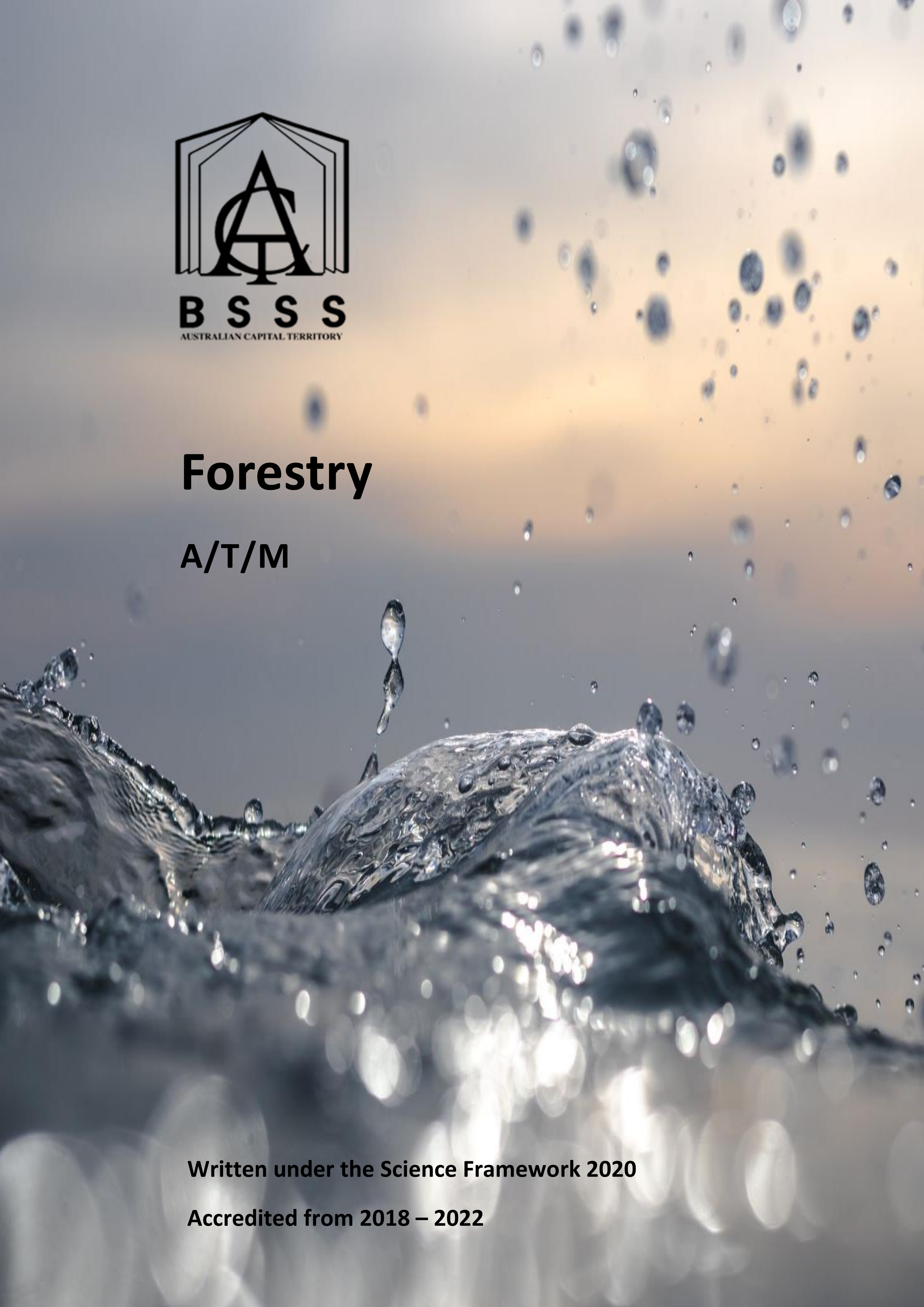

Forestry

A/T/M

Written under the Science Framework 2020

Accredited from 2018 – 2022

Cover Art provided by Canberra College student Aidan Giddings

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The ACT Senior Secondary System

The ACT senior secondary system recognises a range of university, vocational or life skills pathways.

The system is based on the premise that teachers are experts in their area: they know their students and community and are thus best placed to develop curriculum and assess students according to their needs and interests. Students have ownership of their learning and are respected as young adults who have a voice.

A defining feature of the system is school-based curriculum and continuous assessment. School-based curriculum provides flexibility for teachers to address students' needs and interests. College teachers have an opportunity to develop courses for implementation across ACT schools. Based on the courses that have been accredited by the BSSS, college teachers are responsible for developing programs of learning. A program of learning is developed by individual colleges to implement the courses and units they are delivering.

Teachers must deliver all content descriptions; however, they do have flexibility to emphasise some content descriptions over others. It is at the discretion of the teacher to select the texts or materials to demonstrate the content descriptions. Teachers can choose to deliver course units in any order and teach additional (not listed) content provided it meets the specific unit goals.

School-based continuous assessment means that students are continually assessed throughout years 11 and 12, with both years contributing equally to senior secondary certification. Teachers and students are positioned to have ownership of senior secondary assessment. The system allows teachers to learn from each other and to refine their judgement and develop expertise.

Senior secondary teachers have the flexibility to assess students in a variety of ways. For example: multimedia presentation, inquiry-based project, test, essay, performance and/or practical demonstration may all have their place. College teachers are responsible for developing assessment instruments with task specific rubrics and providing feedback to students.

The integrity of the ACT Senior Secondary Certificate is upheld by a robust, collaborative and rigorous structured consensus-based peer reviewed moderation process. System moderation involves all Year 11 and 12 teachers from public, non-government and international colleges delivering the ACT Senior Secondary Certificate.

Only students who desire a pathway to university are required to sit a general aptitude test, referred to as the ACT Scaling Test (AST), which moderates student course scores across subjects and colleges. Students are required to use critical and creative thinking skills across a range of disciplines to solve problems. They are also required to interpret a stimulus and write an extended response.

Senior secondary curriculum makes provision for student-centred teaching approaches, integrated and project-based learning inquiry, formative assessment and teacher autonomy. ACT Senior Secondary Curriculum makes provision for diverse learners and students with mild to moderate intellectual disabilities, so that all students can achieve an ACT Senior Secondary Certificate.

The ACT Board of Senior Secondary Studies (BSSS) leads senior secondary education. It is responsible for quality assurance in senior secondary curriculum, assessment and certification. The Board consists of representatives from colleges, universities, industry, parent organisations and unions. The Office of the Board of Senior Secondary Studies (OBSSS) consists of professional and administrative staff who support the Board in achieving its objectives and functions.

ACT Senior Secondary Certificate

Courses of study for the ACT Senior Secondary Certificate:

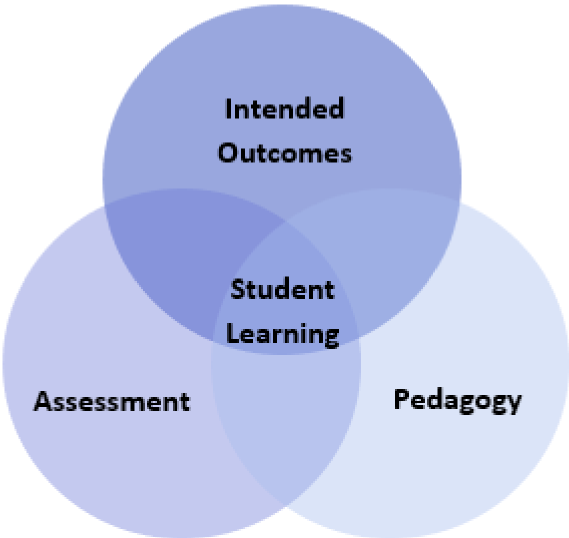
- provide a variety of pathways, to meet different learning needs and encourage students to complete their secondary education
- enable students to develop the essential capabilities for twenty-first century learners
- empower students as active participants in their own learning
- engage students in contemporary issues relevant to their lives
- foster students' intellectual, social and ethical development
- nurture students' wellbeing, and physical and spiritual development
- enable effective and respectful participation in a diverse society.

Each course of study:

- comprises an integrated and interconnected set of knowledge, skills, behaviours and dispositions that students develop and use in their learning across the curriculum
- is based on a model of learning that integrates intended student outcomes, pedagogy and assessment
- outlines teaching strategies which are grounded in learning principles and encompass quality teaching
- promotes intellectual quality, establish a rich learning environment and generate relevant connections between learning and life experiences
- provides formal assessment and certification of students' achievements.

Underpinning beliefs

- All students are able to learn.
- Learning is a partnership between students and teachers.
- Teachers are responsible for advancing student learning.



Learning Principles

1. Learning builds on existing knowledge, understandings and skills.
   (Prior knowledge)
2. When learning is organised around major concepts, principles and significant real world issues, within and across disciplines, it helps students make connections and build knowledge structures.
   (Deep knowledge and connectedness)
3. Learning is facilitated when students actively monitor their own learning and consciously develop ways of organising and applying knowledge within and across contexts.
   (Metacognition)
4. Learners' sense of self and motivation to learn affects learning.
   (Self-concept)
5. Learning needs to take place in a context of high expectations.
   (High expectations)
6. Learners learn in different ways and at different rates.
   (Individual differences)
7. Different cultural environments, including the use of language, shape learners' understandings and the way they learn.
   (Socio-cultural effects)
8. Learning is a social and collaborative function as well as an individual one.
   (Collaborative learning)
9. Learning is strengthened when learning outcomes and criteria for judging learning are made explicit and when students receive frequent feedback on their progress.
   (Explicit expectations and feedback)

General Capabilities

All courses of study for the ACT Senior Secondary Certificate should enable students to develop essential capabilities for twenty-first century learners. These ‘capabilities’ comprise an integrated and interconnected set of knowledge, skills, behaviours and dispositions that students develop and use in their learning across the curriculum.

The capabilities include:

- literacy
- numeracy
- information and communication technology (ICT)
- critical and creative thinking
- personal and social
- ethical understanding
- intercultural understanding

Courses of study for the ACT Senior Secondary Certificate should be both relevant to the lives of students and incorporate the contemporary issues they face. Hence, courses address the following three priorities. These priorities are:

- Aboriginal and Torres Strait Islander histories and cultures
- Asia and Australia’s engagement with Asia
- Sustainability

Elaboration of these General Capabilities and priorities is available on the ACARA website at www.australiancurriculum.edu.au.

Literacy

Literacy is important in students’ development of *Science Inquiry Skills* and their understanding of content presented through the *Science Understanding* and *Science as a Human Endeavour* strands. Students gather, interpret, synthesise and critically analyse information presented in a wide range of genres, modes and representations (including text, flow diagrams, symbols, graphs and tables). They evaluate information sources from scientists, industry and lobby-groups and compare and contrast ideas, information and opinions presented within and between texts. They communicate processes and ideas logically and fluently and structure evidence-based arguments, selecting genres and employing appropriate structures and features to communicate for specific purposes and audiences.

Numeracy

Numeracy is key to students’ ability to apply a wide range of *Science Inquiry Skills*, including making and recording observations; ordering, representing and analysing data; and interpreting trends and relationships. They employ numeracy skills to interpret complex spatial and graphic representations, and to appreciate the ways in which biological systems are structured, interact and change across spatial and temporal scales. They engage in analysis of data, including issues relating to reliability and probability, and they interpret and manipulate mathematical relationships to calculate and predict values.

Information and Communication Technology (ICT) Capability

ICT capability is a key part of *Science Inquiry Skills*. Students use a range of strategies to locate, access and evaluate information from multiple digital sources; to collect, analyse and represent data; to model and interpret concepts and relationships; and to communicate and share science ideas, processes and information. Through exploration of *Science as a Human Endeavour* concepts, students assess the impact of ICT on the development of science and the application of science in society, particularly with regard to collating, storing, managing and analysing large data sets.

Critical and Creative Thinking

Critical and creative thinking is particularly important in the science inquiry process. Science inquiry requires the ability to construct, review and revise questions and hypotheses about increasingly complex and abstract scenarios and to design related investigation methods. Students interpret and evaluate data; interrogate, select and cross-reference evidence; and analyse processes, interpretations, conclusions and claims for validity and reliability, including reflecting on their own processes and conclusions. Science is a creative endeavour and students devise innovative solutions to problems, predict possibilities, envisage consequences and speculate on possible outcomes as they develop *Science Understanding* and *Science Inquiry Skills.* They also appreciate the role of critical and creative individuals and the central importance of critique and review in the development and innovative application of science.

Personal and Social Capability

Personal and social capability is integral to a wide range of concepts and activities in Forestry, as students develop and practise skills of communication, teamwork, decision-making, initiative-taking and self-discipline with increasing confidence and sophistication. In particular, students develop skills in both independent and collaborative investigation; they employ self-management skills to plan effectively, follow procedures efficiently and work safely; and they use collaboration skills to conduct investigations, share research and discuss ideas. In considering aspects of *Science as a Human Endeavour,* students also recognise the role of their own beliefs and attitudes in their response to science issues and applications, consider the perspectives of others, and gauge how science can affect people's lives and the future of the planet.

Ethical Understanding

Ethical understanding is a vital part of science inquiry. Students evaluate the ethics of experimental science, codes of practice, and the use of scientific information and science applications. They explore what integrity means in science, and they understand, critically analyse and apply ethical guidelines in their investigations. They consider the implications of their investigations on others, the environment and living organisms. They use scientific information to evaluate the claims and actions of others and to inform ethical decisions about a range of social, environmental and personal issues and applications of science.

Intercultural Understanding

Intercultural understanding is fundamental to understanding aspects of *Science as a Human Endeavour*, as students appreciate the contributions of diverse cultures to developing science understanding and the challenges of working in culturally diverse collaborations. They develop awareness that raising some debates within culturally diverse groups requires cultural sensitivity, and they demonstrate open-mindedness to the positions of others. Students also develop an understanding that cultural factors affect the ways in which science influences and is influenced by society.

Cross-Curriculum Priorities

While the significance of the cross-curriculum priorities for Forestry varies, there are opportunities for teachers to select contexts that incorporate the key concepts from each priority.

Aboriginal and Torres Strait Islander Histories and Cultures

Through an investigation of contexts that draw on Aboriginal and Torres Strait Islander histories and cultures students could investigate the importance of Aboriginal and Torres Strait Islander Peoples' knowledge in developing a richer understanding of the Australian environment. Students could develop an appreciation of the unique Australian biota and its interactions, the impacts of Aboriginal and Torres Strait Islander Peoples on their environments and the ways in which the Australian landscape has changed over tens of thousands of years. They could examine the ways in which Aboriginal and Torres Strait Islander knowledge of ecosystems has developed over time and the spiritual significance of Country/Place.

Asia and Australia's Engagement with Asia

Contexts that draw on scientific research and development and collaborative endeavours in the Asia Pacific region provide an opportunity for students to investigate Asia and Australia's engagement with Asia. Students could explore the diverse environments of the Asia region and develop an appreciation that interaction between human activity and these environments continues to influence the region, including Australia, and has significance for the rest of the world. By examining developments in forest science, students could appreciate that the Asia region plays an important role in scientific research and development, including through collaboration with Australian scientists, in such areas natural resource management, biosecurity and food security.

Sustainability

The Sustainability cross-curriculum priority is explicitly addressed in the Forestry curriculum. Forestry and agroforestry provide authentic contexts for exploring, investigating and understanding the function and interactions of forest environments across a range of spatial and temporal scales. By investigating the relationships between forest systems and system components, and how systems respond to change, students develop an appreciation for the interconnectedness of the biosphere. Students appreciate that forest science provides the basis for decision making in many areas of society and that these decisions can impact the Earth system. They understand the importance of using science to predict possible effects of human and other activity, and to develop management plans or alternative technologies that minimise these effects and provide for a more sustainable future.

Forestry

A/T/M

Rationale

There is an innate human curiosity about and wish to understand the universe. The study of science encourages and enables students to develop complex and sophisticated understanding of the universe through observation, questioning, experimentation, discussion, critical analysis and creative thinking.

In a technologically based society, scientific literacy for all citizens is of paramount importance. The Program for International Student Assessment (PISA) defines scientific literacy as "the ability to use scientific knowledge and processes not only to understand the natural world but to participate in decisions that affect it" (*OECD: the 2012 PISA Assessment and Analytical Framework*). Scientifically literate individuals contribute to the quality of their own lives and to society through informed decision-making. Scientific processes challenge current understanding and are continually re-evaluated. Students are constantly encouraged, through their study of science, to examine and reconsider their understanding of scientific concepts and their interrelationships, of scientific inquiry methods and therefore of their world more generally. Science courses also help students understand and apply their learning in other subjects, in a scientific way.

The essence of science involves social, cultural, critical and aesthetic perspectives. An appreciation of the aesthetic qualities and understanding of the universe strengthens students' curiosity and sense of wonder. The study of science equips students to be independent thinkers and life-long learners.

Forestry is an applied science that draws on concepts from many scientific endeavours, social history and economics. Through the study of forestry, students are introduced to the issues of over utilisation of a limited resource, soil degradation, conservation of remnant forests, maintenance of biodiversity across a range of biomes and ecosystems and they become aware of the need to develop sustainable forestry systems. Forestry appeals to students with a wide range of interests and abilities; they find it enjoyable, productive and relevant. A broad focus on varying natural environments will enable student to make scientifically informed decisions regarding conservation and resource use.. Forests enhance our surroundings and contribute to quality of life. Forestry's broad conceptual base with its practical experience can lead to further education and training or employment, as well as to the enhancement of lifestyle and leisure activities.

This course aligns with Australian Curriculum senior Science.

Goals

Forestry aims to develop students':

- sense of wonder and curiosity about life and respect for all living things and the environment
- understanding of how forest systems interact and are interrelated; the flow of matter and energy through and between these systems; and the processes by which they persist and change
- appreciation of how forestry knowledge has developed over time and continues to develop; how scientists use environment science in a wide range of applications; and how forestry knowledge influences society in local, regional and global contexts

- ability to plan and carry out fieldwork, laboratory and other research investigations including the collection and analysis of qualitative and quantitative data and the interpretation of evidence
- ability to critically evaluate and debate scientific arguments and claims in order to solve problems and generate informed, responsible and ethical conclusions
- ability to communicate forestry understanding, findings, arguments and conclusions using appropriate representations, modes and genres.

Student Group

This course is intended for students who are considering studying forestry, environmental science, horticulture or applied biology at a tertiary level. It will also serve as a background for other groups of students who may do further vocational study, and/or as a subject of enjoyment that will allow for the development of an interest in this field, widening students' general knowledge and possibly providing preparation for future employment.

Mathematical skills expected of students studying Forestry

The Forestry curriculum requires students to use the mathematical skills they have developed through the F-10 Australian Curriculum: Mathematics, in addition to the numeracy skills they have developed through the Science Inquiry Skills strand of the Australian Curriculum: Science.

Within the Science Inquiry Skills strand, students are required to gather, represent and analyse numerical data to identify the evidence that forms the basis of scientific arguments, claims or conclusions. In gathering and recording numerical data, students are required to make measurements using appropriate units to an appropriate degree of accuracy.

Students may need to be taught when it is appropriate to join points on a graph and when it is appropriate to use a line of best fit. They may also need to be taught how to construct a straight line that will serve as the line of best fit for a set of data presented graphically.

It is assumed that students will be able to competently:

- perform calculations involving addition, subtraction, multiplication and division of quantities
- perform approximate evaluations of numerical expressions
- express fractions as percentages, and percentages as fractions
- calculate percentages
- recognise and use ratios
- transform decimal notation to power of ten notation
- substitute physical quantities into an equation using consistent units so as to calculate one quantity and check the dimensional consistency of such calculations
- solve simple algebraic equations
- comprehend and use the symbols/notations $<$,$>$, Δ, $\approx$
- translate information between graphical, numerical and algebraic forms
- distinguish between discrete and continuous data then select appropriate forms, variables and scales for constructing graphs
- construct and interpret frequency tables and diagrams, pie charts and histograms
- describe and compare data sets using mean, median and inter-quartile range
- interpret the slope of a linear graph.

Unit Titles

In Forestry, students develop their understanding of forests and forestry systems, the components of these systems and their interactions, how forests influence systems around them, and the ways in which forests can be managed to provide natural and or commercial benefits. There are five units:

- Forestry & Agroforestry
- Forestry and Soils
- Australian Biodiversity
- Resource Management
- Independent Study

Organisation of Content

Forestry & Agroforestry

In this unit, students learn that forests are complex systems which are influenced by the climatic and geophysical characteristics of the areas where they are found and upon which they have a significant impact. Agroforestry is a land management system which has the potential to improve the carrying capacity of land and improve outcomes for more than just land holders. Students develop their understanding of forest trees and forest types in Australia, including the components that support tree survival and growth. Students study planting and growing methods. They review the significance of trees in their environments and consider how trees influence local and global climates. They examine wood structure, timber characteristics and forest resources. Students review agroforestry systems in Australia and other countries that enhance land management. Students analyse how the introduction of trees into traditional farming systems can lead to more sustainable outcomes. Students use science inquiry skills and investigate the concept of science as a human endeavour.

Forestry and Soils

In this unit, students learn that forest systems influence and are influenced by the characteristics of the trees which grow within them, the soils on which they develop and the environmental impacts they experience. Students develop their understanding of the growth requirements of forest trees and the genetic modifications which can improve various characteristics for forestry purposes. Students investigate and explain the interactions between trees and the Australian environment, looking in particular at, soils, salinity and bushfires. Students examine the specific characteristics and adaptations that Australian native plants have to their environment. Through the investigation of appropriate contexts, students explore how forestry concepts relate to science as a human endeavour. Students use science inquiry skills to collect, analyse and interpret data relating to the impact of climate change on forests. They critically analyse the range of factors that influence the effects of conservation issues at local, regional and global levels.

Australian Biodiversity

In this unit, students learn that Australian forests play a critical role in maintaining biodiversity. Plants and animals, particularly endemic species, have evolved over time. Students explore the range of pressures that affect Australian forests and other ecosystems. In this unit, students develop their understanding of how Australian forests evolved, looking in particular at endemic species. They investigate and analyse threats to biodiversity and forests, including habitat alteration through land clearance and changing land-use, unsustainable resource use, introduced species and climate change. Students appreciate the challenge of conserving biodiversity, and the complexity in the application of forestry concepts. Students use science inquiry skills and develop the concepts of science as a human endeavour.

Resource Management

In this unit students learn that Australia contains many unique environments that are characterised by particular plant and animal species that require resource management. This unit uses case studies of distinct environments for students to develop important conceptual understandings in resource management. Management of these environments, to maintain forest trees, requires a multidisciplinary approach, looking at both land and catchment management strategies. Students examine a variety of Australian environments to highlight the differences in approach for different regions in Australia. Students explore in depth, the ecological interactions in particular forest systems. They analyse how these systems have evolved and their function in the Australian landscape. Students investigate the different types of trees present and their ecological function within these environments, possible uses of these trees for commercial gain and the management practices that would need to be in place to prevent loss of threatened species of trees.

Through the investigation of appropriate contexts, students explore how science as a human endeavour concepts develop our understanding of Australian forests and environments. Students investigate how scientific knowledge is used to offer valid explanations and reliable predictions in forestry, and the ways in which it interacts with social, economic and cultural factors, including the design of action for sustainability.

Students use science inquiry skills to collect, analyse and interpret data relating to Australian trees within different environments. They critically analyse the range of factors that influence the effects of conservation issues at local, regional and global levels.

Independent Study

An Independent Study unit has an important place in senior secondary courses. It is a valuable pedagogical approach that empowers students to make decisions about their own learning. An Independent Study unit can be proposed by an individual student for their own independent study and negotiated with their teacher. The program of learning for an Independent Study unit must meet the unit goals and content descriptions as they appear in the course.

Through the investigation of appropriate forestry contexts, students explore how international collaboration, evidence from multiple disciplines and individuals and the development of ICT and other technologies have contributed to developing our understanding of the evolution of Australian plants and animals. They investigate how scientific knowledge is used to offer valid explanations and reliable predictions, and the ways in which it interacts with social, economic and cultural factors.

Students use science inquiry skills to collect, analyse and interpret data relating to the impact of climate change on the evolution of plant and animal species. They critically analyse the range of factors that influence the effects of interference with ecosystems at local, regional and global levels.

Science strand descriptions

The Australian Curriculum: Science has three interrelated strands: Science Inquiry Skills, Science as a Human Endeavour and Science Understanding. These strands are used to organise the Science learning area from Foundation to Year 12. In the senior secondary Science subjects, the three strands build on students' learning in the F-10 Australian Curriculum: Science.

In the practice of science, the three strands are closely integrated: the work of scientists reflects the nature and development of science, is built around scientific inquiry, and seeks to respond to and influence society. Students' experiences of school science should mirror this multifaceted view of science. To achieve this, the three strands of the Australian Curriculum: Science should be taught in an integrated way. The content descriptions for Science Inquiry Skills, Science as a Human Endeavour and Science Understanding have been written so that this integration is possible in each unit.

Science Inquiry Skills

- Science inquiry involves identifying and posing questions; planning, conducting and reflecting on investigations; processing, analysing and interpreting data; and communicating findings. This strand is concerned with evaluating claims, investigating ideas, solving problems, reasoning, drawing valid conclusions, and developing evidence-based arguments.
- Science investigations are activities in which ideas, predictions or hypotheses are tested and conclusions are drawn in response to a question or problem. Investigations can involve a range of activities, including experimental testing, field work, locating and using information sources, conducting surveys, and using modelling and simulations. The investigation design will depend on the context and subject of the investigation.
- In science investigations, the collection and analysis of data to provide evidence plays a major role. This can involve collecting or extracting information and reorganising data in the form of tables, graphs, flow charts, diagrams, prose, keys, spreadsheets and databases. The analysis of data to identify and select evidence, and the communication of findings, involve the selection, construction and use of specific representations, including mathematical relationships, symbols and diagrams.
- Through the senior secondary Science subjects, students will continue to develop generic science inquiry skills, building on the skills acquired in the F-10 Australian Curriculum: Science. These generic skills are described below and will be explicitly taught and assessed in each unit. In addition, each unit provides more specific skills to be taught within the generic science inquiry skills; these specific skills align with the Science Understanding and Science as a Human Endeavour content of the unit.

The generic science inquiry skills are:

- Identifying, researching and constructing questions for investigation; proposing hypotheses; and predicting possible outcomes
- Designing investigations, including the procedure/s to be followed, the materials required and the type and amount of primary and/or secondary data to be collected; conducting risk assessments; and considering ethical research
- Conducting investigations, including using equipment and techniques safely, competently and methodically for the collection of valid and reliable data
- Representing data in meaningful and useful ways; organising and analysing data to identify trends, patterns and relationships; recognising error, uncertainty and limitations in data; and selecting, synthesising and using evidence to construct and justify conclusions
- Interpreting scientific and media texts and evaluating processes, claims and conclusions by considering the quality of available evidence; and using reasoning to construct scientific arguments
- Selecting, constructing and using appropriate representations to communicate understanding, solve problems and make predictions
- Communicating to specific audiences and for specific purposes using appropriate language, nomenclature, genres and modes.
- The senior secondary Science subjects have been designed to accommodate, if appropriate, an extended scientific investigation within each pair of units.

Science as a Human Endeavour

- Through science, we seek to improve our understanding and explanations of the natural world. The Science as a Human Endeavour strand highlights the development of science as a unique way of knowing and doing, and explores the use and influence of science in society.
- As science involves the construction of explanations based on evidence, the development of science concepts, models and theories is dynamic and involves critique and uncertainty. Science concepts, models and theories are reviewed as their predictions and explanations are continually re-assessed through new evidence, often through the application of new technologies. This review process involves a diverse range of scientists working within an increasingly global community of practice and can involve the use of international conventions and activities such as peer review.
- The use and influence of science are shaped by interactions between science and a wide range of social, economic, ethical and cultural factors. The application of science may provide great benefits to individuals, the community and the environment, but may also pose risks and have unintended consequences. As a result, decision making about socio-scientific issues often involves consideration of multiple lines of evidence and a range of stakeholder needs and values. As an ever-evolving body of knowledge, science frequently informs public debate, but is not always able to provide definitive answers.
- Across the senior secondary Science subjects, the same set of Science as a Human Endeavour content descriptions is used for Units 1 and 2 of the subjects; and another set for Units 3 and 4. This consistent approach enables students to develop a rich appreciation of the complex ways in which science interacts with society, through the exploration of Science as a Human Endeavour concepts across the subjects and in multiple contexts.
- ‘Examples in context’ will be developed to illustrate possible contexts related to Science Understanding content, in which students could explore Science as a Human Endeavour concepts. Each Example in context will be aligned to the relevant sub-unit in Science Understanding and will include links to the relevant Science as a Human Endeavour content descriptions.

Science Understanding

- Science understanding is evident when a person selects and integrates appropriate science concepts, models and theories to explain and predict phenomena, and applies those concepts, models and theories to new situations. Models in science can include diagrams, physical replicas, mathematical representations, word-based analogies (including laws and principles) and computer simulations. Development of models involves selection of the aspects of the system/s to be included in the model, and thus models have inherent approximations, assumptions and limitations.
- The Science Understanding content in each unit develops students’ understanding of the key concepts, models and theories that underpin the subject, and of the strengths and limitations of different models and theories for explaining and predicting phenomena.
- Science understanding can be developed through the selection of contexts that have relevance to and are engaging for students.
- online materials
- scientists in schools.

Assessment

The identification of criteria within the achievement standards and assessment task types and weightings provides a common and agreed basis for the collection of evidence of student achievement.

Assessment Criteria (the dimensions of quality that teachers look for in evaluating student work) provide a common and agreed basis for judgement of performance against unit and course goals, within and across colleges. Over a course, teachers must use all these criteria to assess students' performance but are not required to use all criteria on each task. Assessment criteria are to be used holistically on a given task and in determining the unit grade.

Assessment Tasks elicit responses that demonstrate the degree to which students have achieved the goals of a unit based on the assessment criteria. The Common Curriculum Elements (CCE) is a guide to developing assessment tasks that promote a range of thinking skills (see Appendix C). It is highly desirable that assessment tasks engage students in demonstrating higher order thinking.

Rubrics are constructed for individual tasks, informing the assessment criteria relevant for a particular task and can be used to assess a continuum that indicates levels of student performance against each criterion.

Assessment Criteria

Students will be assessed on the degree to which they demonstrate an understanding of:

- concepts, models and application
- contexts
- inquiry skills.

Assessment Task Types

Suggested tasks

Individual tasks may incorporate one or more of the following:

- models
- commentary
- debate
- portfolio/journal
- field work
- investigation
- document/source analysis
- practical report
- role play
- research report
- test/quiz
- seminar/workshop/lecture
- poster
- response to stimulus
- essay
- multimedia presentation
- creative response
- interview
- discussion forum
- rationale/validation
- practical skills

It is recommended that a student conceived investigation be undertaken at least once during a minor and twice during a major. This investigation may either be theoretical or practical, or a combination of both.

Weightings in A/T/M 1.0 and 0.5 Units:

No task to be weighted more than 45% for a standard 1.0 unit.

Additional Assessment Information

Requirements

- For a standard unit (1.0), students must complete a minimum of three assessment tasks and a maximum of five.
- For a half standard unit (0.5), students must complete a minimum of two and a maximum of three assessment tasks.
- Students must experience a variety of task types and different modes of communication to demonstrate the Achievement Standards in both theoretical and practical tasks.
- All Achievement Standards must be demonstrated in standard (1.0) or half-standard (0.5) units.
- Task types need to be selected to address all Achievement Standards within the Concepts, Models & Applications, Contexts and Inquiry Skills strands across a standard (1.0) or half-standard (0.5) unit.
- For tasks completed in unsupervised conditions, schools need to have mechanisms to uphold academic integrity, for example: student declaration, plagiarism software, oral defence, interview, or other validation tasks.

Achievement Standards

Years 11 and 12 achievement standards are written for A/T courses. A single achievement standard is written for M courses.

A Year 12 student in any unit is assessed using the Year 12 achievement standards. A Year 11 student in any unit is assessed using the Year 11 achievement standards. Year 12 achievement standards reflect higher expectations of student achievement compared to the Year 11 achievement standards. Years 11 and 12 achievement standards are differentiated by cognitive demand, the number of dimensions and the depth of inquiry.

An achievement standard cannot be used as a rubric for an individual assessment task. Assessment is the responsibility of the college. Student tasks may be assessed using rubrics or marking schemes devised by the college. A teacher may use the achievement standards to inform development of rubrics. The verbs used in achievement standards may be reflected in the rubric. In the context of combined Years 11 and 12 classes, it is best practice to have a distinct rubric for Years 11 and 12. These rubrics should be available for students prior to completion of an assessment task so that success criteria are clear.

Achievement Standards for Science A Course – Year 11

	*A student who achieves an **A** grade typically*	*A student who achieves a **B** grade typically*	*A student who achieves a **C** grade typically*	*A student who achieves a **D** grade typically*	*A student who achieves an **E** grade typically*
Concepts, Models & Applications	• analyses the fundamental properties and functions of system components, processes and interactions, and how they are affected by factors across a range of temporal and spatial scales • analyses the nature, functions, limitations and applications of theories and models using evidence, in unfamiliar contexts • assesses processes and claims, provides a critique based on evidence, and discusses alternatives	• explains the fundamental properties and functions of system components, processes and interactions, and how they are affected by factors across a range of temporal and spatial scales • explains the nature, functions, limitations and applications of theories and models using evidence, in familiar contexts • explains processes and claims, provides a critique with reference to evidence, and identifies alternatives	• describes the fundamental properties and functions of system components, processes and interactions, and how they are affected by factors across a range of temporal and spatial scales • describes the nature, functions, limitations and applications of theories and models with supporting evidence • describes processes and claims, and identifies alternatives with some reference to evidence	• identifies the fundamental properties and functions with some identification of system components and factors that affect processes across a range of temporal and spatial scales • identifies the nature, functions, applications, and some possible limitations of theories and models, with some evidence • identifies processes and claims, and identifies the need for improvements with some reference to evidence	• identifies the fundamental properties and functions with little or no identification of system components, processes, interactions and contextual scales • identifies the nature, function of theories and models, with an assertion of a few possible limitations • identifies processes and the need for some improvements, with little or no reference to evidence
Contexts	• analyses how the practice and applications of science meet needs, make decisions; and is influenced by social, economic, technological, and ethical factors	• explains how the practice and applications of science meet needs, make decisions, and is influenced by social, economic, technological, and ethical factors	• describes how the applications of science meet needs, make decisions, and is influenced by social, economic, technological, and ethical factors	• identifies ways in the applications of science meet needs, and is influenced by some factors	• identifies ways in which the application of science has been used in society to meet needs
Inquiry Skills	• designs, conducts and improves safe, ethical and original inquiries individually and collaboratively, that efficiently collect valid and reliable data in response to a complex question • analyses causal and correlational relationships, anomalies, reliability and validity of data and representations, and analyses errors • reflects with insight on their own thinking and learning and evaluates planning, time management and use of appropriate strategies to work independently and collaboratively • communicates concisely, effectively and accurately, demonstrating scientific literacy in a range of modes, styles, representations, and genres for specific audiences and purposes, with appropriate evidence and accurate referencing	• designs, conducts and improves safe, ethical inquiries individually and collaboratively, that collect valid data in response to a complex question • explains causal and correlational relationships, anomalies, reliability and validity of data and representations, and explains errors • reflects on their own thinking and analyses planning, time management, use of appropriate strategies to work independently and collaboratively • communicates clearly and accurately, demonstrating scientific literacy in a range of modes, styles, representations and genres for specific audiences and purposes, with appropriate evidence and accurate referencing	• plans and conducts safe, ethical inquiries individually and collaboratively, that collect valid data in response to a question • describes relationships in data sets, reliability and validity of data and representations, and describes common errors • reflects on their own thinking and explains planning, time management, use of appropriate strategies to work independently and collaboratively • communicates accurately demonstrating scientific literacy, in a range of modes, styles, representations, and genres for specific purposes, with appropriate evidence and mostly consistent referencing	• follows a procedure to conduct safe, ethical inquiries individually and collaboratively, to collect data in response to a question with varying success • identifies trends and anomalies in data and representations, with general comments about errors • reflects on their own thinking with some reference to planning, time management, use of appropriate strategies to work independently and collaboratively • communicates demonstrating some scientific literacy, in a range of modes, representations, and genres with some evidence and inconsistent referencing	• follows a procedure to conduct safe, ethical inquiries individually and collaboratively, to collect data with little or no connection to a question • identifies trends in data and representations, with little or no reference to anomalies and errors • reflects on their own thinking with little or no reference to planning, time management, use of appropriate strategies to work independently and collaboratively • communicates demonstrating limited scientific literacy, in a range of modes and representations, with inconsistent and inaccurate referencing

Achievement Standards for Science T Course – Year 11

	A student who achieves an **A** grade typically	A student who achieves a **B** grade typically	A student who achieves a **C** grade typically	A student who achieves a **D** grade typically	A student who achieves an **E** grade typically
Concepts, Models & Applications	• critically analyses the fundamental properties and functions of system components, processes and interactions, and the effects of factors across a range of scales	• analyses the fundamental properties and functions of system components, processes and interactions, and the effects of factors across a range of scales	• explains the fundamental properties and functions of system components, processes and interactions and the effects of factors across a range of scales	• describes the fundamental properties and functions, and with some description of system components, processes and interactions, and the effects of factors across a range of scales	• identifies the fundamental properties and functions of system and identifies components, processes and interactions, and the effects of factors across a range of scales
	• evaluates the nature, functions, limitations and applications of theories and models using evidence, in unfamiliar contexts	• analyses the nature, functions, limitations and applications of theories and models using evidence, in familiar contexts	• explains the nature, functions, limitations and applications of theories and models using evidence, in familiar contexts	• describes the nature, functions, limitations and applications of theories and models with supporting evidence	• identifies the nature, functions, applications, and some possible limitations of theories and models, with some evidence
	• analyses evidence with reference to models and/or theories, and develops evidence-based conclusions and evaluates limitations	• assesses evidence with reference to models and/or theories, and develops evidence-based conclusions and discusses limitations	• explains evidence with reference to models and/or theories, and develops evidence-based conclusions and identifies limitations	• describes evidence, and develops conclusions with some reference to models and/or theories	• identifies evidence, and asserts conclusions with little or no reference to models and/or theories
Contexts	• critically analyses epistemology, role of peer review, collaboration and technology in developing knowledge	• analyses epistemology, role of peer review and technology in developing knowledge	• explain epistemology, role of peer review and technology in developing knowledge	• describes the role of peer review in developing knowledge	• identifies that scientific knowledge has changed over time
	• critically analyses the influence of social, economic, ethical and cultural factors on Science	• analyses the influence of social, economic, ethical and cultural factors on Science	• explains the influence of social, economic, ethical and cultural factors on Science	• describes the influence of social, economic, ethical and cultural factors on Science	• identifies the influence of social, economic, ethical and cultural factors on Science
Inquiry Skills	• designs, conducts and improves safe, ethical and original inquiries individually and collaboratively, that collect valid, reliable data in response to a complex question	• designs, conducts and improves safe, ethical inquiries individually and collaboratively, that collect valid, reliable data in response to a question	• plans and conducts safe, ethical inquiries individually and collaboratively, that collect valid data in response to a familiar question	• follows a procedure to conduct safe, ethical inquiries individually and collaboratively, to collect data in response to a simple question with varying success	• follows a procedure to conduct safe, ethical inquiries individually and collaboratively, to collect data with little or no connection to a question
	• analyses causal and correlational relationships, anomalies, reliability and validity of data and representations, and analyses errors	• analyses causal and correlational relationships, anomalies, reliability and validity of data and representations, and discusses errors	• explains causal and correlational relationships, anomalies, reliability and validity of data and representations, and cites common errors	• describes trends, relationships and anomalies in data, identifies anomalies, and some possible sources of error	• identifies trends and relationships in data, with little or no reference to sources of error
	• analyses processes and claims, and provides a critique based on evidence, and critically analyses alternatives	• assesses processes and claims, and provides a critique with reference to evidence, and analyses alternatives	• explains processes and claims, and identifies alternatives with reference to reliable evidence	• describes processes and claims, and identifies the need for improvements with some reference to evidence	• identifies processes and the need for some improvements, with little or no reference to evidence
	• reflects with insight on own thinking and that of others, and evaluates planning, time management, and use of appropriate work strategies to work independently and collaboratively	• reflects on their own thinking and analyses planning, time management, use of appropriate work strategies to work independently and collaboratively	• reflects on their own thinking and explains planning, time management, use of appropriate work strategies to work independently and collaboratively	• reflects on their own thinking, with reference to planning and the use of appropriate work strategies to work independently and collaboratively	• reflects on their own thinking with little or no reference to planning, time management, and use of work strategies to work independently and collaboratively
	• communicates concisely, effectively and accurately, demonstrating scientific literacy in a range of modes, styles, representations, and genres for specific audiences and purposes, with appropriate evidence and accurate referencing	• communicates clearly and accurately, demonstrating scientific literacy in a range of modes, styles, representations and genres for specific audiences and purposes, with appropriate evidence and accurate referencing	• communicates accurately demonstrating scientific literacy, in a range of modes, styles, representations, and genres for specific purposes, with appropriate evidence and mostly consistent referencing	• communicates demonstrating some scientific literacy, in a range of modes, representations, and genres with some evidence and inconsistent referencing	• communicates demonstrating limited scientific literacy, in a range of modes and representations, with inconsistent and inaccurate referencing

Achievement Standards for Science A Course – Year 12

	*A student who achieves an **A** grade typically*	*A student who achieves a **B** grade typically*	*A student who achieves a **C** grade typically*	*A student who achieves a **D** grade typically*	*A student who achieves an **E** grade typically*
Concepts, Models & Applications	• analyses the fundamental properties and functions of system components, processes and interactions, and the effects of factors across a range of scales • analyse the nature, functions, limitations and applications of theories and models using evidence, in unfamiliar contexts • assesses evidence with reference to models and/or theories, and develops evidence-based conclusions and evaluates limitations	• explains the fundamental properties and functions of system components, processes and interactions, and the effects of factors across a range of scales • explains the nature, functions, limitations and applications of theories and models using evidence, in familiar contexts • explains evidence with reference to models and/or theories, and develops evidence-based conclusions and discusses limitations	• describes the fundamental properties and functions of system components, processes and interactions, and the effects of factors across a range of scales • describes the nature, functions, limitations and applications of theories and models using evidence, in familiar contexts • describes evidence with reference to models and/or theories, and develops evidence-based conclusions and identifies limitations	• describes the fundamental properties and functions of system components, processes and interactions, and the effects of one or more factors • describes the nature, functions, limitations and applications of theories and models with supporting evidence • describes evidence, and develops conclusions with some reference to models and/or theories	• identifies the fundamental properties and functions of system components, processes and interactions, and the effects of factors • identifies the nature, functions, applications, and some limitations of theories and models with some evidence • identifies evidence, and asserts conclusions with little or no reference to models and/or theories
Contexts	• analyses epistemology, role of peer review, collaboration and technology in developing knowledge • analyses the influence of social, economic, ethical and cultural factors on Science	• explains epistemology, role of peer review and technology in developing knowledge • explains the influence of social, economic, ethical and cultural factors on Science	• describes epistemology, role of peer review and technology in developing knowledge • describes the influence of social, economic, ethical and cultural factors on Science	• describes role of peer review and technology in developing knowledge • describes the influence of social, economic, ethical and cultural factors on Science	• identifies that scientific knowledge has changed over time • identifies the influence of social, economic, ethical and cultural factors on Science
Inquiry Skills	• designs, conducts and improves safe, ethical and original inquiries individually and collaboratively, that collect valid, reliable data in response to a complex question • analyses causal and correlational relationships, anomalies, reliability and validity of data and representations, and analyses errors • analyses processes and claims, and provides a critique based on evidence, and analyses alternatives • reflects with insight on own thinking and that of others and, evaluates planning, time management and use of appropriate independent and collaborative work strategies • communicates concisely, effectively and accurately, demonstrating scientific literacy in a range of modes, styles, representations, and genres for specific audiences and purposes, with appropriate evidence and accurate referencing	• designs, conducts and improves safe, ethical inquiries individually and collaboratively, that collect valid, reliable data in response to a question • analyses causal and correlational relationships, anomalies, reliability and validity of data and representations, and discusses errors • explains processes and claims, and provides a critique with reference to evidence, and proposes alternatives • reflects on their own thinking and analyses planning, time management, and use of appropriate independent and collaborative work strategies • communicates clearly and accurately, demonstrating scientific literacy in a range of modes, styles, representations and genres for specific audiences and purposes, with appropriate evidence and accurate referencing	• plans and conducts safe, ethical inquiries individually and collaboratively, that collect valid data in response to a familiar question • describes causal and correlational relationships, anomalies, reliability and validity of data and representations, and cites common errors • describes processes and claims, and identifies alternatives with reference to reliable evidence • reflects on their own thinking and explains planning, time management, and use of appropriate independent and collaborative work strategies • communicates accurately demonstrating scientific literacy, in a range of modes, styles, representations, and genres for specific purposes, with appropriate evidence and mostly consistent referencing	• follows a procedure to conduct safe, ethical inquiries individually and collaboratively, to collect data in response to a simple question with varying success • describes trends, relationships and anomalies in data, identifies anomalies, and some possible sources of error • describes processes and claims, and identifies the need for improvements with some reference to evidence • reflects on their own thinking, with reference to planning and the use of appropriate independent and collaborative work strategies • communicates demonstrating some scientific literacy, in a range of modes, representations, and genres with some evidence and inconsistent referencing	• follows a procedure to conduct safe, ethical inquiries individually and collaboratively, to collect data with little or no connection to a question • identifies trends and relationships in data, with little or no reference to sources of error • identifies processes and the need for some improvements, with little or no reference to evidence • reflects on their own thinking with little or no reference to planning, time management, and use of appropriate independent and collaborative work strategies • communicates demonstrating limited scientific literacy, in a range of modes and representations, with inconsistent and inaccurate referencing

Achievement Standards for Science T Course – Year 12

	*A student who achieves an **A** grade typically*	*A student who achieves a **B** grade typically*	*A student who achieves a **C** grade typically*	*A student who achieves a **D** grade typically*	*A student who achieves an **E** grade typically*
Concepts, Models & Applications	• critically analyses the properties and functions of system components, processes and interactions, and the interplay and effects of factors across a range of scales • evaluates applications, limitations, and predictions of theories and models to explain systems and create solutions, with evidence, in unfamiliar contexts • evaluates evidence with reference to critical analysis of models and/or theories, and develops evidence-based conclusions and evaluates limitations	• analyses the properties and functions of system components, processes and interactions, and the interplay and effects of factors across a range of scales • analyses applications, limitations, and predictions of theories and models to explain systems and create plausible solutions, with evidence in familiar contexts • analyses evidence with reference to models and/or theories, and develops evidence-based conclusions and discusses limitations	• explains the fundamental properties and functions of system components, processes and interactions, and the effects of factors across a range of scales • explains applications, limitations, and predictions of theories and models to explain systems and create plausible solutions in familiar contexts • describes evidence with reference to models and/or theories, and develops evidence-based conclusions and identifies limitations	• describes the fundamental properties and functions of system components, processes and interactions, and the effects of one or more factors • describes the nature, functions, limitations and applications of theories and models to create solutions to problems with supporting evidence • describes evidence, and develops conclusions with some reference to models and/or theories	• identifies the fundamental properties and functions of system components, processes and interactions, and some affective factors • identifies the nature, functions, limitations and applications of theories and models, and suggest solutions to problems with supporting evidence • identifies evidence, and asserts conclusions with little or no reference to models and/or theories
Contexts	• critically analyses epistemology, role of peer review, collaboration, and technology in developing knowledge • critically analyses the influence of social, economic, ethical and cultural factors on Science	• analyses epistemology, role of peer review and technology in developing knowledge • analyses the influence of social, economic, ethical and cultural factors on Science	• explains epistemology, role of peer review and technology in developing knowledge • explains the influence of social, economic, ethical and cultural factors on Science	• describes role of peer review and technology in developing knowledge • describes the influence of social, economic, ethical and cultural factors on Science	• identifies that scientific knowledge has changed over time • identifies the influence of social, economic, ethical and cultural factors on Science
Inquiry Skills	• designs, conducts and improves safe, ethical and original inquiries individually and collaboratively, that collect valid, reliable data in response to a complex question • critically analyses cause and correlation, anomalies, reliability and validity of data and representations, and critically analyses errors • evaluates processes and claims, and provides a critique based on evidence, and critically analyses alternatives • reflects with insight on own thinking and that of others, evaluates planning, time management, and use of appropriate independent and collaborative work strategies • communicates concisely, effectively and accurately, with scientific literacy in a range of modes, representations, and genres for specific audiences and purposes, and accurate referencing	• designs, conducts and improves safe, ethical inquiries individually and collaboratively, that collect valid, reliable data in response to a question • analyses cause and correlation, anomalies, reliability and validity of data and representations, and analyses errors • explains processes and claims, and provides a critique with reference to evidence, and analyses alternatives • reflects on their own thinking and analyses planning, time management, and use of appropriate independent and collaborative work strategies • communicates clearly and accurately, with scientific literacy in a range of modes, representations and genres for specific audiences and purposes, and accurate referencing	• plans and conducts safe, ethical inquiries individually and collaboratively, that collect valid data in response to a familiar question • describes causal and correlational relationships, anomalies, reliability and validity of data and representations, and discusses common errors • describes processes and claims, and identifies alternatives with reference to reliable evidence • reflects on their own thinking and explains planning, time management, and use of appropriate independent and collaborative work strategies • communicates accurately demonstrating scientific literacy, in a range of modes, representations, and genres for specific purposes, and mostly consistent referencing	• follows a procedure to conduct safe, ethical inquiries individually and collaboratively, to collect data in response to a simple question with varying success • describes trends, relationships and anomalies in data, identifies anomalies, and cites sources of error • describes processes and claims, and identifies the need for improvements with some reference to evidence • reflects on their own thinking, with reference to planning and the use of appropriate independent and collaborative work strategies • communicates demonstrating some scientific literacy, in a range of modes, representations, and genres with some evidence and inconsistent referencing	• follows a procedure to conduct safe, ethical inquiries individually and collaboratively, to collect data with little or no connection to a question • identifies trends and relationships in data with reference to sources of error • identifies processes and the need for some improvements, with little or no reference to evidence • reflects on their own thinking with little or no reference to planning, time management, and use of appropriate independent and collaborative work strategies • communicates demonstrating limited scientific literacy, in a range of modes and representations, with inconsistent and inaccurate referencing

Achievement Standards for Science M Course – Years 11 and 12

	*A student who achieves an **A** grade typically*	*A student who achieves a **B** grade typically*	*A student who achieves a **C** grade typically*	*A student who achieves a **D** grade typically*	*A student who achieves an **E** grade typically*
Concepts, Models & Applications	• describes the properties and functions of system components and processes with independence • describes system components and processes with some reference to how they are affected by factors with independence	• describes the properties and functions of system components, processes and interactions with assistance • describes system components, processes and interactions with some reference to how they are affected by factors with assistance	• identifies the properties and functions of system components, processes and interactions with independence • identifies system components, processes and interactions with independence	• identifies the properties and functions of system components, processes and interactions with assistance • identifies system components, processes and interactions with assistance	• identifies the properties and functions of system components, processes and interactions with direct instruction • identifies system components, processes and interactions with direct instruction
Contexts	• describes the impact of science on an aspect of society with independence	• describes the impact of science on an aspect of society with some independence	• identifies the impact of science on an aspect of society with independence	• identifies the impact of science on an aspect of society with assistance	• identifies the impact of science on an aspect of society with direct instruction
Inquiry Skills	• plans and conducts investigations in response to a question or problem with independence • draws evidence-based conclusions from investigations with independence • reflects on own thinking and learning in science with independence • communicates findings effectively with independence	• plans and conducts investigations in response to a question or problem with some independence • draws evidence-based conclusions from investigations with some independence • reflects on own thinking and learning in science with some independence • communicates findings effectively with some independence	• plans and conducts investigations in response to a question or problem with assistance • draws evidence-based conclusions from investigations with assistance • reflects on own thinking and learning in science with assistance • communicates findings with assistance	• plans and conducts investigations in response to a question or problem with repeated cueing • draws evidence-based conclusions from investigations with repeated cueing • reflects on own thinking and learning in science with repeated cueing • communicates findings with repeated cueing	• follows a procedure to conduct investigations to collect data with direct instruction • draws evidence-based conclusions from investigations with direct instruction • reflects on own thinking and learning in science with direct instruction • communicates findings with direct instruction

Forestry & Agroforestry — Value 1.0

Forestry & Agroforestry a — **Value 0.5**

Forestry & Agroforestry b — **Value 0.5**

Unit Description

In this unit, students learn that forests are complex systems which are influenced by the climatic and geophysical characteristics of the areas where they are found and upon which they have a significant impact. Agroforestry is a land management system which has the potential to improve the carrying capacity of land and improve outcomes for more than just land holders. Students develop their understanding of forest trees and forest types in Australia, including the components that support tree survival and growth. Students study planting and growing methods. They review the significance of trees in their environments and consider how trees influence local and global climates. They examine wood structure, timber characteristics and forest resources. Students review agroforestry systems in Australia and other countries that enhance land management. Students analyse how the introduction of trees into traditional farming systems can lead to more sustainable outcomes. Students use science inquiry skills and investigate the concept of science as a human endeavour.

Specific Unit Goals

This unit should enable students to:

A Course	T Course	M Course
• understand how forests grow and influence their surroundings	• understand how forests grow and influence their surroundings	• recall that forests grow and influence their surroundings
• understand forest types and forest trees in Australian forests	• understand forest types and forest trees in Australian forests	• recall that there are different forest types and forest trees in Australian forests
• understand the interactions of farmed trees with other agricultural systems and their importance in developing sustainable systems	• understand the interactions of farmed trees with other agricultural systems and their importance in developing sustainable systems	• recall that farmed trees are important in sustainable systems
• understand how theories and models have developed based on evidence from multiple disciplines	• understand how theories and models have developed based on evidence from multiple disciplines; and the uses and limitations of forestry and agroforestry knowledge in a range of contexts	
• use science inquiry skills to collect, analyse and communicate primary and secondary data on forests and trees in a range of setting, native to farmed land	• use science inquiry skills to collect, analyse and communicate primary and secondary data on forests and trees in a range of setting, native to farmed land	

A Course	T Course	M Course
• describe claims about forests and agroforestry	• evaluate, with reference to empirical evidence, claims about forests and trees in a range of setting, native to farmed land	
• communicate forestry understanding using qualitative representations in appropriate modes and genres	• communicate forestry understanding using qualitative and quantitative representations in appropriate modes and genres	• communicate an understanding of forestry concepts

Content Descriptions

A Course	T Course	M Course
Science Inquiry Skills		
• identify, research and construct questions for investigation, propose hypotheses and predict possible outcomes	• identify, research and construct questions for investigation propose hypotheses and predict possible outcomes	• use data to respond to questions
• conduct investigations, including the procedure/s to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics	• design investigations, including the procedure/s to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments and consider research ethics	• follow instructions to set up equipment
• conduct investigations, including collection of plant material to aid in identification, study of plant material and wood structure safely, competently and methodically for the collection of valid and reliable data	• conduct investigations, including collection of plant material to aid in identification, study of plant material and wood structure safely, competently and methodically for the collection of valid and reliable data	• conduct investigations safely, competently and methodically
• represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships	• represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships qualitatively describe sources of measurement error, and uncertainty and limitations in data; and select, synthesise and use evidence to make and justify conclusions	• represent data in useful ways

A Course	T Course	M Course
• interpret a range of scientific and media texts, and describe processes, claims and conclusions with the use of evidence	• interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments	• recall the key idea in selected scientific and media texts
• select, construct and use appropriate representations, including classification keys, forest and climate models, mathematical models for determination of tree height and volume, and farm plans	• select, construct and use appropriate representations, including classification keys, agroforestry models, mathematical models for determination of tree height and volume, and farm plans, to communicate conceptual understanding, solve problems and make predictions	• use labelled diagrams and images to aid understanding
• communicate to general audiences and use appropriate language, nomenclature, genres and modes, including scientific reports	• communicate to specific audiences and for specific purposes using appropriate language, nomenclature, genres and modes, including scientific reports and compilations of field data and research reports	• communicate to a general audience using appropriate language, about a topic
Science as A Human Endeavour		
• science is a global enterprise that relies on clear communication and international conventions	• science is a global enterprise that relies on clear communication, international conventions, peer review and reproducibility • development of complex models and/or theories often requires a wide range of evidence from multiple individuals and across disciplines	• science is a global enterprise
• advances in science understanding in one field can influence other areas	• advances in science understanding in one field can influence other areas of science, technology and engineering	• advances in science understanding in one field can influence other areas
• the use of scientific knowledge is influenced by social, economic, cultural and ethical considerations	• the use of scientific knowledge is influenced by social, economic, cultural and ethical considerations	

A Course	T Course	M Course
• the use of scientific knowledge may have beneficial and/or harmful and/or unintended consequences	• the use of scientific knowledge may have beneficial and/or harmful and/or unintended consequences	• the use of scientific knowledge may have beneficial and/or harmful consequences
• scientific knowledge can enable scientists to offer valid explanations and make reliable predictions	• scientific knowledge can enable scientists to offer valid explanations and make reliable predictions	• scientific knowledge can enable scientists to offer valid explanations and make predictions
• scientific knowledge can be used to predict economic, social and environmental impacts and actions for sustainability	• scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability	• scientific knowledge can be used to take action for sustainability
Science Understanding		
Trees and Forests		
• the critical role of trees and forests in maintenance of ecosystems, climates and soil systems	• the critical role of trees and forests in the maintenance of ecosystems, climates and soil systems	• trees help maintain ecosystems, climates and soil systems
• an introduction to the history of forestry allows for the industry in Australia and around the world to be compared and contrasted	• an introduction to the history of forestry allowing for comparison of industry in Australia and around the world with assessment of sustainability of programs	
• evolution of trees and their classification and identification explains the difference between gymnosperms and angiosperms	• evolution of trees and their classification and identification explains the difference between gymnosperms and angiosperms	• gymnosperms and angiosperms are different
• Australia has a range of forest types that can be classified depending on climate zones and land type.	• Australia has a range of forest types that can be classified depending on climate zones and land type.	• Australia has a range of forest types that can be classified depending on climate zones and land type
• identification of the trees local to the Canberra area can be carried out using dichotomous keys	• identification of the trees local to the Canberra area using dichotomous keys	• there are trees local to the Canberra area
• independent tissue systems in trees allow for nutrients and fluids to be moved through the interior and exterior of trees	• independent tissue systems in trees allow for nutrients and fluids to be moved through the interior and exterior of trees	

A Course	T Course	M Course
• the wood structure of gymnosperms and angiosperms, the similarities and differences and the resultant wood types can explain the many uses of wood in a range of settings • pinus radiata, as a case study, is a functional and practical species for timber products.	• the wood structure of gymnosperms and angiosperms, the similarities and differences and the resultant wood types, including special properties of conducting tissues within plants, can explain the many uses of wood in a range of settings • pinus radiata, as a case study, is a functional and practical species for timber products.	• models can be used to show how the wood structure of gymnosperms and angiosperms differs
Agroforestry		
• agroforestry concepts enhance the sustainability of agricultural land (pruning, windbreaks, shelter belts) • the characteristics and properties of trees explain their suitability in a range of agricultural settings as well as producing different products that have suitability for economic potential • planting of native species on farmland requires appropriate techniques e.g. root pruning, optimum plant size, protection from browsing animals and soil profile inversion • benefits of conservation programs for degraded soils are soil improvement and rehabilitation of eroded areas enhancing long term sustainability of land use • data collection techniques assess the volume of timber being grown	• agroforestry concepts enhance the sustainability of agricultural land (pruning, windbreaks, shelter belts) • the characteristics and properties of trees explain their suitability in a range of agricultural settings as well as producing different products that have suitability for economic potential • planting of native species on farmland requires appropriate techniques e.g. root pruning, optimum plant size, protection from browsing animals and soil profile inversion • benefits of conservation programs for degraded soils are soil improvement and rehabilitation of eroded areas enhancing long term sustainability of land use • data collection techniques assess the volume of timber being grown	• agroforestry is where trees are combined with traditional agriculture • different trees have different commercial uses • planting of native species on farmland needs to be carried out using appropriate techniques • conservation programs are designed to improve soil quality

A Course	T Course	M Course
• carbon farming uses farming methods that reduce greenhouse gas emissions, and/or capture and hold carbon in vegetation and soils to provide environmental and economic benefits	• carbon farming uses farming methods that reduce greenhouse gas emissions, and/or capture and hold carbon in vegetation and soils to provide environmental and economic benefits	• carbon farming helps reduce greenhouse gas emissions
• the history and use of paper and the range of materials from which it can be made highlights the value of the resource, its versatility and durability	• the history and use of paper and the range of materials from which it can be made highlighting the value of timber as a resource, its versatility and durability	• the history and use of paper and the range of materials from which it can be made
• the interaction between politics, conservation concerns and multinational companies shows the complexities of forest management	• the interaction between politics, conservation and multinational companies shows the complexities of forest management, both in Australia and internationally	

A guide to reading and implementing content descriptions

Content descriptions specify the knowledge, understanding and skills that students are expected to learn and that teachers are expected to teach. Teachers are required to develop a program of learning that allows students to demonstrate all the content descriptions. The lens which the teacher uses to demonstrate the content descriptions may be either guided through provision of electives within each unit or determined by the teacher when developing their program of learning.

A program of learning is what a college provides to implement the course for a subject. It is at the discretion of the teacher to emphasis some content descriptions over others. The teacher may teach additional (not listed) content provided it meets the specific unit goals. This will be informed by the student needs and interests.

Assessment

Refer to pages 13-17.

Forestry and Soils Value 1.0

Forestry and Soils a Value 0.5

Forestry and Soils b Value 0.5

Unit Description

In this unit, students learn that forests systems influence and are influenced by the characteristics of the trees which grow within them, the soils on which they develop and the environmental impacts they experience. Students develop their understanding of the growth requirements of forest trees and the genetic modifications which can improve various characteristics for forestry purposes. Students investigate and explain the interactions between trees and the Australian environment, looking in particular at, soils, salinity and bushfires. Students examine the specific characteristics and adaptations that Australian native plants have to their environment.

Through the investigation of appropriate contexts, students explore how forestry concepts relate to science as a human endeavour.

Students use science inquiry skills to collect, analyse and interpret data relating to the impact of climate change on forests. They critically analyse the range of factors that influence the effects of conservation issues at local, regional and global levels.

Specific Unit Goals

This unit should enable students to:

A Course	T Course	M Course
• understand the factors that influence tree growth and genetic improvement	• understand the factors that influence tree growth and genetic improvement	• list factors that influence tree growth
• understand soil formation and soil as a medium for plant growth	• understand soil formation and soil as a medium for plant growth	• recall how soil is formed and that soil is a medium for plant growth
• understand the environmental conditions in Australia that favour bushfires and the adaptations of Australian plants to bushfires	• understand the environmental conditions in Australia that favour bushfires and the adaptations of Australian plants to bushfires	• state some environmental conditions in Australia that contribute to bushfires
• understand management practices in forests, conservation issues and the link between forests and climate change	• understand management practices in forests, conservation issues and the link between forests and climate change	• describe some adaptations of Australian plants to fire
• understand how theories and models have developed based on evidence from multiple disciplines	• understand how theories and models have developed based on evidence from multiple disciplines	• state management practices in forests
• use science inquiry skills to collect, analyse and communicate primary and secondary data on tree growth and genetic improvement and the effect of bushfires	• use science inquiry skills to collect, analyse and communicate primary and secondary data on tree growth and genetic improvement and the effect of bushfires	• use science inquiry skills to collect data on tree growth and the effect of bushfires

A Course	T Course	M Course
• describe claims about tree growth and genetic improvement and the effect of bushfires	• evaluate, with reference to empirical evidence, claims about tree growth and genetic improvement and the effect of bushfires	• list claims about tree growth and the effect of bushfires

Content Descriptions

All knowledge, understanding and skills below must be delivered:

A Course	T Course	M Course
Science Inquiry Skills		
• identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes	• identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes	• use data to respond to questions
• conduct investigations, including the procedure/s to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics	• design investigations, including the procedure/s to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics	• follow instructions to set up equipment
• conduct investigations, including propagation techniques, study of factors that affect plant growth, Australian tree adaptations to fire and the environmental interactions after fires, safely, competently and methodically for the collection of valid and reliable data	• conduct investigations, including propagation techniques, study of factors that affect plant growth, Australian tree adaptations to fire and the environmental interactions after fires, safely, competently and methodically for the collection of valid and reliable data	• conduct investigations safely, competently and methodically
• represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships	• represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error, and uncertainty and limitations in data; and select, synthesise and use evidence to make and justify conclusions	• represent data in useful ways

A Course	T Course	M Course
• interpret a range of scientific and media texts, and describe processes, claims and conclusions by considering evidence	• interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments	• view selected scientific and media texts
• select and use appropriate representations, including diagrams of structures and processes; and images from different imaging techniques	• select, construct and use appropriate representations, including forest and climate models, data analysis of GIS information and secondary data from forest studies, to communicate conceptual understanding, solve problems and make predictions	• use labelled diagrams and images to aid understanding
• communicate to general audiences and for specific purposes using appropriate language, nomenclature, genres and modes, including scientific reports and compilations of field data and research reports	• communicate to specific audiences and for specific purposes using appropriate language, nomenclature, genres and modes, including scientific reports and compilations of field data and research reports	• communicate to a general audience using appropriate language, about a topic
Science As a Human Endeavour		
• science is a global enterprise that relies on clear communication and international conventions	• science is a global enterprise that relies on clear communication, international conventions, peer review and reproducibility	• science is a global enterprise
	• development of complex models and/or theories often requires a wide range of evidence from multiple individuals and across disciplines	
• advances in science understanding in one field can influence other areas	• advances in science understanding in one field can influence other areas of science, technology and engineering	• advances in science understanding in one field can influence other areas
• the use of scientific knowledge is influenced by social, economic, cultural and ethical considerations	• the use of scientific knowledge is influenced by social, economic, cultural and ethical considerations	

A Course	T Course	M Course
• the use of scientific knowledge may have beneficial and/or harmful and/or unintended consequences • scientific knowledge can enable scientists to offer valid explanations and make reliable predictions • scientific knowledge can be used to predict economic, social and environmental impacts and actions for sustainability	• the use of scientific knowledge may have beneficial and/or harmful and/or unintended consequences • scientific knowledge can enable scientists to offer valid explanations and make reliable predictions • scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability	• the use of scientific knowledge may have beneficial and/or harmful consequences • scientific knowledge can enable scientists to offer valid explanations and make predictions • scientific knowledge can be used to take action for sustainability
Science Understandings		
• propagation techniques, from seed and cuttings, can be used for forestry purposes • growth processes of plants, including shoot and root growth and apical dominance, are influenced by natural plant hormones • genetic improvement of trees can result in improvements in timber quality, growth time, girth improvement, insect resistance and general increased productivity • development of soil profiles, a, b and c soil horizons and varying conditions of weathering can produce different soils • soils are mediums of growth with different nutrient levels in a range of soil types. Some soils are better able to hold nutrients and make them available for plants	• propagation techniques, from seed and cuttings, can be used for forestry purposes • growth processes of plants, including shoot and root growth and apical dominance, are influenced by natural plant hormones • genetic improvement of trees can result in improvements to timber quality, growth time, girth improvement, insect resistance and general increased productivity • development of soil profiles, a, b and c soil horizons and varying conditions of weathering can produce different soils • soils are mediums of growth with different nutrient levels in a range of soil types. Some soils are better able to hold nutrients and make them available for plants	• grow plants from seed and cuttings • plant growth is influenced by plant hormones • there are different soil horizons and ways in which soil forms • soils are mediums of growth with different nutrient levels in a range of soil types. Some soils are better able to hold nutrients and have these available for plants

A Course	T Course	M Course
• soil structure, the relevance of particle size and shape, the manner in which soil particles clump affect plant growth	• soil structure, the relevance of particle size and shape, the manner in which soil particles clump affect plant growth	• soil structure affects plant growth
• good structure in soil and condition can help mitigate soil degradation by erosion, salinity, acidification and over tillage	• good structure in soil and condition can help mitigate soil degradation by erosion, salinity, acidification and over tillage	• good structure in soil can help stop soil degradation
• salinity is a major issue for many Australian soils	• salinity is a major issue for many Australian soils as a result of deforestation and replanting trees can mitigate these effects	
• soil organisms can enhance soil health and productivity of soils	• soil organisms can enhance soil health and productivity of soils	• soil organisms can enhance soil health and productivity of soils
• soil pH can influence nutrient availability.	• soil pH can influence nutrient availability.	• recall some factors that change soil pH
• water is important in the chemistry and physics of plant growth	• water is important in the chemistry and physics of plant growth	
• nutrient requirements for optimum growth of plants play a crucial role in plant development	• nutrient requirements for optimum growth of plants play a crucial role in plant development, deficiencies of major, minor and trace elements can have adverse effects on plants	• nutrient requirements for optimum growth of plants play a crucial role in plant development
• forest management practices vary across Australia depending on whether it is wood is for chip or saw log purpose	• forest management practices vary across Australia depending on whether wood is for chip or saw log purpose	• forest management practices vary across Australia depending on whether wood is needed for chip or saw log purpose
• bushfires have a major effect on plants and natural systems with a significant role in the ecology of forests	• bushfires have a major effect on plants and natural systems with a significant role in the ecology of forests. The frequency and intensity of fire affects the plant regimes that develop	• bushfires have a major effect on plants and natural systems with a significant role in the ecology of forests

A Course	T Course	M Course
• various plant adaptations, such as lignification and epicormic shoots, allow some plants to resist or recover from fire	• various plant adaptations, such as lignification and epicormic shoots, allow some plants to resist or recover from fire	• some trees have adaptations that enable them to recover from bushfires
• bushfires disturb soil and change nutrient availability	• bushfires disturb soil and change nutrient availability	• bushfires disturb soil and change nutrient availability
• the likelihood of bushfires can be determined by looking at fuel loads and possible ignition sources	• the likelihood of bushfires can be determined by looking at fuel loads and possible ignition sources	• there are factors that affect the likelihood of bushfires such as fuel loads, possible ignition sources and fire weather
• controlled burning of vegetation fuel load is used as a preventative measure for minimising bush-fires	• controlled burning of vegetation fuel load is used as a preventative measure for minimising bush-fires	
• fire management is an increasingly important aspect of the Australian forest experience as a result of climate change	• fire management is an increasingly important aspect of the Australian forest experience as a result of climate change	• fire management is more important for Australian forests as a result of climate change
• Geographical Information Systems (GIS) is a tool used increasingly in determining plant numbers, forest types and sustainable forest use	• Geographical Information Systems (GIS) is a tool used increasingly in determining plant numbers, forest types and sustainable forest use	• species type and numbers can be counted by different methods
• forests play a major role in managing climate change, either in sequestering or releasing carbon	• forests play a major role in managing climate change, either in sequestering or releasing carbon	• forests play a major role in managing climate change
• changing climates impact on the world forests' ability to cope with threats such as water stress, bushfires and disease	• changing climates impact on the world forests' ability to cope with threats such as water stress, bushfires and disease	• changing climates impact on the world's forests
• forest conservation issues in areas around the world are important topics for discussion, with tropical rainforests being particularly vulnerable	• forest conservation issues in areas around the world are important topics for discussion, with tropical rainforests being particularly vulnerable	• forest conservation around the world is important

A Course	T Course	M Course
• clonal forestry is a method of improving stock and can give benefits in terms of reliability of product and consistency of results and possible problems • use of genetic manipulation raises ethical considerations	• clonal forestry is a method of improving stock and can give benefits in terms of reliability of product and consistency of results but can bring about problems such as lower resistance to insect attack and less disease resistance • there are ethical considerations in genetic manipulation of tissues	• clonal forestry is a method of improving stock but sometimes has associated problems

A guide to reading and implementing content descriptions

Content descriptions specify the knowledge, understanding and skills that students are expected to learn and that teachers are expected to teach. Teachers are required to develop a program of learning that allows students to demonstrate all the content descriptions. The lens which the teacher uses to demonstrate the content descriptions may be either guided through provision of electives within each unit or determined by the teacher when developing their program of learning.

A program of learning is what a college provides to implement the course for a subject. It is at the discretion of the teacher to emphasis some content descriptions over others. The teacher may teach additional (not listed) content provided it meets the specific unit goals. This will be informed by the student needs and interests.

Assessment

Refer to pages 13-15.

Australian Biodiversity — Value 1.0

Australian Biodiversity a — Value 0.5

Australian Biodiversity b — Value 0.5

Unit Description

In the unit, *Australian Biodiversity,* students learn that Australian forests play a critical role in maintaining biodiversity. Plants and animals, particularly endemic species, have evolved over time. Students explore the range of pressures that affect Australian forests and other ecosystems. In this unit, students develop their understanding of how Australian forests evolved, looking in particular at endemic species. They investigate and analyse threats to biodiversity and forests, including habitat alteration through land clearance and changing land-use, unsustainable resource use, introduced species and climate change. Students appreciate the challenge of conserving biodiversity, and the complexity in the application of forestry concepts. Students use science inquiry skills and develop the concepts of science as a human endeavour

Specific Unit Goals

This unit should enable students to:

A Course	T Course	M Course
• understand the evolution of Australian forests	• understand the evolution of Australian forests	• recall that some plants and animals are only found in Australia
• understand threats to biodiversity, for example, forest clearance to provide agricultural land	• understand threats to biodiversity, for example, forest clearance to provide agricultural land	• recall that forests can be removed for farming lands
• understand the effect of exotic species into the Australian environment	• understand the effect of exotic species on Australian forests and examine possible remediation technique	• recall that exotic species can impact on the Australian forests
• understand the possible effects of climate change on Australian forests	• understand the possible effects of climate change on Australian forests	• recall that one organism can be used to control the population of another
• understand how theories and models have developed based on evidence from multiple disciplines	• understand how theories and models have developed based on evidence from multiple disciplines; for example, biological control techniques in a range of contexts	• recall some factors that influence climatic changes
• use science inquiry skills to collect, analyse and communicate primary and secondary data on Australian biodiversity	• use science inquiry skills to collect, analyse and communicate primary and secondary data on Australian biodiversity	• use science inquiry skills to collect data on Australian biodiversity
• describe claims about Australian biodiversity	• evaluate, with reference to empirical evidence, claims about Australian biodiversity	• list claims about Australian biodiversity

A Course	T Course	M Course
• communicate understanding of issues about conservation of biodiversity using qualitative representations in appropriate modes and genres	• communicate understanding of issues about conservation of biodiversity using qualitative and quantitative representations in appropriate modes and genres	• communicate understanding about conservation qualitatively

Content Descriptions

All knowledge, understanding and skills below must be delivered:

A Course	T Course	M Course
Science Inquiry Skills		
• identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes	• identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes	• use data to respond to questions
• conduct investigations, including the procedure/s to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics	• design investigations, including the procedure/s to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics	• follow instructions to set up practicals
• conduct investigations, including plant and animal analysis, safely, competently and methodically for the collection of valid and reliable data	• conduct investigations, including plant and animal analysis, safely, competently and methodically for the collection of valid and reliable data	• conduct investigations safely, competently and methodically
• represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships	• represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error, and uncertainty and limitations in data; and select, synthesise and use evidence to make and justify conclusions	• represent data in useful ways to identify patterns
• interpret a range of scientific and media texts, and describe processes, claims and conclusions by considering evidence	• interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments	• view selected scientific and media texts

A Course	T Course	M Course
• select and use appropriate representations, including tectonic plate modelling, climatic alterations and prediction of the effect of introducing foreign species	• select, construct and use appropriate representations, including tectonic plate modelling, climatic alterations and prediction of the effect of introducing foreign species, to communicate conceptual understanding, solve problems and make predictions	• use labelled diagrams and images to aid understanding
• communicate to general audiences and for specific purposes using appropriate language, nomenclature, genres and modes, including scientific reports and compilations of field data and research reports	• communicate to specific audiences and for specific purposes using appropriate language, nomenclature, genres and modes, including scientific reports and compilations of field data and research reports	• communicate to a general audience using appropriate language
Science as a Human Endeavour		
• ICT and other technologies have provided new tools for scientists to collect and analyse evidence	• ICT and other technologies have dramatically increased the size, accuracy and geographic and temporal scope of data sets with which scientists work	• ICT and other technologies have impacted on scientists' work
• models and theories are contested and refined or replaced when new evidence challenges them, or when a new model or theory has greater explanatory power	• models and theories are contested and refined or replaced when new evidence challenges them, or when a new model or theory has greater explanatory power	• models and theories may be changed when new evidence is produced
• the acceptance of scientific knowledge can be influenced by the social, economic and cultural context in which it is considered	• the acceptance of scientific knowledge can be influenced by the social, economic and cultural context in which it is considered	• the acceptance of scientific knowledge can be influenced by the context in which it is considered
• people can use scientific knowledge to inform the monitoring, assessment and evaluation of risk	• people can use scientific knowledge to inform the monitoring, assessment and evaluation of risk	• people can use scientific knowledge to plan
• science may not always provide definitive answers to public debate; there may be insufficient reliable data available, or interpretation of the data may be open to question	• science can be limited in its ability to provide definitive answers to public debate; there may be insufficient reliable data available, or interpretation of the data may be open to question	• science findings may be open to question if there is insufficient analysis or reliable data available
• international collaboration is often required when investing in large-scale science projects or addressing issues for the Asia-pacific region	• international collaboration is often required when investing in large-scale science projects or addressing issues for the Asia-pacific region	• international collaboration is often required in science

A Course	T Course	M Course
• scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability	• scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability	• scientific knowledge can be used to design action for sustainability
Science Understanding		
• Australia forests and other ecosystems have evolved over significant time, with unique plants and animal species	• Australia forests and other ecosystems have evolved over significant time, with unique plants and animal species	• Australia forests and other ecosystems have evolved over time
• many Australian plant and animal species are endemic due to the isolation of the Australian continent	• isolation of the Australian continent has led to interesting differences in features, such as leaves and stems that highlight adaptations, over time, for example the evolution from Glossopteris to Eucalyptus	• many Australian plant and animal species are endemic due to the isolation of the Australian continent
• conserving biodiversity of Australian forests involves examination of the issues such as land use changes, exotic species, sustainability of resource use	• conserving biodiversity of Australian forests involves examination of the issues such as land use changes, exotic species, sustainability of resource use and alternate sources of income from forest use such as in National parks	• conserving biodiversity of Australian forests involves issues such as land use changes, exotic species, sustainability of resource use
• climate change is a major issue that will affect forests in Australia, their location, vegetation types and possible uses	• climate change is a major issue that will affect forests in Australia, their location, vegetation types and possible uses	• climate change is a major issue that will affect forests in Australia
• mitigation of threats to biodiversity and policies to conserve biodiversity can be linked to forest management	• mitigation of threats to biodiversity and policies to conserve biodiversity can be linked to forest management	• forest management can be linked to biodiversity
• sustainable resource use is essential to maintain viable forests in the Australian context. Different forest types and the management practices used can provide useful case studies	• sustainable resource use is essential to maintain viable forests in the Australian context. Different forest types and the management practices used can provide useful case studies	• sustainable resource in Australian forests can provide useful case studies
• ancient examples of flora still exist in certain areas of Australia and the conflict between utilisation of these timbers and preservation is an important issue	• ancient examples of flora still exist in areas of Australia and the conflict between utilisation of these resource areas and preservation is important in context of their existence as remnant vegetation or living fossils. (Nothofagus or Wollemi pines)	• ancient examples of flora still exist in certain areas of Australia

A Course	T Course	M Course
• Proteaceae and Acacia have produced different species on different continents. Looking at species from Australia, Africa or South America can provide interesting comparisons	• Proteaceae and Acacia have produced different species on different continents. Looking at species from Australia, Africa or South America can provide interesting comparisons between, and within, species. Ecological interaction and variations, focussing on trunk, leaf and root function allows intercontinental comparisons	• looking at plant species from Australia, Africa or South America can provide interesting comparisons
• introduction of non-native species to a forest environment can have unpredicted ramifications	• introduction of non-native species to a forest environment can have unpredicted ramifications and the effect, and control methods, can be the basis of case studies of exotic plants in Australian forest ecosystems	• introduction of non-native species to a forest environment can have unpredicted results

A guide to reading and implementing content descriptions

Content descriptions specify the knowledge, understanding and skills that students are expected to learn and that teachers are expected to teach. Teachers are required to develop a program of learning that allows students to demonstrate all the content descriptions. The lens which the teacher uses to demonstrate the content descriptions may be either guided through provision of electives within each unit or determined by the teacher when developing their program of learning.

A program of learning is what a college provides to implement the course for a subject. It is at the discretion of the teacher to emphasis some content descriptions over others. The teacher may teach additional (not listed) content provided it meets the specific unit goals. This will be informed by the student needs and interests.

Assessment

Refer to pages 13-15.

Resource Management Value 1.0

Resource Management a **Value 0.5**

Resource Management a **Value 0.5**

Unit Description

Students learn that Australia contains many unique environments that are characterised by particular plant and animal species that require resource management. This unit uses case studies of distinct environments for students to develop important conceptual understandings in resource management. Management of these environments, to maintain forest trees, requires a multidisciplinary approach, looking at both land and catchment management strategies. Students examine a variety of Australian environments to highlight the differences in approach for different regions in Australia. Students explore in depth, the ecological interactions in particular forest systems. They analyse how these systems have evolved and their function in the Australian landscape. Students investigate the different types of trees present and their ecological function within these environments, possible uses of these trees for commercial gain and the management practices that would need to be in place to prevent loss of threatened species of trees.

Through the investigation of appropriate contexts, students explore how science as a human endeavour concepts develop our understanding of Australian forests and environments. Students investigate how scientific knowledge is used to offer valid explanations and reliable predictions in forestry, and the ways in which it interacts with social, economic and cultural factors, including the design of action for sustainability.

Students use science inquiry skills to collect, analyse and interpret data relating to Australian trees within different environments. They critically analyse the range of factors that influence the effects of conservation issues at local, regional and global levels.

Specific Unit Goals

This unit should enable students to:

A Course	T Course	M Course
• understand some of the complexities and fragility of the Murray-Darling River system and its uses and management	• understand the complexities and fragility of the Murray-Darling River system and the management practices and multiple uses of the system	• state some features of the Murray-Darling River ecosystems and its management
• understand the variety of trees and environmental interactions within the cold temperature rainforest in Tasmania, how the area was used and managed	• understand the variety of trees and environmental interactions within the cool temperature rainforest in Tasmania, its uses and management	• recall key ideas relating to cool temperature rainforests in Tasmania
• understand key features of the Daintree Rainforest, management practices within, and the multiple uses of, the Rainforest	• understand key features of the Daintree Rainforest, the management practices within, and the multiple uses of, the Daintree Rainforest	• recall key ideas relating to the Daintree Rainforest
• understand concepts from contemporary land-use managements	• understand concepts from contemporary land-use management such as Key techniques that are used to mitigate threats to biodiversity,	• recall some important methods of land-care

A Course	T Course	M Course
• understand how theories and models have developed based on evidence from multiple disciplines	• understand how theories and models have developed based on evidence from multiple disciplines;	
• use science inquiry skills to collect, analyse and communicate primary and secondary data on ecosystem characteristics	• use science inquiry skills to collect, analyse and communicate primary and secondary data on ecosystem characteristics	• use science inquiry skills to view data on ecosystems
• describe claims about ecosystem characteristics	• evaluate, with reference to empirical evidence, claims about ecosystem characteristics	• list claims about ecosystem characteristics
• communicate forest and ecosystem understanding using qualitative representations in appropriate modes and genres	• communicate forest, ecosystem and management strategy understanding using qualitative and quantitative representations in appropriate modes and genres	• report on forests and ecosystems qualitatively

Content Descriptions

All knowledge, understanding and skills below must be delivered:

A Course	T Course	M Course
Science Inquiry Skills		
• identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes	• identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes	• use data to respond to questions
• conduct investigations, list the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics	• design investigations, including the procedure/s to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics	• follow instructions to set up equipment.
• conduct investigations, including study of factors that determine forest and tree types in different areas of Australia, safely, competently and methodically for the collection of valid and reliable data	• conduct investigations, including study of factors that determine forest and tree types in different areas of Australia, safely, competently and methodically for the collection of valid and reliable data	• conduct investigations, safely, competently and methodically

A Course	T Course	M Course
• represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships	• represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error, and uncertainty and limitations in data; and select, synthesise and use evidence to make and justify conclusions	• represent data in useful ways
• interpret a range of scientific and media texts, and describe processes, claims and conclusions by considering evidence	• interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments	• view selected scientific and media texts
• select and use appropriate representations, including diagrams of structures and processes; and images from different imaging techniques	• select, construct and use appropriate representations, including Australian ecology models, data analysis of GIS information and secondary data, to communicate conceptual understanding, solve problems and make predictions	• use diagrams of structures and processes to aid in understanding
• communicate to a general audience using appropriate language, nomenclature, genres and modes, including scientific reports	• communicate to specific audiences and for specific purposes using appropriate language, nomenclature, genres and modes, including scientific reports and compilations of field data and research reports	• communicate to a general audience using appropriate language, about a topic
Science as a Human Endeavour		
• ICT and other technologies have dramatically increased the size, accuracy and geographic and temporal scope of data sets with which scientists work	• ICT and other technologies have dramatically increased the size, accuracy and geographic and temporal scope of data sets with which scientists work	• ICT and other technologies have provided effective data sets with which scientists work
• models and theories are contested and refined or replaced evidence challenges them with new information and evidence	• models and theories are contested and refined or replaced when new evidence challenges them, or when a new model or theory has greater explanatory power	• models and theories are changed when there is new evidence
• the acceptance of scientific knowledge can be influenced by the context in which it is considered	• the acceptance of scientific knowledge can be influenced by the social, economic and cultural context in which it is considered	

A Course	T Course	M Course
• people can use scientific knowledge to inform the monitoring, assessment and evaluation of risk	• people can use scientific knowledge to inform the monitoring, assessment and evaluation of risk	• people can use scientific knowledge to reduce risk
• science can be limited in its ability to provide definitive answers to public debate; there may be insufficient reliable data available, or interpretation of the data may be open to question	• science can be limited in its ability to provide definitive answers to public debate; there may be insufficient reliable data available, or interpretation of the data may be open to question	
• international collaboration is often required when investing in large-scale science projects or addressing issues for the Asia-Pacific region	• international collaboration is often required when investing in large-scale science projects or addressing issues for the Asia-Pacific region	• international collaboration is of benefit to science
• scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability	• scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability	• scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability
Science Understanding		
• Murray-Darling River system is a complex system of water ways, wetlands and groundwater resources that cover much of south-east Australia	• Murray-Darling River system is a complex system of water ways, wetlands and groundwater resources that cover much of south-east Australia. A case study of this river system allows for data analysis of water use, salt movement and vegetation changes over time and their interdependence	• Murray-Darling River system is an important river system that covers much of south-east Australia
• management strategies in the Murray Darling River system have had a significant effect on the native forest trees in the system	• management strategies in the Murray Darling River system have had a significant effect on the native forest trees in the system, for example, logging	• management strategies have had an effect on the local forest trees
• trees, with specific adaptations, play an integral role in maintaining the health of the river system	• trees, with specific adaptations, play an integral role in maintaining the health of the river system	• logging of the River red Gums along the river has serious short and long term consequences for this river system.
• sustainable management of the Murray-Darling Basin is complex and involves balancing many needs	• sustainable management of the Murray-Darling Basin is complex and involves balancing economic, political, social, cultural and environmental needs, examples such as carbon sequestration versus water flow studies	• sustainable management of the Murray-Darling Basin involves balancing many needs

A Course	T Course	M Course
• movement of the Australian continent over time resulted in changes in climate that lead to the formation of the current ecosystems and can provide insight into potential human induced climate change on forest environments over the coming decades	• movement of the Australian continent over time resulted in changes in climate that lead to the formation of the current ecosystems and can provide insight into potential human induced climate change on forest environments	• changes in climate over time lead to the formation of the current ecosystems and can provide insight into potential human induced climate change on forest environments over the coming decades
• the ecosystem surrounding the lake is fragile and delicate, easily impacted on by human actions	• catchment management of fragile ecosystems surrounding salt lakes can be used as case studies of ecosystems impacted upon by human actions	• the ecosystem surrounding a salt-lake is fragile and delicate, easily impacted on by interference
• Tasmanian forests include ancient rainforests of World Heritage significance such as those within the Styx, Weld and Upper Florentine valleys and the Weilangta and Tarkine regions	• Tasmanian forests include ancient rainforests of World Heritage significance such as those within the Styx, Weld and Upper Florentine valleys and the Weilangta and Tarkine regions/	• Tasmanian forests include ancient rainforests of World Heritage significance
• Tasmania contains Australia's largest tracts of cool temperate rainforest, dominated by a variety of tree species with different uses.	• Tasmania contains Australia's largest tracts of cool temperate rainforest, dominated by a variety of tree species. A case study of tree use for furniture making and building products highlights their value as a high-end resource.	• Tasmania contains Australia's largest tracts of cool temperate rainforest.
• land and catchment management within Tasmanian forests, such as those within the Styx, Weld and Upper Florentine valleys and the Weilangta and Tarkine regions covers a range of complex issues, from conservation to resource management	• land and catchment management within Tasmanian forests, such as those within the Styx, Weld and Upper Florentine valleys and the Weilangta and Tarkine regions covers a range of complex issues, from conservation to resource management	• land and catchment management within Tasmanian forests covers a range of issues, include ancient rainforests of World Heritage significance
• the Daintree Rainforest is a complex and unique Australian forest with many ancient and rare trees. Successful management of this resource is critical to its continued existence	• the Daintree Rainforest is a complex and unique Australian forest with many ancient and rare trees. Successful management of this resource is critical to its continued existence	• the Daintree Rainforest is a unique Australian forest Successful management of this resource is critical to its continued existence

A Course	T Course	M Course
• the Daintree Rainforest is under threat from human impacts including logging, farming, development, tourism and mining	• the Daintree Rainforest is under threat from human impacts including logging, farming, development, tourism and mining. A case study of the extinction of the Red Cedar will allow exploration of some complex issues surrounding forestry management practices	• the Daintree Rainforest is under threat from human impacts
• timber extraction processes vary in different Australian forests, particularly rainforests, as do the effects that these processes have on the forest ecosystems, for example, the clear-felling technique in forests can be compared with selective logging	• timber extraction processes vary in different Australian forests, particularly rainforests, as do the effects that these processes have on the forest ecosystems for example, the clear-felling technique in forests can be compared with selective logging	• compare timber extraction processes used in different Australian forests, particularly rainforests such as clear-felling and selective logging
• key landcare techniques including selecting nature reserves, connectivity and wildlife corridors, ecosystem restoration, sustainable yield, translocation and control of pest plants and animals.	• the potential of key landcare techniques for resource management including selecting nature reserves, connectivity and wildlife corridors, ecosystem restoration, sustainable yield, translocation and control of pest plants and animals.	• important land-care techniques include wild-life corridors, nature reserves and national parks and control of pest species

A guide to reading and implementing content descriptions

Content descriptions specify the knowledge, understanding and skills that students are expected to learn and that teachers are expected to teach. Teachers are required to develop a program of learning that allows students to demonstrate all the content descriptions. The lens which the teacher uses to demonstrate the content descriptions may be either guided through provision of electives within each unit or determined by the teacher when developing their program of learning.

A program of learning is what a college provides to implement the course for a subject. It is at the discretion of the teacher to emphasis some content descriptions over others. The teacher may teach additional (not listed) content provided it meets the specific unit goals. This will be informed by the student needs and interests.

Assessment

Refer to pages 13-15.

Independent Study Value 1.0

Independent Study a **Value 0.5**

Independent Study b **Value 0.5**

Prerequisite

Students must have studied at least **THREE** standard 1.0 units from this course. A student can only study a maximum of one Independent Study unit in each course. An Independent Study unit requires the principal's written approval. Independent study units are only available to individual students in Year 12. Principal approval is also required for a student in Year 12 to enrol concurrently in an Independent unit and the third 1.0 unit in a course of study.

Unit Description

An Independent Study unit has an important place in senior secondary courses. It is a valuable pedagogical approach that empowers students to make decisions about their own learning. An Independent Study unit can be proposed by an individual student for their own independent study and negotiated with their teacher. The program of learning for an Independent Study unit must meet the unit goals and content descriptions as they appear in the course.

Students use science inquiry skills to collect, analyse and interpret data relating to the study of a topic, area or issue within forestry. Students develop understandings related to the nominated study and explore the concepts of science as a human endeavour.

Specific Unit Goals

This unit should enable students to:

A Course	T Course	M-Course
• analyse the concepts underpinning the forestry topic • apply concepts to solve problems in real world situations	• analyse the concepts underpinning the forestry topic • evaluate and apply concepts to solve problems in real world situations	• describe the concepts underpinning the topic
• use science inquiry skills to design, conduct, and communicate investigations	• use science inquiry skills to design, conduct, evaluate and communicate investigations	• conduct experiments
• communicate scientific concepts using appropriate scientific terminology	• communicate scientific concepts in a range of contexts using appropriate scientific terminology	• communicate scientific concepts using appropriate terminology
• apply workplace health and safety skills • work independently and or collaboratively	• apply workplace health and safety skills • work independently and or collaboratively	• apply workplace health and safety skills • work independently and or collaboratively

Content Descriptions

All knowledge, understanding and skills below must be delivered:

A course	T course	M course
Science Inquiry Skills		
• identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes	• identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes	• use data to respond to questions
• conduct investigations, list the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics	• design investigations, including the procedure/s to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics	• follow instructions to set up equipment
• conduct investigations, safely, competently and methodically for the collection of valid and reliable data	• conduct investigations, pertaining to the study ,safely, competently and methodically for the collection of valid and reliable data	• conduct investigations, safely, competently and methodically
• interpret a range of scientific and media texts, and describe processes, claims and conclusions by considering evidence	• interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments	• view selected scientific and media texts
• communicate to a general audience using appropriate language, nomenclature, genres and modes, including scientific reports	• communicate to specific audiences and for specific purposes using appropriate language, nomenclature, genres and modes, including scientific reports and compilations of field data and research reports	• communicate to a general audience using appropriate language, about a topic
• apply ICT applications such as a basic spreadsheet and graph, data-logging where appropriate in a project	• evaluate ICT applications and apply where appropriate as a feature of a science project (e.g. spreadsheets, graphing applications, data-logging, programming, image analysis etc)	• use ICT and other technologies as appropriate

A course	T course	M course
• scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability and to influence government policy	• scientific knowledge can be used to predict economic, social and environmental impacts and to modify actions for sustainability and to influence government policy	
Science as a Human Endeavour		
• ICT and other technologies have dramatically increased the size and accuracy and scope of data sets with which scientists work	• ICT and other technologies have dramatically increased the size, accuracy and geographic and temporal scope of data sets with which scientists work	• ICT and other technologies have provided effective data sets with which scientists work
• models and theories are contested and refined or replaced when new evidence challenges them,	• models and theories are contested and refined or replaced when new evidence challenges them, or when a new model or theory has greater explanatory power	• models and theories are changed when there is new evidence
• the acceptance of scientific knowledge can be influenced by the context in which it is considered	• the acceptance of scientific knowledge can be influenced by the social, economic and cultural context in which it is considered	
• people can use scientific knowledge to inform the monitoring, assessment and evaluation of risk	• people can use scientific knowledge to inform the monitoring, assessment and evaluation of risk	• people can use scientific knowledge to reduce risk
• science can be limited in its ability to provide definitive answers to public debate; there may be insufficient reliable data available, or interpretation of the data may be open to question	• science can be limited in its ability to provide definitive answers to public debate; there may be insufficient reliable data available, or interpretation of the data may be open to question	
• international collaboration is often required when investing in large-scale science projects or addressing issues for the Asia-Pacific region	• international collaboration is often required when investing in large-scale science projects or addressing issues for the Asia-Pacific region	• international collaboration is of benefit to science
• scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability	• scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability	• scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability

A course	T course	M course
Science Understanding		
• analyse how technological advancements have contributed to a greater understanding of forest environments	• evaluation of how technological advancements have contributed to a greater understanding of forest environments	• describe technological advancements in understanding the forest environment
• discussion of principles, concepts and applications of forestry within the defined topic	• evaluation of principles, concepts and applications of forestry within the defined topic	• describe how a scientific principle or concept is applied in forestry
• explain the interconnectedness of biological, physical, geological and or chemical systems and processes within forestry	• synthesise the interconnectedness of biological, physical, geological and or chemical systems and processes within forestry	
• describe human impacts/ natural events impact forest environment	• evaluate human impacts/ natural events impact on forest environments	• discuss man and or nature's impact on the forest environment

A guide to reading and implementing content descriptions

Content descriptions specify the knowledge, understanding and skills that students are expected to learn and that teachers are expected to teach. Teachers are required to develop a program of learning that allows students to demonstrate all the content descriptions. The lens which the teacher uses to demonstrate the content descriptions may be either guided through provision of electives within each unit or determined by the teacher when developing their program of learning.

A program of learning is what a college provides to implement the course for a subject. It is at the discretion of the teacher to emphasis some content descriptions over others. The teacher may teach additional (not listed) content provided it meets the specific unit goals. This will be informed by the student needs and interests.

Assessment

Refer to pages 13-15.

Appendix A – Implementation Guidelines

Available course patterns

A standard 1.0 value unit is delivered over at least 55 hours. To be awarded a course, students must complete at least the minimum units over the whole minor, major, major/minor or double major course.

Course	Number of standard units to meet course requirements
Minor	Minimum of 2 units
Major	Minimum of 3.5 units

Units in this course can be delivered in any order.

Prerequisites for the course or units within the course

For the Independent Study Unit (if applicable), students must have studied a minimum of **THREE** standard 1.0 units from this course. An Independent Study unit requires the principal's written approval. Independent study units are only available to individual students in Year 12.

Arrangements for students continuing study in this course

Students who studied the previous course may undertake any units in this course provided there is no duplication of content.

Duplication of Content Rules

Students cannot be given credit towards the requirements for a Senior Secondary Certificate for a unit that significantly duplicates content in a unit studied in another course. The responsibility for preventing undesirable overlap of content studied by a student rests with the principal and the teacher delivering the course. Students will only be given credit for covering the content once.

Units from other courses

No units from other courses can be included in this Forestry course.

Guidelines for Delivery

Program of Learning

A program of learning is what a school provides to implement the course for a subject. This meets the requirements for context, scope and sequence set out in the Board endorsed course. Students follow programs of learning in a college as part of their senior secondary studies. The detail, design and layout of a program of learning are a college decision.

The program of learning must be documented to show the planned learning activities and experiences that meet the needs of particular groups of students, taking into account their interests, prior knowledge, abilities and backgrounds. The program of learning is a record of the learning experiences that enable students to achieve the knowledge, understanding and skills of the content descriptions. There is no requirement to submit a program of learning to the OBSSS for approval. The Principal will need to sign off at the end of Year 12 that courses have been delivered as accredited.

Content Descriptions

Are all content descriptions of equal importance? No. It depends on the focus of study. Teachers can customise their program of learning to meet their own students' needs, adding additional content descriptions if desired or emphasising some over others. A teacher must balance student needs with their responsibility to teach all content descriptions. It is mandatory that teachers address all content descriptions and that students engage with all content descriptions.

Half standard 0.5 units

Half standard units appear on the course adoption form but are not explicitly documented in courses. It is at the discretion of the college principal to split a standard 1.0 unit into two half standard 0.5 units. Colleges are required to adopt the half standard 0.5 units. However, colleges are not required to submit explicit documentation outlining their half standard 0.5 units to the BSSS. Colleges must assess students using the half standard 0.5 assessment task weightings outlined in the framework. It is the responsibility of the college principal to ensure that all content is delivered in units approved by the Board.

Moderation

Moderation is a system designed and implemented to:

- provide comparability in the system of school-based assessment
- form the basis for valid and reliable assessment in senior secondary schools
- involve the ACT Board of Senior Secondary Studies and colleges in cooperation and partnership
- maintain the quality of school-based assessment and the credibility, validity and acceptability of Board certificates.

Moderation commences within individual colleges. Teachers develop assessment programs and instruments, apply assessment criteria, and allocate Unit Grades, according to the relevant Course Framework. Teachers within course teaching groups conduct consensus discussions to moderate marking or grading of individual assessment instruments and unit grade decisions.

The Moderation Model

Moderation within the ACT encompasses structured, consensus-based peer review of Unit Grades for all accredited courses over two Moderation Days. In addition to Moderation Days, there is statistical moderation of course scores, including small group procedures, for T courses.

Moderation by Structured, Consensus-based Peer Review

Consensus-based peer review involves the review of student work against system wide criteria and standards and the validation of Unit Grades. This is done by matching student performance with the criteria and standards outlined in the Achievement Standards, as stated in the Framework. Advice is then given to colleges to assist teachers with, or confirm, their judgments. In addition, feedback is given on the construction of assessment instruments.

Preparation for Structured, Consensus-based Peer Review

Each year, teachers of Year 11 are asked to retain originals or copies of student work completed in Semester 2. Similarly, teachers of a Year 12 class should retain originals or copies of student work completed in Semester 1. Assessment and other documentation required by the Office of the Board of Senior Secondary Studies should also be kept. Year 11 work from Semester 2 of the previous year is presented for review at Moderation Day 1 in March, and Year 12 work from Semester 1 is presented for review at Moderation Day 2 in August.

In the lead up to Moderation Day, a College Course Presentation (comprised of a document folder and a set of student portfolios) is prepared for each A, T and M course/units offered by the school and is sent into the Office of the Board of Senior Secondary Studies.

The College Course Presentation

The package of materials (College Course Presentation) presented by a college for review on Moderation Days in each course area will comprise the following:

- a folder containing supporting documentation as requested by the Office of the Board through memoranda to colleges, including marking schemes and rubrics for each assessment item
- a set of student portfolios containing marked and/or graded written and non-written assessment responses and completed criteria and standards feedback forms. Evidence of all assessment responses on which the Unit Grade decision has been made is to be included in the student review portfolios.

Specific requirements for subject areas and types of evidence to be presented for each Moderation Day will be outlined by the Board Secretariat through the *Requirements for Moderation Memoranda* and Information Papers.

Visual evidence for judgements made about practical performances

It is a requirement that schools' judgements of standards to practical performances (A/T/M) be supported by visual evidence (still photos or video).

The photographic evidence submitted must be drawn from practical skills performed as part of the assessment process.

Teachers should consult the BSSS website for current information regarding all moderation requirements including subject specific and photographic evidence.

Appendix B – Course Developer

Name	College
Cate Rosier	Narrabundah College

Appendix C – Common Curriculum Elements

Common curriculum elements assist in the development of high-quality assessment tasks by encouraging breadth and depth and discrimination in levels of achievement.

Organisers	Elements	Examples
create, compose and apply	apply	ideas and procedures in unfamiliar situations, content and processes in non-routine settings
	compose	oral, written and multimodal texts, music, visual images, responses to complex topics, new outcomes
	represent	images, symbols or signs
	create	creative thinking to identify areas for change, growth and innovation, recognise opportunities, experiment to achieve innovative solutions, construct objects, imagine alternatives
	manipulate	images, text, data, points of view
analyse, synthesise and evaluate	justify	arguments, points of view, phenomena, choices
	hypothesise	statement/theory that can be tested by data
	extrapolate	trends, cause/effect, impact of a decision
	predict	data, trends, inferences
	evaluate	text, images, points of view, solutions, phenomenon, graphics
	test	validity of assumptions, ideas, procedures, strategies
	argue	trends, cause/effect, strengths and weaknesses
	reflect	on strengths and weaknesses
	synthesise	data and knowledge, points of view from several sources
	analyse	text, images, graphs, data, points of view
	examine	data, visual images, arguments, points of view
	investigate	issues, problems
organise, sequence and explain	sequence	text, data, relationships, arguments, patterns
	visualise	trends, futures, patterns, cause and effect
	compare/contrast	data, visual images, arguments, points of view
	discuss	issues, data, relationships, choices/options
	interpret	symbols, text, images, graphs
	explain	explicit/implicit assumptions, bias, themes/arguments, cause/effect, strengths/weaknesses
	translate	data, visual images, arguments, points of view
	assess	probabilities, choices/options
	select	main points, words, ideas in text
identify, summarise and plan	reproduce	information, data, words, images, graphics
	respond	data, visual images, arguments, points of view
	relate	events, processes, situations
	demonstrate	probabilities, choices/options
	describe	data, visual images, arguments, points of view
	plan	strategies, ideas in text, arguments
	classify	information, data, words, images
	identify	spatial relationships, patterns, interrelationships
	summarise	main points, words, ideas in text, review, draft and edit

Appendix D – Glossary of Verbs

Verbs	Definition
Analyse	Consider in detail for the purpose of finding meaning or relationships, and identifying patterns, similarities and differences
Apply	Use, utilise or employ in a particular situation
Argue	Give reasons for or against something
Assess	Make a Judgement about the value of
Classify	Arrange into named categories in order to sort, group or identify
Compare	Estimate, measure or note how things are similar or dissimilar
Compose	The activity that occurs when students produce written, spoken, or visual texts
Contrast	Compare in such a way as to emphasise differences
Create	Bring into existence, to originate
Demonstrate	Give a practical exhibition an explanation
Describe	Give an account of characteristics or features
Discuss	Talk or write about a topic, taking into account different issues or ideas
Evaluate	Examine and judge the merit or significance of something
Examine	Determine the nature or condition of
Explain	Provide additional information that demonstrates understanding of reasoning and /or application
Extrapolate	Infer from what is known
Hypothesise	Put forward a supposition or conjecture to account for certain facts and used as a basis for further investigation by which it may be proved or disproved
Identify	Recognise and name
Interpret	Draw meaning from
Investigate	Planning, inquiry into and drawing conclusions about
Justify	Show how argument or conclusion is right or reasonable
Manipulate	Adapt or change
Plan	Strategize, develop a series of steps, processes
Predict	Suggest what might happen in the future or as a consequence of something
Reflect	The thought process by which students develop an understanding and appreciation of their own learning. This process draws on both cognitive and affective experience
Relate	Tell or report about happenings, events or circumstances
Represent	Use words, images, symbols or signs to convey meaning
Reproduce	Copy or make close imitation
Respond	React to a person or text
Select	Choose in preference to another or others
Sequence	Arrange in order
Summarise	Give a brief statement of the main points
Synthesise	Combine elements (information/ideas/components) into a coherent whole
Test	Examine qualities or abilities
Translate	Express in another language or form, or in simpler terms
Visualise	The ability to decode, interpret, create, question, challenge and evaluate texts that communicate with visual images as well as, or rather than, words

Appendix E – Glossary for ACT Senior Secondary Curriculum

Courses will detail what teachers are expected to teach and students are expected to learn for year 11 and 12. They will describe the knowledge, understanding and skills that students will be expected to develop for each learning area across the years of schooling.

Learning areas are broad areas of the curriculum, including English, mathematics, science, the arts, languages, health and physical education.

A **subject** is a discrete area of study that is part of a learning area. There may be one or more subjects in a single learning area.

Frameworks are system documents for Years 11 and 12 which provide the basis for the development and accreditation of any course within a designated learning area. In addition, frameworks provide a common basis for assessment, moderation and reporting of student outcomes in courses based on the framework.

The **course** sets out the requirements for the implementation of a subject. Key elements of a course include the rationale, goals, content descriptions, assessment, and achievement standards as designated by the framework.

BSSS courses will be organised into units. A unit is a distinct focus of study within a course. A standard 1.0 unit is delivered for a minimum of 55 hours generally over one semester.

Core units are foundational units that provide students with the breadth of the subject.

Additional units are avenues of learning that cannot be provided for within the four core 1.0 standard units by an adjustment to the program of learning.

An **Independent Study unit** is a pedagogical approach that empowers students to make decisions about their own learning. Independent Study units can be proposed by a student and negotiated with their teacher but must meet the specific unit goals and content descriptions as they appear in the course.

An **elective** is a lens for demonstrating the content descriptions within a standard 1.0 or half standard 0.5 unit.

A **lens** is a particular focus or viewpoint within a broader study.

Content descriptions refer to the subject-based knowledge, understanding and skills to be taught and learned.

A **program of learning** is what a college develops to implement the course for a subject and to ensure that the content descriptions are taught and learned.

Achievement standards provide an indication of typical performance at five different levels (corresponding to grades A to E) following completion of study of senior secondary course content for units in a subject.

ACT senior secondary system **curriculum** comprises all BSSS approved courses of study.

Appendix F – Course Adoption

Condition of Adoption

This course and units are consistent with the philosophy and goals of the college and as an adopting college have the human and physical resources to implement the course.

Adoption Process

Course adoption must be initiated electronically by an email from the principal or their nominated delegate to bssscertification@ed.act.edu.au. A nominated delegate must CC the principal.

The email will include the **Conditions of Adoption** statement above, and the table below adding the **College** name, **Course** title, **A** and/or **T** and/or **M** and/or **V** to the **Classification/s** section of the table, and the relevant **Framework**.

College:						
Course Title:	**Forestry**					
Classification/s:	**A**	**T**	**M**			
Framework:	Science 2020					
Dates of Course Accreditation:			**from**	2018	**to**	2022