responses to natural and manipulated environments in horticulture
	1.4 Analyse information on Australia's bioregions identifying climatic influences on ***Australian vegetation communities***
	1.5 Document information for reference in plant selection for a range of horticultural sites
2 Research plants used in horticulture	2.1 Source ***references*** for the identification of a range of plants
	2.2 Describe a range of plants to species level, using botanical names and terminology
	2.3 Collate ***documentation*** and other information including plant adaptations, plant form and environmental requirements of the identified plants

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	2.4	Source and examine information on plants that may present a ***threat to the environment***
3 Select plants for sustainable horticultural practices	3.1	Research and describe requirements and applications of ***sustainable horticultural practices***
	3.2	Identify and record the ***criteria for plant selection*** including environmental factors for application to a range of sustainable horticultural practices.
	3.3	Research and comply with ***legislation*** applicable to horticulture when selecting plants.
	3.4	Apply selection criteria to evaluate documented research information to select plants for sustainable horticultural practices.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required Skills:

- describing plants using botanical terminology
- using correct botanical names
- evaluating the physical and environmental requirements of a range of plants
- identifying and evaluating the factors for plant selection criteria for sustainable horticultural practices
- selecting plants to meet particular criteria for a range of horticultural situations

Required Knowledge:

- the influence of environmental factors on natural plant distribution, plant adaptations, plant form (morphology) and growth
- plant adaptations to the natural environment
- plant nomenclature according to the rules and recommendations of the International Code of Botanical Nomenclature (ICBN) and the International Code of Nomenclature for Cultivated Plants (ICNCP)
- botanical terminology
- environmental threats of plants used in horticulture
- sustainable horticultural practices

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

Environmental factors may include:	• climatic factors including temperature ranges, rainfall, wind, evaporation, frost, and extreme events • microclimates

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	• topography including aspect, altitude and slope • soil characteristics and fertility • fires, floods and droughts • biotic factors including competition and other interactions with other plants
Plant growth may be affected by:	• nutrient availability • water availability • growth cycle and growing season • light, quality, quantity and duration • humidity • temperature
Plant adaptations may include:	• structural modifications of leaves, stems and roots including sunken stomata, hairs, thorns, tendrils, lignotubers, epicormic buds, pneumatophores, tubers and rhizomes • physiological characteristics and responses to environmental conditions including leaf drop, CAM photosynthesis and tolerance of salty, dry or wet conditions • adapted life cycles and other strategies including plant or seed dormancy and symbiotic relationships
Australian vegetation communities may include:	• tropical and cool temperate rainforest • wet and dry sclerophyll forests and woodlands • open and closed forests and woodlands • shrublands • grasslands • mangroves
References may include:	• plant keys • herbarium collections • botanical and horticultural reference books • photographic and digital images • websites • published books and journals (e.g. Floras) • experts in the local area or industry sector
Documentation may include:	• reports, portfolios, plant culture sheets, catalogue or databases
Threat to the environment may come from:	• plants included in State and Commonwealth legislation relating to weeds • plants with the potential to out-compete other plants for moisture, nutrients, light and space • plants containing toxic compounds and allergens that affect other lifeforms including plants and animals

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	• plants that harbour diseases and vermin
Sustainable horticulture practices may include:	• protection of soil from wind and water erosion • providing habitat for interdependent plants and animals • carbon sequestration • selecting plants suited to the microclimate that require minimal water and maintenance
Criteria for plant selection may include:	• lifecycle • climatic and microclimatic factors • water and nutrient requirements • attributes of plants including plant form, habit, size, leaves, flowers and fruit, colour, texture and scent • use and function over time • specific theme including historic • commercial horticultural production
Legislation may include:	• Catchment and Land Protection Act which covers State Prohibited, Regionally Controlled, Regionally Prohibited, and Restricted Weeds • Local Government Acts under which councils enable local bylaws targeting specific weeds • Fisheries Act which covers the use of aquatic plants • Environment Protection and Biodiversity Conservation Act which covers the importation of live plants and actions that impact on threatened species • Biosecurity legislation • environmental overlays

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Curriculum.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessment must confirm the ability to: • determine the effects of climatic and environmental conditions on plant growth and distribution • explain the impacts of climatic conditions on plants and horticultural practices • explain how plants adapt to their natural environments • select a range of plants and their suitability for sustainable horticultural situations using plant selection criteria
Context of and specific resources for assessment	Assessment must ensure: • access to a real or simulated workplace environment where plant identification and selection would be required • classroom and computer access, horticultural references and

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publications

- a minimum of 500 plant identifications

Methods of assessment

The knowledge required in this unit underpins a wide range of horticultural skills and knowledge applicable to other areas of horticulture.

The following suggested assessment methods are suitable for this unit:

- assignment on plant adaptations to their environment
- oral and/or written questioning to assess understanding of the effects of climatic conditions on plant growth
- portfolio of plant cultural information
- report on plant selection recommendations for sustainable horticultural applications

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Unit code	VU22737
Unit title	Apply sustainable horticultural practices
Unit Descriptor	This unit describes the performance outcomes, skills and knowledge required to use sustainable practices in horticulture. It includes the ability to use the principles of sustainability to make recommendations to initiate and/or improve sustainable practices. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability skills	This unit contains Employability Skills.
Application of the Unit	This unit is applicable to persons working in all sectors of the horticulture industry.

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*
1 Investigate the principles of sustainability for use in horticulture	1.1 Examine the ***environmental and ecological impacts*** of horticultural practices
	1.2 Research and describe **sustainable horticultural practices**
	1.3 Evaluate the ***economic considerations*** of sustainable horticultural practices
	1.4 Analyse the influences and impacts of ***societal values*** on sustainable horticultural practices
	1.5 Identify the ***legislation, standards, policies and regulations*** that apply to horticultural practices
2 Apply the principles of sustainability to the use of energy resources and materials	2.1 Identify strategies to minimise the use of ***energy resources and materials*** for horticultural practices
	2.2 Locate energy resources originating from ***renewable or alternative sources*** and evaluate materials in relation to their ***sustainability***
	2.3 Minimise the use of energy through the introduction of ***efficient and passive systems*** to reduce energy requirements for horticultural practices
	2.4 Investigate the life-cycles and embodied energy of materials used for horticultural practices
	2.4 Make ***recommendations*** to improve the efficiency of energy resources and material use

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3	Apply the principles of sustainability to the use of water	3.1	Determine water requirements for horticultural practices
		3.2	Investigate alternative ***sustainable water sources***
		3.3	Develop ***strategies*** for efficient water use
		3.4	Develop planting strategies suitable for horticultural objectives in accordance with sustainable watering strategies
4	Undertake a sustainability audit	4.1	Review ***procedures*** used in undertaking a sustainability audit
		4.2	Develop a sustainability audit strategy for horticultural practices
		4.3	Conduct the sustainability audit for horticultural practices in accordance with industry guidelines
		4.4	Interpret audit findings and recommend ***amendments*** to horticultural practices to improve sustainability

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required Skills:

- examining and evaluating sustainable principles in relation to horticulture
- identifying renewable or alternative sources of energy
- selecting efficient and passive systems to minimise the use and waste of energy resources and materials
- researching materials used in horticulture and evaluate them in relation to sustainability
- undertaking a horticulture sustainability audit and analyse results
- recommending improvements to sustainable practices in horticulture

Required Knowledge:

- principles of sustainability and their application in horticulture
- the sustainable use of energy resources and materials
- efficient water systems and sustainable sources of water
- the process of evaluating materials in relation to their sustainability
- the life-cycle analysis characteristics of materials and their embodied energy use
- procedures used in undertaking a sustainability audit

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

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Environmental and ecological impacts may include:	• consumption of natural resources • impact of human actions on the environment • energy and water strategies • effective protection of the environment • the life-cycle performance of materials • atmospheric pollution • the generation and management of waste • enhancement of natural systems • consideration of microclimates and natural energy flows • management of environmental weeds • the provision of habitat and wildlife corridors and benefits to plants, animals and humans • impact on groundwater
Sustainable horticultural practices may include:	• plant selection, use of indigenous plants • efficient use of water and energy resources • reducing material requirements and waste • optimizing plant health to reduce use of fungicides and pesticides • recycling materials and composting waste • developing habitat diversity, enhancing biodiversity
Economic considerations may include:	• budget parameters • developing cost effective practices • durability of plants and materials • long-term maintenance requirements • on-going costs
Societal values	• values of society, cultural considerations • the human relationship with nature • human and animal rights • the involvement of local community and professionals from different sectors • considered use of natural resources and the responsibilities in meeting current needs without compromising future generations • business ethics • fair trading
Legislation, standards, policies and regulations may include:	• State Environment Protection Policies • Commonwealth, State and Local Government Acts

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	• Regulations and Codes of Practice • Environmental Management Systems • ISO 14000 Standards from International Organization for Standardisation • UN Local Agenda 21 - the Rio Declaration on Environment and Development
Energy resources and materials may include:	• energy resources including electricity, gas, water and fuel • materials such as soil, rocks, mulches, timber for construction, timber products, sand, gravel and pebbles, plants, paper, plastics and chemicals
Renewable or alternative sources may include:	• sourcing electricity from a company using solar, hydro and wind power • installing solar powered lighting and energy efficient light globes • using hybrid cars or those using alternative fuel
Sustainability may include:	• locally produced or availability on-site • minimal processing • remanufactured, reusable or recycled • non emission of toxic substances • biodegradable products • minimal impact on the environment from where they are sourced (e.g. timber from renewable plantations) • high life-cycle performance (the life-cycle analysis characteristics of a material including composition, toxicity, durability and potential for environmental impact, reuse or recycling) • low embodied energy use (the energy used to extract, manufacture, transport, apply and dispose of a material or product) • porous quality allowing for water penetration
Efficient and passive systems may include:	• low energy lighting • irrigation systems that minimise water use • orientation of landscape features for sun/shade • sustainable planting strategies, designing for low maintenance requirements • regular machinery maintenance to minimise emissions and discharges
Recommendations may include:	• Ecologically Sustainable Development (ESD) Building Principles • buying products that meet the Minimum Energy Performance Standards (MEPS)

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	• reusing/recycling paper • buying materials obtained in amounts that minimise packaging and waste • planting trees to maximise light and shade requirements • using ground covers or mulches to prevent soil erosion and water evaporation • installing water efficient fixtures and appliances • minimising the need for additional watering above given rainfall
Sustainable water sources may include:	• grey water systems • collecting rainwater and roof runoff • recycled water
Strategies may include:	• use of efficient watering systems • misting sprays and capillary matting irrigation in nurseries • use of organic matter and mulch to control evaporation • coring and scarifying turf to allow deeper water penetration • planting warm-season grasses • training staff in effective water management • application of wetting agents • use of soil moisture sensors • regular maintenance of irrigation systems • using plants with low water requirements • grouping plants with similar cultural requirements
Procedures may include:	• calculating ecological footprints • cost benefit analyses • Environmental Performance Evaluation (EPE) • evaluating the impact on society and the environment • analysing the life-cycle performance of materials and embodied energy use • evaluating the use of energy resources and materials • identifying actions taken to minimise the impact of activities on the environment • identifying mechanisms for reviewing and increasing the effectiveness of actions taken
Amendments may include:	• introduction of new/improved sustainable products and materials • reviewing the use of water and energy resources

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- amending working practices to improve sustainability
- updating policies and procedures and complying with new legislation
- networking with local community and other professionals in implementing collective sustainable practices

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Curriculum.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Assessment must confirm the ability to:

- identify and evaluate the principles of sustainability and their application in horticulture
- apply the principles of sustainability in accordance with sustainable water and energy use strategies
- apply strategies to identify and select sustainable materials
- undertake a sustainability audit in a horticultural enterprise
- interpret audit results and recommend strategies for improving sustainability

Context of and specific resources for assessment

Assessment must ensure:

- access to a real or simulated horticultural work environment, a computer lab and internet access, copies of legislation, standards and policies that apply to sustainability
- access to information on principles of sustainability, sources of renewable or alternative energy resources, materials used in horticulture, in particular renewable, reusable and recyclable materials and methods of undertaking sustainability audits

Methods of assessment

The knowledge required in this unit underpins a wide range of horticultural skills and knowledge applicable to other areas of horticulture.

The following suggested assessments methods are suitable for this unit:

- oral and/or written questioning to assess knowledge of legislation, standards, procedures and policies that apply to sustainable principles
- assignment on the analysis of resources and materials
- a project of a sustainability audit for a horticultural enterprise
- report recommending improvements in horticultural practices following a sustainability audit

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Unit code	VU22738
Unit title	Manage soils and growing media to enhance sustainability
Unit Descriptor	This unit describes the performance outcomes, skills and knowledge required to identify and assess soils and growing media characteristics. It requires knowledge of the impact of environmental conditions and horticultural practices on soil/media health. It includes the ability to identify, implement and review sustainable practices to promote healthy soil/soil less media. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability Skills	This unit contains Employability Skills.
Application of the Unit	This unit is applicable to persons working in all sectors of the horticulture industry.

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*
1 Research characteristics of Australian soils and impacts of land use practices	1.1 Identify the ***common characteristics*** of Australian soils and their limitations. 1.2 Analyse a site assessment to establish ***soil characteristics.*** 1.3 Examine ***soil biota*** and the ***effect of soil biota*** on soil fertility. 1.4 Evaluate current horticultural practices in terms of their possible contribution to ***land degradation and soil problems.***
2 Develop a plan to improve and maintain the health of soils and/or growing media	2.1 Undertake ***soil/media tests*** and analyse results. 2.2 Identify climatic information and risks that may impact on soil improvement activities 2.3 Determine required nutrient levels to improve fertility for effective use and uptake by plants. 2.4 Evaluate alternative strategies or products to improve soil/media fertility.

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		2.5 Develop a soil/media amendment strategy including ***soil/media ameliorating activities*** and ***soil/media ameliorant products*** to enhance sustainability of soil/media health.
		2.6 Determine soil conservation strategies to minimise soil erosion and integrate the most suitable methods of soil/media improvement operations with the proposed land use.
		2.7 Assess the ***environmental implications of chemical use***, consider and document alternative methods.
3	Implement plan for improvement and maintenance of healthy soil/media	3.1 Develop a work plan schedule for soil/media improvement taking into account ***seasonal, geographical and resource factors.***
		3.2 Modify schedule to meet all contingencies.
		3.3 Record soil/media management activities according to workplace practice.
4	Review plan implementation strategy	4.1 Assess the outcomes of the implementation of the work plan.
		4.2 Evaluate effectiveness of the soil/media improvement management plan.
		4.3 Determine necessary modifications and prepare recommendations for future strategies.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required Skills:

- researching information on soils and different growing media
- assessing soil type, texture and structure of a site
- identifying land degradation issues and soil problems
- interpreting soil/media sample test to determine priorities for improving soil/media health
- selecting alternatives including organic products and methods for improving soil/media health
- developing, implementing and evaluating a plan to achieve healthy soils/media
- monitoring soil/media health

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Required Knowledge:

- physical, chemical and biological properties of soils/media
- soil biota - types, role in cycling nutrients and improving soil structure
- basic chemistry concepts related to interpreting soil tests
- the role of soil biota in the fertility and health of soils
- factors affecting soil biota: moisture, temperature, aeration, nutrient supply, pH, and organic matter
- the natural cycling of nutrients: carbon, nitrogen, phosphorous and the role of soil biota in the cycles
- possibility of problems with the use of conventional chemical fertilisers including acidification contamination of soil and associated water contamination and harm to soil biota
- a range of methods to improve soil fertility, including products and use of machinery for aeration and mulching
- appropriate timing for fertiliser applications
- soil conservation strategies and sustainable techniques
- causes of land degradation and soil media problems
- data collection and record keeping

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

Common characteristics may include:	• low fertility levels • low organic matter • low cation exchange capacity • shallow depth of topsoil
Soil characteristics may include:	• soil physical properties including -texture, structure (slaking, dispersion), density, porosity and soil strength • topsoil depth • soil smell • presence of carbonates • soil compaction • depth of root growth, root health and colour • water holding capacity and water infiltration • living organism diversity • earthworm numbers- as a general indicator of soil health • degree of dispersability of soil • sodicity

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Soil biota refers to:	• diverse range of microorganisms in soil, including bacteria, fungi and soil fauna such as nematodes, protozoa and arthropods • beneficial and pathogenic organisms
The ***effect of soil biota*** includes:	• decomposing organic matter and cycle nutrients • bioturbation • enhanced soil structure, • control populations of soil organisms, including pests, and sustainable soil fertility • break down toxic substances
Land degradation and soil problems may include:	• dry-land and irrigation salinity • wind and water erosion • bare areas • poor plant growth • weeds • soil compaction • water-logging and poor water quality • nutrient deficiencies • pesticides, herbicides and other chemical contamination • acidification • excessive nutrients • mass movement of phosphates, nitrates • effect on groundwater levels and quality • fertiliser and nitrates run-off causing algal blooms • herbicide and pesticide effects on living biology of soil, human and animal populations • runoff
Soil/media tests may include:	• soil pH • Cation Exchange Capacity and the balance of cations • toxicity levels e.g. aluminium, sodium • carbon content/organic matter • approximate nutrient levels in soil/media • suggested optimum levels of nutrients • plant available water • drainage and rate of drainage • bulk density

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Alternative strategies may include:	• use of green manure crops; increasing calcium levels; adding organic matter and aeration of soils to improve soil biota activity and utilising nutrients that are locked up • organic matter may include mulched sites/plant tissue, organic nutrients, crop residues, worm castings, composted paper and cardboard, grass clippings, sawdust and seaweed • use of parasitic controls and strategic use of herbicides to minimise frequency of use and concentration • use of biological controls
Soil/media ameliorating activities may include:	• alleviating soil compaction by using aerator and balancing the calcium/magnesium ratio • reducing source or cause of compaction • cultivation • modifications to soil drainage or water holding capacity • practices that increase levels of organic matter
Soil/media ameliorant products may include:	• pH modifying agents such as lime • structure modifying agents such as gypsum and artificial structure additives • organic matter • animal organic products • flocculating agents • texture modifications • wetting and water retention agents
Environmental implications of chemical use may include:	• mass movement of phosphates, nitrates • effect on groundwater levels and quality • fertiliser and nitrates run-off causing algal blooms • herbicide and pesticide effects on living biology of soil, human and animal populations
Seasonal, geographical and resource factors may include:	• weather events including forecast of heavy rain events when application of fertiliser is scheduled, flood and frost • lack of rain in growing season • long term drought or wet conditions • summer rainfall where weed germination may occur • availability of staff and/or contractors

EVIDENCE GUIDE

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The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Curriculum.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Assessment must confirm the ability to:

- use soil science to assess current soil status and identify essential elements of healthy soils/growing media
- develop a plan to improve and maintain a healthy soil/media
- implement plan to improve and sustain a healthy soil/media
- review the plan in terms of the intended outcomes of achieving healthy soils/media and make modifications

Context of and specific resources for assessment

Assessment must ensure:

- access to a range of soils and growing media
- soil/media test laboratory results
- soil biota laboratory results
- records of soil/media tests

Methods of assessment

The knowledge required in this unit underpins a wide range of horticultural skills and knowledge applicable to other areas of horticulture.

The following assessment methods are suitable for this unit:

- practical exercises, for example assessing the current status of the soil and/ media health and structure
- written and/or oral questioning to assess knowledge and understanding of soil and media physical properties, soil chemistry, analysing soil test results and plant nutrition through soil management
- development of a product or plan to improve the health and fertility of soil/media
- analysis of case studies which may be from different geographical areas and rainfall zones

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Unit code	VU22739
Unit title	Develop and implement a pruning program
Unit Descriptor	This unit of competency describes the performance outcomes, skills and knowledge required for the development and implementation of a pruning program, evaluating the results and recommending improvements. It requires the knowledge of basic plant physiology and morphology, principles and techniques of specialist pruning and pruning tools and equipment. It includes the application of particular pruning techniques, monitoring of the pruning program and undertaking risk management strategies, when required. Pruning activities should be undertaken at a height limit of no more than two metres. This unit does not cover aerial pruning from ladders, elevated work platforms or from climbing ropes and rigging in a tree. Specialists should be consulted when required. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability Skills	This unit contains Employability Skills
Application of the Unit	This unit is applicable to persons working in all sectors of the horticulture industry.

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*
1 Develop a pruning program	1.1 Identify target species and determine ***pruning requirements*** according to the ***plant characteristics*** and desired outcomes. 1.2 Establish the appropriate pruning strategies for ***specialist plants***, consulting ***references***, when required. 1.3 Identify ***OHS/WHS hazards,*** assess risks and establish suitable controls, according to workplace policies and procedures. 1.4 Select the ***pruning tools and equipment*** according to the requirements of the program. 1.5 Identify the ***limits of own expertise*** and utilise the ***providers of specialised services*** as required. 1.6 Determine requirements for access for staff and equipment

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		1.7	Document the pruning program, including costs and scheduled priorities to meet timelines and accommodate staffing resources
2	Implement and monitor the pruning program	2.1	Select and use tools, equipment and machinery according to OHS/WHS and hygiene and biosecurity protocol requirements and manufacturer's specifications
		2.2	Apply ***pruning techniques*** according to the pruning program and within limits of own expertise.
		2.3	Monitor and document pruning techniques as specified in the program, and undertake ***risk management strategies*** if required.
		2.4	Clear and clean site, dispose of waste material, clean and store tools, equipment and machinery following hygiene and biosecurity protocols.
3	Evaluate the pruning program	3.1	Inspect plants to ensure pruning requirements have been met.
		3.2	Assess the results of pruning against the planned program.
		3.3	Recommend and record improvements to the effectiveness and efficiency of the program.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required Skills:

- identifying a comprehensive range of plant species and their pruning requirements
- recognising the need for pruning, including formative, remedial or corrective pruning
- using, maintaining and storing tools required for pruning following hygiene protocols
- using appropriate pruning techniques
- communicating with work personnel
- recognising when the services of specialist technical expertise is required

Required Knowledge:

- basic plant physiology and morphology
- the effect of pruning on a range of plants
- OHS/WHS hazards and risk assessment associated with pruning
- principles and methods of pruning to achieve given objectives
- hygiene and biosecurity protocols before, during and after pruning
- specialist pruning tools, equipment and machinery
- plant annual growth cycles and the correct timing for pruning

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RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

Pruning requirements may include:	• Size, light, shape, aesthetics, competition, density, structures, manipulation of form, modification of flowering or fruiting behaviour and removal of diseased, broken or damaged material
Plant characteristics may include:	• Growth patterns, type of foliage, timing of flowering and fruiting, responses to pruning, habit and form
Specialist plants may include:	• Fruit trees and vines, ornamental flowering trees and shrubs, heritage listed plants, standards, topiaries, arbors, roses, plants grown for fruit production, and other plants that have special pruning requirements due to flowering, growth or other characteristics.
References consulted may include:	• *Australian Standards for Pruning of Amenity Trees*, *Australian Standards for Tree Stock for Landscape Use*, significant tree registers and/or legislation, specific tree preservation orders, council by-laws, specialist texts, horticultural fact sheets and grower notes, Internet sites and consultants
OHS/WHS hazards may include:	• Solar radiation, dust, noise, falling limbs, sharp/blunt pruning tools and equipment, toxic and injurious plant material, muscle strain injuries and uneven ground
Pruning tools and equipment may include:	• Secateurs, pruners, handsaws, hedge trimmers, steps, chippers and mulchers
Limits of own expertise may include***:***	• The point at which the scope and/or complexity of a given job necessitates the outsourcing of particular components of a pruning program to a practitioner who is more expert in that field
Providers of specialised services may include:	• Arborists or heritage tree experts
Pruning techniques may include:	• Dead wooding, hedging, branch and root pruning, canopy regeneration, promotion of flower and fruit production, formative pruning, biomass reduction, epicormic and green shoot removal
Risk management strategies may include:	• Unforeseen changes, staffing availability, OHS/WHS hazards, changes to priorities, outbreak of plant diseases, damage caused by extraneous circumstances

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Curriculum.

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Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessment must confirm the ability to: • determine the need for pruning and select the appropriate pruning technique according to the plant characteristics • identify OHS/WHS hazards and implement suitable control methods • identify hygiene and biosecurity protocols • undertake a range of different pruning techniques to achieve the given objectives • use a range of pruning tools, equipment and machinery • identify limits of own expertise in pruning and source and apply technical/specialist services when required • evaluate results of pruning and make recommendations for improvements to the program
Context of and specific resources for assessment	Assessment must ensure: • access to a real or simulated workplace environment where pruning would be undertaken, access to a range of plants, access to pruning tools and equipment, computers and industry references and publications
Methods of assessment	The following assessment methods are suitable for this unit: • oral and/or written questioning to determine understanding of specialised pruning techniques • assignment in developing a documented pruning program • practical demonstration of pruning techniques • work diary detailing pruning activities

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Unit code	VU22740
Unit title	Develop and implement a propagation program
Unit Descriptor	This unit describes the performance outcomes, skills and knowledge required for the processes of plant propagation. It requires the application of a broad range of knowledge including ethics and legislation pertaining to plant material collection; propagation techniques and treatments, growing media, containers and resources required for propagation and hygiene protocols. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability Skills	This unit contains Employability Skills
Application of the Unit	This unit is applicable to persons working in all sectors of the horticulture industry.

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*
1 Plan a propagation program	1.1 Identify the ***requirements*** for the program, including Plant Breeders Rights and relevant ***legislation and regulations***.
	1.2 Select the ***propagation techniques*** and timing appropriate for the plant species.
	1.3 Develop strategies for modifying the growing environment according to ***environmental parameters.***
	1.4 Plan for and assess suitable controls for ***OHS/WHS hazards***.
	1.5 Identify the ***propagation media and container characteristics*** according to the propagation technique and needs of the plant species.
	1.6 Coordinate ***resources*** required for the implementation of the program.
2 Implement propagation program	2.1 Comply with relevant legislation and regulations with regard to ***biosecurity regulations***.
	2.2 Observe ***collecting ethics*** when selecting specimens and collecting plant material.
	2.3 Collect propagation material from appropriate mother stock resources and apply suitable ***conditioning and storage requirements***.
	2.4 Propagate plant material, using correct

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			preparation treatments, according to the propagation program.
		2.5	Complete propagation activities ensuring work site is cleaned and ***waste*** is collected and disposed of, or recycled.
		2.6	Apply ***after care treatments*** to suit media conditions, plant requirements and propagation techniques employed.
		2.7	Complete documentation of propagation activities and record any ***cultural intervention procedures*** required during growing on period.
3	Review the propagation program	3.1	Assess propagated plants for health, quality and viability according to marketing requirements and quality specifications and site requirements.
		3.2	Review propagation program, recommend and document strategies for potential improvements.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required Skills:

- researching information for propagation plans from a range of sources
- identifying and assessing OHS/WHS hazards and implement controls
- identifying and selecting healthy parent plants, mother stock and other propagation materials, media, equipment and materials according to hygiene standards
- collecting and storing plant material
- propagating plants using a variety of techniques
- performing after care requirements for a range of plants
- modifying a growing environment in response to needs of propagated material
- analysing basic data to review performance and success of propagation program

Required Knowledge:

- legislation and regulations relating to plant propagation
- quality specifications for parent plants, mother stock and other propagation material
- hygiene and biosecurity practices required for propagation operations
- a range of propagation techniques
- appropriate timing and scheduling for propagation for a range of plants
- types of propagative material suitable for different times of the year and environments
- preferred propagation media and containers or methods for a range of plant species
- common problems associated with the propagation and growing on of plants in a controlled environment and preventative/corrective actions that may apply

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- aftercare requirements for a range of propagated plants

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

Requirements may include:	• purpose or intended use of the propagated plants • budget limitations • quality and continuous improvement processes and standards • best practice • permits or licences for collection of material • environmental management, waste disposal, recycling and re-use guidelines • maintenance activities for propagation after-care • marketing quality and quantity specifications and timelines for the program/scheduling
Legislation and regulations may include:	• Plant Breeders Rights, Biosecurity Acts, Gene Technology Act, OHS/WHS, plant collection permits and environmental issues
Propagation techniques may include:	• seed • vegetative techniques including stem, leaf or root cuttings, ground and aerial layering, division or splitting, budding or grafting • spores • tissue culture
Environmental parameters may include:	• temperature, soil or growing media moisture levels, light, humidity • wind and frost in field conditions
OHS/WHS hazards may include:	• air and soil-borne microorganisms • chemicals and hazardous substances • sharp hand tools and equipment • manual handling • plant allergies • solar radiation • dust • noise • machinery and machinery parts • slippery and uneven surfaces

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Propagation media and container characteristics may include:	• propagation media characteristics will be specific to the species and method of propagation, and may need to be determined using recognised testing procedures for pH, drainage, aeration, salinity, nitrate levels and water repellence • media types may include: sand, potting mix, gravel, scoria, rock wool, gro-wool, pine bark, perlite, vermiculite, a variety of containers and conditioners/additives • hygienic and sterilised according to workplace guidelines
Resources may include:	• tools, equipment, machinery and other materials • staff • budget
Biosecurity regulations may include:	• Biosecurity Regulations • Relevant and current import and export permits from the Australian Government Department of Agriculture and Water Resources • restrictions under the *State Biosecurity Act* • biosecurity regulations set by Agriculture Victoria or other Australian State or Territory Government Agencies
Collecting ethics that must be observed:	• no collecting of prohibited plants or from prohibited locations • obtaining permits from land owner and/or Federal and State government departments and agencies if required • collection of minimal material from healthy vigorous plants • disruption to the site and surrounding vegetation is minimised and justification in collecting material from less common or rare plant species
Conditioning and storage requirements may include:	• maintaining required moisture content and temperature range • bundling and labelling and storing and monitoring in a bio-secure area
Preparation treatments may include:	• hormone application • fungicides • hot water treatment • disbudding • hydration/dehydration • stratification • scarification • division

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- sterilisation
- smoke treatment

Waste may include:

- plant pots
- discarded propagation material
- growing media waste
- disinfecting/sterilising agents

After care treatments may include:

- fungicides and pesticides
- fertilisers
- water
- nutrients
- heat regulation
- ameliorants
- beneficial organisms

Cultural intervention procedures may include:

- fertilising
- misting
- tip/root pruning
- light manipulation
- application of growth hormones
- temperature regulation
- increased/decreased humidity
- ventilation
- tying, staking or taping
- removing damaged, diseased or dead plant material
- irrigation
- beneficial organisms
- integrated pest management

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Curriculum.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Assessment must confirm the ability to:

- comply with guidelines and legislative requirements, including OHS/WHS, Plant Breeders Rights and biosecurity, environmental and organisational guidelines relevant to propagation activities
- undertake planning procedures for a propagation program
- coordinate appropriate resources
- implement propagation activities in accordance with

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	planned program • assess propagated plants against marketing requirements, quality specifications and site requirements • review program and make recommendations
Context of and specific resources for assessment	Assessment must ensure: • access to a real or simulated work place environment suitable for plant propagation, plant material suitable for propagation, materials, tools and equipment relevant to plant propagation, access to computers and the internet, copies of legislation, codes of practice and standards and policies that apply to plant propagation
Methods of assessment	The following assessment methods are suitable for this unit: • oral and/or written questioning to assess knowledge of legislation, standards and procedures that apply to the propagation of plants • an assignment on a propagation program • report of the recommendations for improving the propagation program • practical demonstration of plant propagation techniques

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Unit code	VU22741
Unit title	Manage the care and maintenance of trees
Unit Descriptor	This unit describes the performance outcomes, skills and knowledge required for the management of tree care and maintenance. It requires the identification of a range of tree pests, disease and nutrient deficiencies and other environmental impacts affecting soil condition and general tree health. It includes the ability to recommend treatments and identify requirements in general tree maintenance and management. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability Skills	This unit contains Employability Skills.
Application of the Unit	This unit is applicable to persons working in all sectors of the horticulture industry.

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*
1 Examine trees to determine condition	1.1 Identify and describe a range of tree species
	1.2 Identify ***key symptoms and signs that indicate poor health and vigour*** in trees.
	1.3 Identify the ***signs and symptoms caused by insects and other pests***.
	1.4 Investigate ***environmental factors*** that may impact on tree health.
	1.5 Assess ***cultural practices*** that may have an effect on tree health.
	1.6 Survey trees to determine existing or potential problems and document recommendations for appropriate actions.
	1.7 Determine ***preventative approaches for tree protection*** of existing trees and future plantings.
2 Conduct soil tests	2.1 Identify the ***key symptoms of nutritional deficiency*** in trees.
	2.2 Identify ***factors*** that may impact on soil condition and determine the relationship between soil condition and the nutritional status of trees.
	2.3 Undertake relevant soil tests to assess tree soil growing

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		conditions
		2.4 Record results and plan soil amendment strategies, if required.
3	Develop tree maintenance plan	3.1 Research the ***legal aspects and restrictions*** that may impact on tree management.
		3.2 Identify ***OHS/WHS hazards and environmental impacts*** of tree management and plan control measures.
		3.3 Establish ***maintenance scope and standards*** for tree management.
		3.4 Source and cost ***resources, tools, equipment and machinery*** required for tree management and confirm availability with suppliers, contractors and appropriate personnel.
		3.5 Determine ***preventative approaches*** to tree management and care and incorporate into the management plan.
		3.6 Document tree management plan, including useful landscape life expectancy and ***risk management strategies***.
4	Source specialist technical services	4.1 Identify ***limits of own expertise*** in the management of trees and identify and specify actions and/or programs to be undertaken by ***providers of technical services and specialised expertise***.
		4.2 Utilise the services of technical and specialised experts, as required.
		4.3 Prioritise and monitor work activities and make adjustments to the management plan, as required.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required Skills:

- identifying a range of tree species
- recognising a range of common diseases, pests and nutrient deficiencies in trees
- developing appropriate soil amendments strategies in response to soil test results
- researching and documenting information for a tree management program
- recognising the limits of own expertise and when the services of specialist/technical services are required
- communicating with the staff, managers, suppliers, contractors and consultants

Required Knowledge:

- a comprehensive range of tree species

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- common diseases, pests and nutrient deficiencies in trees
- key symptoms that indicate health and vigour problems in trees
- legislation and regulations relevant to tree management
- OHS/WHS hazards and environmental impacts in tree management
- Australian Standards for Pruning of Amenity Trees
- the principles of Compartmentalisation of Disease in Trees (CODIT)
- principles and methods of pruning to meet given objectives
- maintenance requirements for tree management
- principles of Integrated Pest Management
- Australian Standard, Protection of Trees on Development Sites

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

Key symptoms and signs that indicate poor health and vigour in trees may include:	• leaf spot, blotch, blight, canker, gummosis or chlorosis • presence of fungi • leaf wilt and disfigurement • defoliation • lack of growth • physiological limb decline or limb loss • leaf and vein discolouration • epicormic growth • development of a branch collar
Signs and symptoms caused by insects and other pests may include:	• leaf spots • branch dieback • stem and leaf galls • cankers and swellings • webbing • presence of frass • chewed or skeletonised leaves and leaf curling • puckering or rolling
Environmental factors may include:	• shading or overshadowing • lightning strike • fire • pollution • inadequate rainfall • runoff • salinity

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	• poor drainage, soil compaction and/or erosion • soil oxygen levels • soil pathogens • climatic conditions unfavourable to the species • niche environmental factors
Cultural practices may include:	• spraying chemicals • using mowers and brush cutters • pruning and installation of irrigation systems
Preventative approaches for tree protection may include:	• restricted or prohibited access to heavy machinery • excessive foot traffic • maintenance of grade level • clear guidelines for staff and contractors working within root zones • effective watering regime • formative pruning • careful planning for tree and site compatibility • mulching • regular inspections of trees • identification of Structural Root Zones and Tree Protection Zones • adoption of Australian Standards for protection of trees on development sites
Key symptoms of nutritional deficiency may include:	• tip burn • chlorosis and necrosis • leaf and vein discolouration • wilt, stunted or slow growth • distorted growth of leaves, flowers and fruit
Factors that might affect soil condition may include:	• presence or lack of soil organisms • temperature • pH levels • moisture content • fertility • salinity • compaction
Legal aspects and restrictions may include:	• OHS/WHS Acts • Regulations and Codes of Practice • *Environmental Protection Act and Environmental Protection Act Amendment*

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	• local council regulations • *Australian Standards for Pruning of Amenity Trees* • *Australian Standards for Protection of Trees on Development Sites* • heritage overlays • specifications on the Victorian Heritage Register
OHS/WHS hazards and environmental impacts may include:	• machinery and equipment operation • working outdoors and/or working in a public space • noise and dust • manual handling • chemical use and off target damage from chemical use • falling limbs • damage to soil structure and soil loss • changes to microclimate following tree removal
Maintenance scope and standards may include:	• pruning • monitoring tree health and vigour • root zone protection • treatment of pests and diseases • fertilising and other soil treatments • removal or replacement of heritage trees • aesthetic and amenity value of the tree • trees already identified as hazardous or problematic • useful landscape life expectancy • maintenance required following storm damage • trees in high traffic areas • trees which could be a risk to public safety • the period covered by the maintenance plan • frequency of tasks are to be undertaken
Resources, tools, equipment and machinery may include:	• resources such as soil testing consumables, weed mats, mulch, stakes, tree guards, fencing materials, soil ameliorants, fertilisers, weed, pest and disease control materials, irrigation and drainage system components, labour, contractors, suppliers and consultants including arborists • tools and equipment such as saws, secateurs, pruners, PPE • machinery such as chippers and mulchers, digging and aerating devices
Preventative approaches	• integrated pest management

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may include:	• tree and site compatibility • competition control • addition of soil ameliorants • informed plant selection • fertilising and watering regimes • root zone protection • correct planting techniques • formative pruning
Risk management strategies mean:	• allowing for changes to the maintenance plan arising from issues that may include staffing availability, OHS/WHS hazards, changes to priorities, the outbreak of plant diseases and environmental damage (e.g. wind/storm damage) or changing climate
Limits of own expertise means:	• limits of own expertise is the point at which the scope and/or complexity of a given job necessitates the outsourcing or particular aspects of tree management to a practitioner more expert in that area
Providers of technical services and specialised expertise may include:	• qualified arborists • foresters • plant health specialists

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Curriculum.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessment must confirm the ability to: • identify a range of tree species • recognise common diseases, pests and nutrient deficiencies in trees and make recommendations for their treatment • undertake tree management within the required legislation and restrictions • identify requirements for tree management including maintenance scope and standards • identify limits of own expertise in tree management and source and apply technical/specialist services when required • undertake risk management strategies when implementing the tree management plan

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Context of and specific resources for assessment	Assessment must ensure: • access to a real or simulated workplace environment, access to trees, tools and equipment, relevant legislation, computers and industry references and publications
Methods of assessment	The following suggested assessment methods are suitable for this unit: • oral and/or written questioning to determine understanding of the relationship between soil condition and nutrient deficiencies and the effect of other soil factors on tree health. • practical exercises in identifying priorities in planning tree maintenance and identifying symptoms of tree health problems • assignment on recommendations for improving tree health • practical demonstration identifying pest, disease and nutrient deficiency problems • project on the development of a tree maintenance plan

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Unit code	VU22742
Unit title	Plan, establish and maintain lawns and lawn alternatives
Unit Descriptor	This unit describes the performance outcomes, skills and knowledge required for planning, establishing and maintaining lawns or lawn alternatives in public recreational open space, and/or domestic situations. It requires knowledge of growth habits and cultural requirements of plants species and cultivars under a range of soil and environmental conditions to encourage the use of alternative plants that require less maintenance, consumption of water and other resources. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability Skills	This unit contains Employability Skills
Application of the Unit	This unit is applicable to persons working in all sectors of the horticulture industry.

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*
1 Plan the establishment of lawn or lawn alternatives	1.1 Confirm client ***preferences and requirements*** for proposed site. 1.2 Assess site for ***existing conditions*** and perform necessary ***soil tests.*** 1.3 Research and select ***plant species/cultivars*** and ***planting methods*** to suit site and client requirements. 1.4 Identify and comply with relevant ***legislation*** that may apply impact on the establishment of plants on the site. 1.5 Identify ***environmental implications*** and, if necessary, report them to relevant personnel. 1.6 Identify the ***OHS/WHS hazards*** associated with plant establishment works and assess and control risks. 1.7 Develop and document the ***plan*** for the pre and post establishment and ongoing maintenance of the area and **confirm with client**
2 Establish lawn or lawn alternatives	2.1 Organise ***resources*** required for the plant establishment. 2.2 Undertake ***pre-establishment procedures*** according to the plan 2.3 Establish plants using planting or installation method consistent with the species requirements.

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		2.4 Implement ***post-establishment procedures*** according to the plan.
		2.5 Monitor the newly established planted area**,** identify any problems and implement required changes to the plan.
3	Maintain and monitor lawn or lawn alternatives	3.1 Identify the maintenance requirements covering a ***range of conditions and purposes*** according to published data on the species or cultivar, historical records and own experience.
		3.2 Identify and confirm availability of resources, tools, equipment and machinery required for the plant maintenance.
		3.3 Identify OHS/WHS hazards and environmental implications associated with the maintenance plan.
		3.4 Plan and implement ***cyclical maintenance procedures*** according to the ***scope and standards*** required by the client.
		3.5 Monitor and review the maintenance plan and take ***remedial action*** in response to changing conditions, where required.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required Skills:

- assess site factors and evaluate their impact on the development of plant establishment and maintenance
- recommend suitable plant species for specific uses
- recognise common weeds, pests and diseases
- select appropriate additives for a given situation
- safely operate a range of horticultural machinery and equipment
- comply with OHS/WHS and environmental legislation
- make adjustments to maintenance plan in response to changing conditions
- establish client needs and preferences

Required Knowledge:

- plant species suitable for use in a lawn or as a lawn alternative
- growth habits and cultural requirements of specific plant species and cultivars under a range of soil and environmental conditions
- assessment of weed potential of plant species selected for lawns or as a lawn alternative
- signs and symptoms of pests and diseases and suitable methods of control
- maintenance requirements and procedures for specific plant species and cultivars after initial establishment
- site assessment techniques including soil analysis

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- nutrient requirements of specific plant species and cultivars and the effects of nutrient deficiency and toxicity on individual plant species and cultivars, including visual symptoms
- characteristics of soil and other growth media types, and the use of additives and ameliorants to enhance the available nutrition for specific plant species and cultivars
- characteristics of simple and compound fertiliser products
- legislation and regulations relating to sites and maintenance activities

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

Preferences and requirements may include:	• purpose or intended use of the site • preferred plant species or cultivars • plant characteristics • growth and cultural requirements • maintenance services • budget limitations and timelines
Existing conditions may include:	• local climate • soil types, structure and profiles • soil drainage characteristics • nutrient toxicities and deficiencies • the aspect of the site • natural and artificial watercourses • buildings and structures • services • other water supplies and quality • existing plants • projected patterns of wear
Soil tests may include:	• infiltration rate • physical characteristics such as colour, texture, structure, and soil type • depth of root zone • watertable and chemical characteristics such as pH, salinity and nutrient and carbonate content • soil compaction
Plant species/cultivars may include:	• common lawn grass species • native grass species • groundcovers

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	• low growing plants and herbs
Planting methods may include:	• container stock planting • sowing • laying • rolling • chaffing • sprigging • hydroseeding • hydrosprigging • solid turfing
Legislation may refer to:	• nature of ownership • covenants • easements • historical • cultural or heritage values of the site • local by-laws including prohibited plant species and land-use restrictions
Environmental implications may include:	• improved drainage and soil structure • minimisation of water and fertiliser run-off • removal of weeds • improvement of the aesthetics of the site
OHS/WHS hazards may include:	• disturbance or interruption of services • solar radiation • dust and/or soil • noise • chemicals and hazardous substances • sharp hand tools and equipment • manual handling • slippery and uneven surfaces
Plan may include:	• availability of stock • staged timelines • availability of staff • costs • resources and equipment • pre and post-establishment activities • scope and standards of maintenance procedures

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Resources may include:	• seeds • turf or other plants • tools • equipment such as hand tools (rakes, spreaders, shovels, level lawn tool, turf spades, rollers, wheelbarrows, hoses and hose fittings) • machinery such as trailed or motorised equipment, sod cutters, mechanical rollers, edgers and trimmers; fertiliser spreaders, top-dressing machinery, levellers and tractors and 3-point linkage equipment
Pre-establishment procedures may include:	• grading • contouring • levelling • installing drainage and irrigation • soil preparation and cultivation • weed control • top dressing and aeration
Post-establishment procedures may include:	• watering • fertilising • mowing • mulching • weed control • prevention of access to establishing areas
Range of conditions may include:	• weather • seasonal influences • soil characteristics • nature and frequency of use of the site • fertiliser history • weed competition • irrigation methods and scheduling • spraying program and soil management practices • hydrophobic soil • compacted soil
Cyclical maintenance procedures may include:	• soil testing • fertilising • watering • rolling

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	• mowing • monitoring plant health • pest and disease control • replanting • renovating and repairing wear and damage where necessary
Scope and standards may include:	• plant care • treatment of weeds, pests and diseases • mowing • edging • maintenance of irrigation and drainage systems
Remedial action may include:	• adjustments to irrigation scheduling and nutrient application rates • pest and disease control • replacement of stock • changes to soil management practices • rescheduling maintenance tasks

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Curriculum.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessment must confirm the ability to: • use client preferences to plan, establish and maintain a lawn or lawn alternatives for site conditions • comply with relevant legislation • plan and implement procedures for the establishing and maintaining a lawn or lawn alternatives • monitor newly established plants and implement changes to the plan, where required • undertake maintenance procedures over a range of conditions • monitor and review the plan and implement necessary changes
Context of and specific resources for assessment	Assessment must ensure: • access to a real or simulated workplace environment, a site for establishing a lawn or lawn alternatives, access to plants, materials, tools and equipment; relevant legislation, computers and industry references and publications.
Methods of assessment	The following suggested assessment methods are suitable for this unit: • oral and/or written questioning to determine understanding

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of plant cultural requirements and relevant legislation

- assignment in developing a documented plant establishment plan
- practical demonstration of establishing plants
- records of maintenance activities for a lawn or lawn alternatives

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Unit code	VU22743
Unit title	Select, use and apply geographical information system (GIS) technology
Unit Descriptor	This unit describes the performance outcomes, skills and knowledge required to choose, evaluate and use appropriate GIS technology to support activities and decision making within an organization. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability Skills	This unit contains Employability Skills.
Application of the Unit	This unit is applicable to persons working in all sectors of the horticulture industry.

ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*
1 Evaluate the need for GIS technology	1.1 Research GIS technology that supports the organisation's operational tasks and decision making
	1.2 Assess the opportunities for operational improvements resulting from adopting GIS
	1.3 Examine the options for equipment and software requirements
	1.4 Investigate the cost-benefit of using GIS technology
	1.5 Source and review independent technical advice and sources of information relating to GIS technology
	1.6 Present ***evaluation*** and recommendations on the need for GIS technology to key stakeholders of the organization management team
	1.7 Develop a plan to incorporate the use of a GIS to improve operational efficiency and sustainability
2 Source, manipulate and analyse data	2.1 Identify ***methods of data capture*** as appropriate for the specified outcomes
	2.2 Identify and interpret data for ***modelling and mapping*** purposes for a range of applications
	2.3 Translate specified data from raster to vector as required
	2.4 Apply strategies to identify and address sources of inaccuracies in GIS data

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3	Evaluate the use of GIS technology	3.1 Develop and review strategies to ensure GIS technology is used effectively within the organisation
		3.2 Assess technology training needs
		3.3 Identify ***barriers*** to the effective use of the technology
		3.4 Develop actions to address barriers to the effective use of GIS technology
		3.5 Review effectiveness of GIS technology to meet application needs

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required Skills:

- identifying and applying a range of compatible Geographic Information System software
- interpreting land management maps/plans to apply to business operations
- analysing digital map images
- assessing and reviewing information
- identifying appropriate training and support for staff
- identifying and managing issues that may arise in the use of the technology

Required Knowledge:

- basic principles of GIS technology and applications
- mapping principles of GIS
- basic principles of cost-benefit analysis
- equipment and software requirements
- barriers to the use of GIS technology
- context in which particular organisations operate and how these may impact on the selection and use of technology
- range of GIS technology options available to support organisational activities
- strategies that can be used to evaluate information regarding technology
- training options available to the organisation to develop skills in the use of technology

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

Evaluation may include:

- effectiveness, including cost effectiveness
- human impacts
- level of training need
- reliability
- suitability

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	• sustainability
Methods of data capture may include but are not limited to:	• transfer of hardcopy material into a digital medium • transfer of digital data to GIS compatible format • remotely sensed data • satellite remote sensing • Global Positioning System
Modelling and mapping may include but are not limited to:	• simple queries • integration of 2 and 3 dimensional characteristics • topological • hydrological • cartographic • overlays
Barriers may include but are not limited to:	• cost • staff training • integration with other IT platforms • digital literacy

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Elements, Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the Curriculum.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessment must confirm the ability to: • choose appropriate GIS technology to support the organisation's activities • develop strategies to ensure GIS technology is used effectively for the required application • communicate recommendations to others
Context of and specific resources for assessment	Assessment must ensure: • access to a real or simulated horticultural work environment, a computer, GIS software and internet access and access to information on GIS technology
Methods of assessment	The following suggested assessment methods are suitable for this unit: • observation of performance in the use of GIS technology • direct questioning combined with reflection on assessment and evaluation processes • analysis of responses to case studies and scenarios • observation of presentations and group discussions • oral or written questioning to assess knowledge

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