

Nature Study in Australia – Past, Present and a Desirable Future

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Natural history has been important in western civilization since Aristotle published the *History of Animals* in the 4th Century until modern times through the extraordinary popularity of naturalist Sir David Attenborough's books, television series and films. Despite natural history having laid the foundation for many advances in biology, Nature study in Australian schools has been in decline after once playing an important role, especially in the curriculum of elementary schools. Nature study and its accompanying field work is now less common in the crowded curriculum which must accommodate considerable laboratory and 'inside' work, reflecting the multiple sub-disciplines that now constitute biology. A future is envisioned where the value of study of nature is re-invigorated; one that will better prepare citizens for a world in which there are serious environmental challenges, especially in terms of loss of biodiversity and climate change.

Key words: *Australia, field work, natural history, nature study*

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INTRODUCTION

Natural history is the study and documented recording of nature, usually by adults. In contrast, Nature study is here taken to mean the study of nature in schools. Field work is an integral component of both Nature study and natural history.

Natural history as a systematic study dates back to the Ancient Greeks, documented in Aristotle's pioneering observations of animals in his *History of Animals* in the 4th Century BC (see Balme, 1991). It progressed through the Renaissance and Enlightenment eras to the 19th Century exemplified in Charles Darwin's revolutionary naturalist contribution to evolutionary biology in his *Origin of Species* published in 1859. In today's times Sir David Attenborough has globally popularised natural history with over 98 popular natural history documentaries such as *Life on Earth* broad-

casted in 1979 (BBC, 2023 – see Websites list that attracted an estimated 500 million viewers alone (Wikipedia, 2022 – see Websites list). More recently a single episode of Planet Earth II broadcast in 2016 attracted 1.8 million viewers in the 16 – 35 years age bracket (BBC, 2022 – see Websites list).

Remarkable strides in biological knowledge have been achieved over many centuries which have relied on naturalist knowledge as the foundation for generation of broader transdisciplinary biological and ecological breakthroughs. Why then does Nature study appear to be valued less in the 21st C education school curricula in Australia than previously? Given Australia's rich and unique biodiversity status as one of only 12 megadiverse countries in the world (Iberdrola, 2023 – see Websites list), should Australia be complacent in edu-

cating the next generation to understand and most importantly *value* the natural environment?

Nature study typically involves field work where school students immerse themselves in nature, not only acquiring knowledge about the natural world, but often developing an empathy with nature that results in their supporting conservation and other environmental causes. Nature study has existed in school curricula in Australia since the States federated in 1901. While it often involved in-classroom work such as dissection of flowers, readings from books and teachers' lectures, there has been an encouragement for outdoor work that formed the basis for field studies as well as exemplifying the more progressive practices in education at the time.

Here I review Nature study in Australian (mainly Victorian) schools from when it became established into new syllabi in 1902, through to the decline in modern era, and then provide an envisioned future.

Why study nature?

Nature study involves careful observation, an enquiring mind and an aesthetic appreciation of and understanding about the natural world. It can also develop empathy by students *for* the environment. Given the environmental challenges we face today, it is important we develop a pro-active, knowledgeable citizenry who are concerned about environmental degradation and loss of biodiversity. Furthermore, Nature study can lead children in their later lives to become naturalists who will be able to provide experimental ecologists with the keen observations and raw data that their models, hypotheses and experiments require (Noss, 1996). Kitano (2004) reported the study of nature encourages students to learn outdoors in the field and there is emerging evidence this can have significant

mental and physical health benefits (Ayotte-Beaudet and Berrigan, 2022 – see Websites list; Mann *et al.*, 2022).

NATURE STUDIES IN AUSTRALIAN SCHOOL CURRICULA

The beginning

Australia was settled by the British in the late 18th Century and the Colony of Port Phillip (later to become the State of Victoria) in the early 19th Century. Federation of the colonies occurred in 1901 to form the Commonwealth of Australia.

In the 1800s the view of Australian nature was that it be subdued and exploited and changed to reflect that of England (Kass, 2014a; Price, 2019). For example, the Victorian Acclimatization Society was established in 1861 to introduce flora and fauna (especially game birds and mammals) from 'home' to Australia. The consequences of these introductions were unforeseen, "there was never a body of men so foolishly, so vigorously, and so disastrously wrong" (Rolls 1984, p. 210). The legacy today is severe and deleterious impacts on the environment from major introduced pests such as rabbits, European carp and various deer species (Tout-Smith, 2003 – see Websites list).

A comparable imperial view was reflected in the school curriculum that "inculcated respect for British society's hierarchical order based on fixed lines of race, class and gender" (Price, 2019, p. 119). The *Irish National Readers* formed the basis of the Victorian school curriculum from 1851 to 1877. These texts were graded for different age levels and, while deemed pedagogically sound, included many Bible stories and tales about European domestic and wild mammals (Price, 2019).

In 1861, the *Irish National Readers* were revised in Great Britain in response to criticisms

about their content and how poorly they were graded. Subsequently Victoria adopted a revised curriculum with some minor adaptations to an Australian context in 1871. Many Australian educators and the public began to query the relevance of the revised Readers, especially their Irish context and frequent reference to religion. There was an emerging recognition of Australian literature, art and nature, and thus a move to discard the Irish Readers from the State's curriculum; replaced by another set of readers from Ireland called the *Royal Readers* in 1877, which still referred extensively to British animals and plants with few Australian references. Those that did mention Australia were rather disparaging. For example, the Australian biota was "strange and unlike those of other countries", Aborigines were "a very wild and savage race" and it "is a pretty sight to see wild rabbits running over the fields" (quotes from *The Royal Readers II and III* cited by Price, 2019).

Concern for relevant nature content in the education syllabus during the mid to late 1800s reflected the emerging interest in Australian nature by the wider community in general. In 1874, for example, the Linnaean Society of New South Wales (see Websites list) was established to "promote the Cultivation and Study of the Science of Natural History in all its branches" and the Society has published its Proceedings since 1875. In 1880, the Field Naturalists Club of Victoria (FNCV) was formed with the joint aims of studying and preserving nature; its highly regarded journal *The Victorian Naturalist* was first published in 1884. The FNCV held monthly meetings at which members gave presentations and displayed items of interest. Regular field trips were held. Some of the most popular activities with the public were the Club's annual conversaziones (public illustrated lectures);

in 1889 over 700 people attended (Presland, 2016). Wildflower shows were held annually from 1881 in conjunction with the conversazione, with ordinary meetings or larger exhibitions arranged by other organisations. Subsequent shows included other natural history exhibits besides flowers which also proved extremely popular with the public. The FNCV continues today with a strong membership, a journal published every two months, nine special interest groups and with regular meetings and field trips. Importantly, one of the groups is set up for children.

Despite the increased interest in Australian natural history (and Australian history, literature and art), *The School Paper*, introduced in 1896 to replace *Royal Readers* in Victoria, still reflected Australia's British colonization and remained the mandatory reading material in Victorian elementary schools (called primary schools in Australia) until deemed obsolete 72 years later in 1968. Its' founding editor argued *The School Paper* aimed to acquaint children with the great prose and poetic works of our literature, acquaint them with classic stories of the ages, and develop in them an understanding love of Victoria, of Australia, of the British Empire, and through these, of humanity (Price, 2019). Most importantly, *The School Paper* also aimed to develop a love of nature in students.

New Education Movement

The New Education Movement, also known as Progressive Education, emerged through several initiatives in Europe and the USA late in the 19th Century (Kass, 2014a; Haenggeli-Jenni, 2020 – see Websites list). It placed the student (as opposed to the teacher) at the centre and incorporated scientific research findings from psychology, anthropology and biology. The teaching focused on student experiential and experimental learning and included

topics such as Nature study, agriculture, woodwork, sewing and moral education, as well as more traditional academic subjects. From 1891 a series of important Nature study schoolbooks were produced in the USA (Jackman, 1891; Scott, 1901; Bailey, 1903) that Kass (2014b) believes had a major influence on Australian elementary school curricula.

The emergence of Nature study in Australian schools thus reflected many of the aspects of New Education. In Victoria, Frank Tate, then Director of Education, enthusiastically embraced the benefits of Nature study in his introduction to the textbook by Gillies and Hall (1903). In doing so, Tate quoted from Charles Hodge's earlier (1859) book:

"Nature study is learning those things in Nature that are best worth knowing, to the end of doing those things that make life worth living. as soon as this truth began to influence educational practice, as soon as teachers began to feel the unreality and dead formalism of so much of school education, there should have arisen the cry – Back to natural methods! Back to the study of Nature herself!". (Tate, 1903, p. ix).

And later,

"Nature study answers satisfactorily to every test the educator may apply. Are we concerned with the intellectual aspect of mental training chiefly, then no subject can give more interesting and effective exercise in close and sustained observation, in comparison and generalization, in collecting and systematizing truths, and in working out the causes and results of observed facts. But best of all, no subject satisfies so thoroughly the emotional and aesthetic necessities so strong in the child's nature..." (Tate, 1903, p. x).

The obituary for Tate noted:

"He has been responsible for so many reforms and developments that one can only give a survey of his major achievements. He aimed to make the school a happy place an efficient instrument for the training of the young in citizenship and an integral part of the community in which it was situated. In the early 20th Century Mr. Tate advocated education as opposed to instruction - in other words development of the mind instead of cramming it with more or less useless facts. He believed that pupils should be taught to think and to reason to read and to comprehend to listen and to understand. The schoolroom and the school surroundings should be made as beautiful as possible. Every school should take an interest in beautifying its grounds and improving the waste lands of the community. This idea led to the Schools Endowment Plantation scheme by which pupils were encouraged to plant waste areas with trees and to teach the community that trees were worthwhile and necessary." (Seitz, 1939, p. 10).

Tate was commended for his strong support for Nature study when its introduction was met with derision by some educators who considered it a "frill" or a "fad" (Leach, 1929). Nature study thus not only taught students *about* nature and the environment, it also stressed learning occurring *in* the environment and importantly *for* the environment.

Western Australia was the first Australian state to reform its elementary school curriculum in light of the New Education movement from 1896, but Kass (2014a) notes that Nature study was treated in the curriculum as a means of economic development by emphasizing the importance of agriculture and rural education. Nature study was introduced later into the Victorian elementary schools in 1902 and two years later in New South

Wales where it was placed in order of importance only behind English and Mathematics (Kass, 2014a, 2018). The other Australian states followed soon after, although each state had its own version of the new curriculum for elementary school students.

In addition to *The School Paper*, other significant texts and resources were produced to provide student learning materials in Nature study (Gillies and Hall, 1903; Gillies, 1904a, b; Long, 1905; Leach, 1929). Kass (2018) highlighted an important article published by Hamilton (1904) that directed teachers to authoritative texts, discussed methodologies and gave practical suggestions for teaching the subject in New South Wales schools. Hamilton's article was published before the Victorian Charles Long's lecture *The Aim and Method in Nature Study* was given and published in 1905. Leach (1929) included an appendix that not only provided notes on the aims, principles and methods of Nature study, but many practical suggestions for teachers that followed on from his earlier guides for teachers (Leach, 1905, 1909).

There is no doubt Nature study in elementary schools had a major impact on students' knowledge about and attitude to nature, but the extent of this impact surely depended on the teacher and their school's support for the subject. My personal recollection of Nature study in elementary school in the 1950s was that we studied nature in the classroom with virtually no field work, reading from *The School Paper*, listening to radio broadcasts from well-known naturalist, Phillip Crosbie Morrison, and being a member of a national bird conservation group known as the Gould League of Bird Lovers. The experience of other students was much more fulfilling (Price, 2019).

Nature study in the current curriculum

From the 1950s Nature study in Australian schools has evolved into various forms, from natural science, through to science, then to environmental education and now in components of education for sustainability. A criticism of Nature study has been its failure to be sufficiently scientific. This criticism in Australian schools was championed by teacher educator Thistle Harris who, as early as 1945 urged science be taught in elementary schools that

- avoided animistic and mystical explanations of the natural world
- downplayed purely observational activities
- avoided developing an appreciation of or sympathy with nature
- encouraged proper scientific investigation (Kass, 2014a).

Harris produced two books for elementary science teachers – one for New South Wales (Harris 1945a) and the other for Victoria (Harris 1954). She also wrote resource books on natural history for adults (Harris, 1945b) and Nature study for children (Harris, 1945c).

Today, a national Australian curriculum is adapted by the states as it is they who have legislative responsibilities for school education. In Victoria, the Victorian Curriculum and Assessment Authority (VCAA) designs and oversees implementation of the preparatory level to year 10 (F – 10) high school curricula for compulsory school levels in eight study areas (subjects), of which science is one. The program levels are meant to reflect learning achievements rather than actual school levels and are grouped into three categories:

- Foundation stage (Prep to grade 2)
- Breadth stage (3 – 8)
- Pathways stage (9 – 10).

There are also four pre-Foundations levels A to D for students with special needs.

The VCAA also has responsibility for senior secondary school (years 11 – 12) curricula in which students complete a Victorian Certificate of Education (VCE). Major reforms of the VCE have been announced, that will be fully implemented by 2025.

Details of these curricula can be found in the VCAA Web site (VCAA (a-d) – see Websites list).

So, what elements of Nature study are still taught in Victorian schools? Up to level 10, Nature study is covered in the study area of Science. Two themes permeate through the curriculum – Science Understanding and Science as Inquiry. In the seven stated aims of the Science study area, the terms “aesthetics,” “sympathy” and “appreciation” (in terms of nature) are not found. The components of the curriculum relevant to nature are listed in Table 1 (at the end of this paper).

In the VCE, two science subjects have relevance to nature study: Biology and Environmental Science. Tables 2 and 3 (at the end of this paper) document the very limited time devoted to what might be traditionally called Nature study. As with the F – 10 programs, there is no mention of appreciation, empathy or sympathy with nature or aesthetic beauty of nature. A subject in the study area of the humanities is Outdoor and Environmental Studies (VCAA, 2016) that emphasizes humans’ uses of outdoor environments (Table 4: at the end of this paper). This subject clearly exemplifies many of the aspects covered in traditional Nature study, but the enrolments are low (Table 5). In Victoria, students typically take five subjects in their final year of high school, with English the only compulsory one. However, areas covered in Outdoor and Environmental Studies include field work, observing and recording nature, ecology, environ-

mental degradation, conflicts in environmental processes and health benefits of nature.

But what of adults interested in nature – the naturalists who pursue natural history?

In an early issue of the prestigious journal *Conservation Biology*, editor Reed Noss decried the decline in natural history and field work. He claimed it was so much easier for biologists to become “keyboard” ecologists, tied to their computers and models than undertaking the laborious and tedious field work that is so important in providing the significant observations and primary data for experimental biologists. Grants to collect observational data outdoors are hard to obtain. Earlier, Evans (1985) had noted that natural history had the insulting descriptor of “alpha ecology” as it is thought by many to have little or no potential for generating ideas. Noss (1996, p. 2) argued we are becoming increasingly separated from nature. He stated

“One of our [conservation biologists] most crucial roles in society is as spokespersons for Nature.We are asked...for our professional opinions on which conditions will favour the conservation of biodiversity... and which will not. What will we look to for help in answering these difficult questions? Our computer models?

Table 5: Student enrolments in Unit 4 (final year of high school) for relevant subjects mentioned in the text*

Subject	Unit 4 enrolment 2021
English	45,660
Biology	15,028
Outdoor & Environmental Studies	2,563
Environmental Science	1,206

*Source: <https://www.acara.edu.au/reporting/national-report-on-schooling-in-australia/year-12-subject-enrolments> <accessed: 18/02/2023>

Our GIS software? The World Wide Web? Yes, in part. But if we apply these tools in the absence of a firm foundation in field experience, void of the ‘naturalist’s intuition’ that is gained only by many years of immersion in raw Nature and through ceaseless hunger for knowledge about living things, we are sure to go astray.”

Such a sentiment was also expressed in Victoria when the FNCV’s journal *The Victorian Naturalist* was threatened with closure (Larkin, 1970). Fortunately, it stayed the course and continued to publish natural history and descriptive ecological studies and with the advent of electronic publishing, no longer faces the huge costs incurred in purely hard copy journal production.

Why has Nature study declined in schools?

The decline in Nature study, field work, natural history and development of a love of nature has many causes:

- Nature study is considered too unscientific; Natural history is looked down upon by practicing, experimental ecologists. Given the challenges humanity faces in climate change, biodiversity loss, pollution and environmental degradation, these studies should be considered highly with suitable funding to support field work.
- The school curriculum is too crowded. There are so many competing calls on student time that nature study and its high time commitment loses out. Even Biology has many competing sub-disciplines that squeeze descriptive ecology from the curriculum. For example, there seems to have been a shift from understanding the fundamental nature of form and function in the traditional sciences to scientific and technical literacy – inquiry, exploration and experimentation.

- Workplace safety “red tape” makes it too difficult to take students into the field. Safety forms must be completed, parental approval obtained, safe operating procedures followed, timetables switched – these factors make outdoor studies difficult.

An envisioned future

I am sure there are other arguments. But given the seriousness of the environmental problems we face, then surely it is imperative we revert to a school curriculum that supports teaching *about, in and for* nature? A future is envisioned in which school students are immersed in the natural environment and encouraged to explore and observe its intricacies. As the students progress, they apply a scientific framework to their astute observations about nature. As for adult learners, their studies in Biology and Environmental Studies lead to the foundations of natural history being incorporated into curricula as bases for experimental studies. Universities will stop insisting academics only publish in the highest category of prestigious journals and encourage staff to write for a wider, lay audience who read natural history publications and “lower-status” journals. Government and industry should support funding for teaching and research in field work that develops foundation knowledge based on meticulous and significant observation and provides the source information for policy decisions.

CONCLUSION

The view of nature in Australian education has undergone many changes. Post European settlement, nature was a set of resources to be exploited and dominated, and studies reflected the British heritage. Acclimatization societies flour-

ished as European settlers yearned for an environment that reminded them of home.

The New Education movement that swept Europe and the United States in the late 19th Century saw a transformation in the elementary school curriculum towards self-directed, experiential learning in the natural environment. Students were encouraged to appreciate nature's aesthetic beauty and develop an empathy for nature through compulsory Nature studies programs introduced in the early 20th Century. By the 1960s interest in the descriptive aspects of Nature studies was replaced by a more inductive, scientific approach resulting in Nature studies being taken over by subjects such as Natural Science, Biology and Environmental Studies.

In Victorian senior high schools, the only subject that reflects the philosophy and tenets of Nature study is Outdoor and Environmental Studies, a subject that is grouped with humanities subjects and not science.

A future is envisioned in which student immersion in nature is returned, respected and valued. When students study science in their later years, Natural history is retained as a core basis for biology and environmental science, and adults continue to enjoy, learn about and advocate for the environment in their capacity as naturalists.

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Table 1: Science curricula content and elaborations for levels F to 10*

<i>Content description</i>	<i>Elaborations</i>
Science/ Foundation to Level 2/ Science understanding/ Biological sciences	
Living things have a variety of external features and live in different places where their basic needs, including food, water and shelter are met	<ul style="list-style-type: none"> • recognizing common features of animals • describing the use of animal body parts for particular purposes e.g. moving, feeding • identifying common features of plants e.g. leaves, roots • recognizing that different living things live in different places e.g. land, water • exploring what happens when habitats change and some living things can no longer have their needs met
Living things grow, change and have offspring similar to themselves	<ul style="list-style-type: none"> • representing personal growth and changes from birth • exploring different characteristics of animal life stages e.g. butterflies, frogs
Science/ Levels 3 and 4 / Science understanding/ Biological sciences	
Living things can be grouped on the basis of observable features and be distinguished from non-living things	<ul style="list-style-type: none"> • exploring differences between living, once living and products of living things • identifying variations in the features of plants e.g. leaf colour and shape, number of legs • identifying variations in the features of animals e.g. body coverings, ear shapes, numbers of legs
Living things have different life cycles and depend on each other and the environment to survive	<ul style="list-style-type: none"> • making and recording observations of living things as they develop through their life cycles e.g. insects, birds, frogs, plants • recognizing that environmental factors can affect life cycles e.g. fire and seed germination • investigating the roles of living things in a habitat e.g. producers, consumers, decomposers • predicting the effects when living things in feeding relationships are lost
Science/ Levels 5 and 6 / Science understanding/ Biological sciences	
Living things have structural features and adaptations that help them to survive in their different environments	<ul style="list-style-type: none"> • explaining how particular adaptations aid survival e.g. nocturnal behaviour, silver coloured leaves of dune plants • describing and listing of adaptations of living things for particular Australian environments
The growth and survival of living things are affected by the physical conditions of the environment	<ul style="list-style-type: none"> • observing the growth of fungi e.g. yeast and bread mould in different temperature conditions • investigating how changing the physical conditions for plants impact on their growth and survival e.g. changing salt water concentrations using fertilisers or transferring to a different soil type • researching organisms that live in extreme environments e.g. Antarctica, deep sea, desert
Science/ Levels 7 and 8 / Science understanding/ Biological sciences	
There are differences between groups of organisms, classification helps organize this diversity	<ul style="list-style-type: none"> • grouping a variety of organisms on the basis of similarities and differences in certain features • classifying using hierarchical systems e.g. kingdom, through to species • using scientific conventions for naming species • using provided keys to identify organisms surveyed in a local habitat

Interactions between organisms can be described in terms of food chains and webs and can be affected by human activity	<ul style="list-style-type: none"> • constructing and interpreting food chains and webs to show relationships between organisms and the environment • recognizing the rate of microorganisms within food chains and webs • researching examples of human impacts on specific ecosystems e.g. Aboriginal use of fire, palm oil harvesting, deforestation, agricultural practices, introduction of new species
Science/ Levels 9 and 10 / Science understanding/ Biological sciences	
Multicellular organisms rely on coordinated and interdependent internal systems to respond to changes in the environment	<ul style="list-style-type: none"> • describing how the requirements for life are provided through body functions and systems e.g. circulatory • explaining using models, flow diagrams and simulations how body systems work together to maintain life • response of the body to changes resulting from presence of microorganisms
Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems	<ul style="list-style-type: none"> • exploring interactions between organisms e.g. predator/prey, pollinators, competitors • modelling to examine factors that affect population size e.g. introduced species, seasonal changes • ecosystem changes with environmental changes e.g. fire, drought, floods
The theory of evolution by natural selection explains the diversity of living things and is supported by a range of scientific evidence	<ul style="list-style-type: none"> • biodiversity as a function of evolution • natural selection – variation, isolation and selection • changes by natural selection e.g. selective breeding • evidence for evolution e.g. fossils, chemical and anatomical similarities, geographical distribution

*Source: <https://victoriancurriculum.vcaa.vic.edu.au/science/introduction/scope-and-sequence> <accessed: 18/02/2023>

Table 2: VCE Biology Study Designs – scope and activity relevant to Nature study*

VCE Biology

Scope: The study of Biology explores the diversity of life as it has evolved and changed over time, and considers how living organisms function and interact. It explores the processes of life, from the molecular world of the cell to that of the whole organism and examines how life forms maintain and ensure their continuity. Students study contemporary research, models and theories to understand how knowledge in biology has developed and how this knowledge continues to change in response to new evidence and discoveries. An understanding of the complexities and diversity of biology provides students with the opportunity to appreciate the interconnectedness of concepts and areas both within biology, and across biology and the other sciences.

Field work: Based on inquiry or the investigation of an issue, fieldwork involves observing and interacting with a selected environment beyond the classroom, usually in an attempt to determine correlation, rather than a causal relationship. It may be conducted through direct qualitative and/or quantitative observations and sampling, participant observation, interviews and questionnaires.

*Source: <https://www.vcaa.vic.edu.au/Documents/vce/biology/2022BiologySD.docx> <accessed: 18/02/2023>.

Table 3: VCE Environmental Science Study Designs – scope and material relevant to Nature study***VCE Environmental Science**

Scope: Environmental science is an interdisciplinary, investigative science that explores the interactions and interconnectedness between humans and their environments and analyses the functions of both living and non-living elements that sustain Earth systems. Students investigate the extent to which humans modify their environments and the consequences of these changes in local and global contexts with a focus on biodiversity, pollution, food and water security, climate change and energy use. Students examine the challenges and opportunities presented by selected environmental issues and case studies, and consider how different value systems, priorities, knowledge and regulatory frameworks affect environmental decision-making and planning for a sustainable future.

Fieldwork: Based on inquiry or the investigation of an issue, fieldwork involves observing and interacting with a selected environment beyond the classroom, usually in an attempt to determine correlation, rather than a causal relationship. It may be conducted through direct qualitative and/or quantitative observations and sampling, participant observation, interviews and questionnaires.

Area of Study 1: How are Earth’s systems organised and connected? Living organisms are able to survive in ecosystems as diverse as deserts, sea beds, the tropics and Antarctica, as well as in backyard gardens and ponds. In this area of study students analyse the range of components and processes that contribute to ecosystem functioning, and examine how events occurring in one of Earth’s four interrelated systems can affect all systems to support life on Earth.

*Source: <https://www.vcaa.vic.edu.au/Documents/vce/envscience/2022EnvironmentalScienceSD.docx> <accessed: 18/02/2023>

Table 4: VCE Outdoor and Environmental Studies Study Designs – scope and material relevant to Nature study*

Scope: VCE Outdoor and Environmental Studies is concerned with the ways humans interact with and relate to outdoor environments. ‘Outdoor environments’ covers environments that have minimum influence from humans, as well as those environments that have been subject to different levels of human intervention. The study enables students to make critically informed comment on questions of environmental sustainability and to understand the importance of environmental health, particularly in local contexts.

Unit 1: Area of Study 1 - Motivations for outdoor experiences

In this area of study students examine motivations for and responses to nature and outdoor experiences. They investigate a range of contemporary uses and meanings of the term ‘nature’ and examine a variety of different types of outdoor environments. Students are introduced to a cultural perspective on the ways humans relate to outdoor environments. *Key knowledge* includes the

- range of differing personal responses to outdoor environments, such as fear, appreciation, awe and contemplation
- a variety of ways in which people know, experience and respond to outdoor environments:
 - as a resource, for recreation and adventure, spiritual connection and
 - as a study site through experiential knowledge, environmental history and ecological, social and economic perspectives.

Unit 2: Area of Study 1 - Investigating outdoor environments

This area of study introduces students to the characteristics of a variety of outdoor environments, including those visited during practical outdoor experiences. Students investigate different types of outdoor environments from a number of perspectives. They undertake case studies of different types of outdoor environments to observe and experience how changes to nature affect people. *Key knowledge* includes:

- scientific understandings of specific outdoor environments, including:
 - interrelationships between biotic and abiotic components
 - effects of natural changes to environments on people and places such as day to night, seasons, tides, flood, drought, migration, succession, and climate change

- the effect fire (both wildfire and controlled burns) has on the environment
- artistic, Indigenous, and historical understandings of specific outdoor environments.

Unit 3: Area of Study 1 - Relationships with outdoor environments

The focus of this unit is the ecological, historical and social contexts of relationships between humans and outdoor environments in Australia. Case studies of a range of impacts on outdoor environments are examined in the context of the changing nature of human relationships with outdoor environments in Australia. *Key knowledge* includes

- an overview of Australian outdoor environments before humans, including characteristics of biological isolation, geological stability, and climatic variations
- relationships with Australian outdoor environments expressed by specific Indigenous communities before and after European colonisation
- relationships with Australian outdoor environments as influenced by: the first non-Indigenous settlers' experiences; increasing population; industrialisation; nation building
- the foundation and role of environmental movements in changing relationships with outdoor environments, in relation to at least one of the following: Lake Pedder (Tasmania) The Little Desert (Victoria) The Franklin River (Tasmania)
- the impact of increasing environmental awareness in Australia on the policies of political parties.

Unit 4: Area Study 1 - Healthy outdoor environments

In this unit students explore the sustainable use and management of outdoor environments. They examine the contemporary state of environments in Australia, consider the importance of healthy outdoor environments, and examine the issues relating to the capacity of outdoor environments to support the future needs of the Australian population. *Key knowledge* includes

- understandings and critiques of sustainability and sustainable development
- observable characteristics of healthy outdoor environments, including:
 - quality and adequacy of water, air and soil
 - amount of biodiversity
 - –amount of pest and introduced species
- the state of outdoor environments in Australia, with reference to common themes used in the current national State of the Environment report
- the importance of healthy outdoor environments for individual physical and emotional wellbeing, and for the future of society
- the potential impact on society and outdoor environments of land degradation, introduced species, climate change, urbanisation and other significant threats.

Unit 4: Area of Study 2 - Sustainable outdoor environments

This area of study explores the contemporary state of outdoor environments in Australia and the importance of outdoor environments for individuals and society. Students examine the nature of sustainability and use observations to evaluate the health of outdoor environments. They investigate current and potential damage to outdoor environments and the subsequent impacts. *Key knowledge* includes

- at least two recent or current conflicts over the use of outdoor environments, including at least one from the following: – marine national parks and sanctuaries – grazing in the Alpine National Park – desalination plant at Wonthaggi – proposed Great Forest National Park – extraction of coal seam gas
- the methods used by individuals and groups to influence decisions about the use of outdoor environments
- the processes followed by land managers and/or governments or their agencies relating to conflicts over the use of outdoor environments, including community consultations, use of court systems, legislation and management plans
- management strategies for achieving and maintaining healthy and sustainable outdoor environments that may be adopted by public and private land managers
- acts or conventions related to the management and sustainability of outdoor environments actions undertaken to sustain healthy outdoor environments.

*Source: <https://www.vcaa.vic.edu.au/Documents/vce/outdoor/2018OutdoorEnviroStdsSD.pdf> <accessed: 22/11/2022>.