

Natural Resources

| American River College

The Natural Resources Department within the Science & Engineering Division has developed new A.S. degree and certificate programs in Environmental Conservation that recognize the change in emphasis in this field's academics and job market.

Environmental Conservation is an interdisciplinary program that advances understanding of ecological systems and their interrelationships, including those with human society. Core study involves plant and animal ecology and natural history, field methods and study design, and conservation and management of ecosystems and natural resources. Students are able to focus their studies in conservation and sustainability; plant ecology, conservation and management; and/or vertebrate ecology, conservation and management. This program covers a wide range of environmental studies, provides many unique opportunities for hands-on and real-world field experience, and prepares students for a variety of careers as well as transfer at the upper division level to academic programs involving environmental sciences.

An increasing number of sectors of the labor market in California, the U.S., and beyond, require knowledge and skills emphasizing conservation and management of plant and animal populations and their habitats, sustainable resource use, and an enhanced understanding of the environment. This program prepares students for entry-level work in a variety of industries and settings, including private firms, nonprofit organizations, and government agencies at the local, state, and federal levels. Students receive not only rigorous instruction in the theory and application of environmental sciences but unique hands-on training as well.

ARC is now a partner organization with the UC California Naturalist program. Learn more at the [UC California Naturalist website](http://calnat.ucanr.edu/) (<http://calnat.ucanr.edu/>).

</academics/arc-program-road-maps>

DIVISION DEAN [Dr. Rina Roy \(/about-us/faculty-and-staff-directory/rina-roy\)](/about-us/faculty-and-staff-directory/rina-roy)

 [Science & Engineering Division Office \(/academics/arc-science-and-engineering-division-office\)](/academics/arc-science-and-engineering-division-office)

DEPARTMENT CHAIR [Jennifer Neale \(/about-us/faculty-and-staff-directory/jennifer-neale\)](/about-us/faculty-and-staff-directory/jennifer-neale)

 (916) 484-8107

 [BettenS@arc.losrios.edu \(mailto:BettenS@arc.losrios.edu\)](mailto:BettenS@arc.losrios.edu)

Associate Degrees

A.S. in Environmental Conservation

Environmental Conservation is an interdisciplinary program that advances the understanding of ecological systems and their interrelationships, including those with human society. Core study involves plant and animal ecology and natural history, field methods and study design, and conservation and management of ecosystems and natural resources. Students have the opportunity to choose among courses in the areas of conservation and sustainability; plant ecology, conservation, and management; and vertebrate ecology, conservation and management. This program covers a wide range of environmental studies, provides many unique opportunities for hands-on and real-world field experience, and prepares students for a variety of careers as well as transfer at the upper division level to academic programs involving environmental sciences.

Degree Requirements

COURSE CODE	COURSE TITLE	UNITS
BIOL 300	The Foundations of Biology (3)	3 - 5
or BIOL 301	Evolution (3)	

COURSE CODE	COURSE TITLE	UNITS
or BIOL 303	Survey of Biology (4)	
or BIOL 310	General Biology (4)	
or BIOL 400	Principles of Biology (5)	
NATR 300	Introduction to Natural Resource Conservation and Policy	4
NATR 310	Study Design and Field Methods	4
NATR 320	Principles of Ecology	4
A minimum of 16 units from the following:		16 ¹
BIOL 305	Natural History (4)	
BIOL 332	Introduction to Ornithology (4)	
BIOL 352	Conservation Biology (3)	
BIOL 370	Marine Biology (4)	
GEOG 300	Physical Geography: Exploring Earth's Environmental Systems (3)	
GEOG 330	Introduction to Geographic Information Systems (3)	
GEOG 300	Physical Geology (3)	
HORT 302	Soils, Soil Management, and Plant Nutrition (3)	
NATR 302	Introduction to Wildlife Biology (4)	
NATR 303	Energy and Sustainability (3)	
NATR 304	The Forest Environment (3)	
NATR 305	Fisheries Ecology and Management (4)	
NATR 306	Introduction to Rangeland Ecology and Management (3)	
NATR 307	Principles of Sustainability (4)	
NATR 322	Environmental Restoration (2)	
NATR 324	Field Studies: Birds and Plants of the High Sierra (1.5)	
NATR 330	Native Trees and Shrubs of California (4)	
NATR 332	Wildflowers of California (3)	
NATR 346	Water Resources and Conservation (3)	
NATR 498	Work Experience in Natural Resources (1 - 4)	
Total Units:		31 - 33

¹At least 10 of the 16 units must come from NATR courses.

The Environmental Conservation Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See ARC graduation requirements.

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- apply scientific methodologies and critical analysis to environmental investigations
- evaluate natural resource systems, including their past and present use and management, and future sustainability
- analyze social, ethical, and biological implications of environmental management alternatives
- identify ecological phenomena in one's everyday experiences and apply ecological principles to understand local, national, and global environmental

issues

- assess the relationships of plants and animals to their environment and to each other
- measure, analyze, and monitor biological and physical components of the environment
- evaluate basic land survey, water quality, soils, vegetation, and wildlife data
- examine the significance of biodiversity conservation

Career Information

An increasing number of sectors of the labor market in California, the U.S., and beyond, require knowledge and skills emphasizing conservation and management of plant and animal populations and their habitats, sustainable resource use, and an enhanced understanding of the environment. This program prepares students for entry-level work in a variety of industries and settings, including private firms, nonprofit organizations, and government agencies at the local, state, and federal levels. Students receive not only rigorous instruction in the theory and application of environmental sciences, but also unique hands-on training.

A.S. in General Science

This program provides a broad study in the fields of biological and physical sciences in preparation for transfer to a four-year program and continuation of studies in upper division science courses.

Degree Requirements

COURSE CODE	COURSE TITLE	UNITS
A minimum of 18 units from the following:		18 ¹
Physical Science Courses		
ASTR 300	Introduction to Astronomy (3)	
ASTR 310	The Solar System (3)	
ASTR 320	Stars, Galaxies, and Cosmology (3)	
ASTR 330	Introduction to Astrobiology (3)	
ASTR 400	Astronomy Laboratory (1)	
ASTR 481	Honors Astronomy: Stars, Galaxies, and Cosmology (4)	
ASTR 495	Independent Studies in Astronomy (1 - 3)	
ASTR 499	Experimental Offering in Astronomy (0.5 - 4)	
CHEM 305	Introduction to Chemistry (5)	
CHEM 306	Introduction to Organic and Biological Chemistry (5)	
CHEM 309	Integrated General, Organic, and Biological Chemistry (5)	
CHEM 310	Chemical Calculations (4)	
CHEM 400	General Chemistry I (5)	
CHEM 401	General Chemistry II (5)	
CHEM 420	Organic Chemistry I (5)	
CHEM 421	Organic Chemistry II (5)	
CHEM 423	Organic Chemistry - Short Survey (5)	
CHEM 495	Independent Studies in Chemistry (1 - 3)	
CHEM 499	Experimental Offering in Chemistry (0.5 - 4)	

COURSE CODE	COURSE TITLE	UNITS
GEOG 300	Physical Geography: Exploring Earth's Environmental Systems (3)	
GEOG 301	Physical Geography Laboratory (1)	
GEOG 305	Global Climate Change (3)	
GEOG 306	Weather and Climate (3)	
GEOG 307	Environmental Hazards and Natural Disasters (3)	
GEOG 308	Introduction to Oceanography (3)	
GEOG 309	Introduction to Oceanography Lab (1)	
GEOG 391	Field Studies in Geography: Mountain Landscapes (1 - 4)	
GEOG 392	Field Studies in Geography: Coastal Landscapes (1 - 4)	
GEOG 393	Field Studies in Geography: Arid Landscapes (1 - 4)	
GEOG 394	Field Studies in Geography: Volcanic Landscapes (1 - 4)	
GEOG 495	Independent Studies in Geography (1 - 3)	
GEOG 499	Experimental Offering in Geography (0.5 - 4)	
GEOL 300	Physical Geology (3)	
GEOL 301	Physical Geology Laboratory (1)	
GEOL 305	Earth Science (3)	
GEOL 306	Earth Science Laboratory (1)	
GEOL 310	Historical Geology (3)	
GEOL 311	Historical Geology Laboratory (1)	
GEOL 320	Global Climate Change (3)	
GEOL 325	Environmental Hazards and Natural Disasters (3)	
GEOL 330	Introduction to Oceanography (3)	
GEOL 331	Introduction to Oceanography Lab (1)	
GEOL 345	Geology of California (3)	
GEOL 390	Field Studies in Geology (1 - 4)	
GEOL 495	Independent Studies in Geology (1 - 3)	
GEOL 499	Experimental Offering in Geology (0.5 - 4)	
PHYS 310	Conceptual Physics (3)	
PHYS 311	Basic Physics (3)	
PHYS 312	Conceptual Physics Laboratory (1)	
PHYS 350	General Physics (4)	
PHYS 360	General Physics (4)	
PHYS 410	Mechanics of Solids and Fluids (5)	
PHYS 421	Electricity and Magnetism (4)	
PHYS 431	Heat, Waves, Light and Modern Physics (4)	
PHYS 495	Independent Studies in Physics (1 - 3)	
PHYS 499	Experimental Offering in Physics (0.5 - 4)	
PS 300	Introduction to Physical Science (3)	
PS 301	Physical Science Laboratory (1)	

COURSE CODE	COURSE TITLE	UNITS
PS 495	Independent Studies in Physical Science (1 - 3)	
PS 499	Experimental Offering in Physical Science (0.5 - 4)	
Biological Science Courses		
ANTH 300	Biological Anthropology (3)	
ANTH 301	Biological Anthropology Laboratory (1)	
ANTH 303	Introduction to Forensic Anthropology (3)	
ANTH 370	Primatology (3)	
ANTH 372	Primatology Field Studies (2)	
ANTH 480	Honors Biological Anthropology (3)	
ANTH 495	Independent Studies in Anthropology (1 - 3)	
ANTH 499	Experimental Offering in Anthropology (0.5 - 4)	
BIOL 300	The Foundations of Biology (3)	
BIOL 301	Evolution (3)	
BIOL 303	Survey of Biology (4)	
BIOL 305	Natural History (4)	
BIOL 310	General Biology (4)	
BIOL 322	Ethnobotany (3)	
BIOL 332	Introduction to Ornithology (4)	
BIOL 342	The New Plagues: New and Ancient Infectious Diseases Threatening World Health (3)	
BIOL 352	Conservation Biology (3)	
BIOL 370	Marine Biology (4)	
BIOL 375	Marine Ecology (3)	
BIOL 390	Natural History Field Study (0.5 - 4)	
BIOL 400	Principles of Biology (5)	
BIOL 410	Principles of Botany (5)	
BIOL 415	Introduction to Biology: Biodiversity, Evolution, and Ecology (5)	
BIOL 420	Principles of Zoology (5)	
BIOL 430	Anatomy and Physiology (5)	
BIOL 431	Anatomy and Physiology (5)	
BIOL 440	General Microbiology (4)	
BIOL 442	General Microbiology and Public Health (5)	
BIOL 482	Honors Marine Biology (4)	
BIOL 495	Independent Studies in Biology (1 - 3)	
BIOL 499	Experimental Offering in Biology (0.5 - 4)	
BIOT 301	Biotechnology and Human Health (3)	
BIOT 305	Introduction to Bioinformatics (1)	
BIOT 307	Biotechnology and Society (2)	
BIOT 311	Biotechnology Laboratory Methods - Molecular Techniques (2)	
BIOT 312	Biotechnology Laboratory Methods - Microbial and Cell Culture Techniques (2)	

COURSE CODE	COURSE TITLE	UNITS
BIOT 499	Experimental Offering in Biology (0.5 - 4)	
NATR 300	Introduction to Natural Resource Conservation and Policy (4)	
NATR 302	Introduction to Wildlife Biology (4)	
NATR 303	Energy and Sustainability (3)	
NATR 304	The Forest Environment (3)	
NATR 305	Fisheries Ecology and Management (4)	
NATR 306	Introduction to Rangeland Ecology and Management (3)	
NATR 307	Principles of Sustainability (4)	
NATR 310	Study Design and Field Methods (4)	
NATR 320	Principles of Ecology (4)	
NATR 322	Environmental Restoration (2)	
NATR 324	Field Studies: Birds and Plants of the High Sierra (1.5)	
NATR 330	Native Trees and Shrubs of California (4)	
NATR 332	Wildflowers of California (3)	
NATR 346	Water Resources and Conservation (3)	
NATR 495	Independent Studies in Natural Resources (1 - 3)	
NATR 499	Experimental Offering in Natural Resources (0.5 - 4)	
PSYC 310	Biological Psychology (3)	
PSYC 311	Biological Psychology Laboratory (1)	
PSYC 495	Independent Studies in Psychology (1 - 3)	
PSYC 499	Experimental Offering in Psychology (0.5 - 4)	
Total Units:		18

¹must be transfer-level and must include one laboratory course in a physical science and one laboratory course in a biological science

The General Science Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See ARC graduation requirements.

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- evaluate new and accepted ideas about the natural universe using scientific methods.
- analyze a wide variety of natural phenomena using basic definitions and fundamental theories of biological or physical sciences.
- apply appropriate quantitative and qualitative methods to interpret and analyze pertinent data.
- outline the basic concepts and fundamental theories of a natural science.
- articulate orally and/or in writing the importance of continuous examination and modification of accepted ideas as a fundamental element in the progress of science.
- discuss ethical components of scientific decision making and apply personal and social values within the process of decision making in scientific endeavors.

Certificate of Achievement

Environmental Conservation Certificate

Environmental Conservation is an interdisciplinary program that advances the understanding of ecological systems and their interrelationships, including those with human society. Core study involves plant and animal ecology and natural history, field methods and study design, and conservation and management of ecosystems and natural resources. Students have the opportunity to choose among courses in the areas of conservation and sustainability; plant ecology, conservation, and management; and vertebrate ecology, conservation, and management. This program covers a wide range of environmental studies, provides many unique opportunities for hands-on and real-world field experience, and prepares students for a variety of entry-level positions in the area of environmental sciences and natural resources as well as transfer at the upper division level to academic programs involving environmental sciences.

Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
NATR 300	Introduction to Natural Resource Conservation and Policy	4
NATR 310	Study Design and Field Methods	4
NATR 320	Principles of Ecology	4
A minimum of 10 units from the following:		10
NATR 302	Introduction to Wildlife Biology (4)	
NATR 303	Energy and Sustainability (3)	
NATR 304	The Forest Environment (3)	
NATR 305	Fisheries Ecology and Management (4)	
NATR 306	Introduction to Rangeland Ecology and Management (3)	
NATR 307	Principles of Sustainability (4)	
NATR 322	Environmental Restoration (2)	
NATR 324	Field Studies: Birds and Plants of the High Sierra (1.5)	
NATR 330	Native Trees and Shrubs of California (4)	
NATR 332	Wildflowers of California (3)	
NATR 346	Water Resources and Conservation (3)	
NATR 498	Work Experience in Natural Resources (1 - 4)	
Total Units:		22

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- apply scientific methodologies and critical analysis to environmental investigations
- evaluate natural resource systems, including their past and present use and management, and future sustainability
- analyze social, ethical, and biological implications of environmental management alternatives
- identify ecological phenomena in one's everyday experiences and apply ecological principles to understand local, national and global environmental issues
- assess the relationships of plants and animals to their environment and to each other
- measure, analyze, and monitor biological and physical components of the environment
- evaluate basic land survey, water quality, soils, vegetation, and wildlife data

- examine the significance of biodiversity conservation

Gainful Employment

The US Department of Education requires colleges to disclose a variety of information for any program that is eligible for financial aid that "prepares students for gainful employment in a recognized occupation." The following link provides Gainful Employment Disclosure information for this certificate program:

[Gainful Employment Information for Environmental Conservation Certificate of Achievement \(https://web.losrios.edu/gainful-emp-info/arc/30589/30589.htm\)](https://web.losrios.edu/gainful-emp-info/arc/30589/30589.htm)

Career Information

An increasing number of sectors of the labor market in California, the U.S., and beyond, require knowledge and skills emphasizing conservation and management of plant and animal populations and their habitats, sustainable resource use, and an enhanced understanding of the environment. This program prepares students for entry-level work in a variety of industries and settings, including private firms, nonprofit organizations, and government agencies at the local, state, and federal levels. Students receive not only rigorous instruction in the theory and application of environmental sciences, but also unique hands-on training.

Certificates

Environmental Conservation Technician (Conservation/Restoration) Certificate

This certificate advances the understanding of ecological systems and their interrelationships, including those with human society. It focuses on ecology, field methods and study design, and conservation and management of ecosystems and natural resources, with an emphasis on environmental restoration theory and practice and global and emerging environmental and conservation issues. Topics include both the causes of ecological degradation and biodiversity loss, as well as the science of development, management, monitoring, and sustainability of restored environments. Conservation priorities and emerging environmental concerns are investigated, such as climate change, energy production, socioeconomic systems, human population, disease dynamics, species extinctions, invasive species, stresses on water resources and food-producing systems, and over-exploitation of natural resources. Emphasis is placed on development of strategies for the establishment of protected areas, monitoring and adaptive management, and conservation outside of protected areas, as well as an understanding of biodiversity at genetic, species, and community/ecosystem levels.

Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
NATR 300	Introduction to Natural Resource Conservation and Policy	4
NATR 310	Study Design and Field Methods	4
NATR 320	Principles of Ecology	4
BIOL 352	Conservation Biology (3)	2 - 3
or NATR 322	Environmental Restoration (2)	
Total Units:		14 - 15

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- apply the scientific method and critical analysis to environmental investigations
- evaluate natural resource systems, including their past and present use and management and future sustainability
- analyze social, ethical, and biological implications of environmental management alternatives
- identify ecological phenomena in one's everyday experiences and apply ecological principles to understand local, national and global environmental issues

- assess the relationships of plants and animals to their environment and to each other
- measure and analyze the physical environment of plant and animal populations
- evaluate basic land survey, water quality, vegetation, and vertebrate wildlife data
- investigate restoration ecology theory and assess and apply restoration practices to real-world environmental restoration problems
- identify global and emerging environmental issues and evaluate potential impacts and possible solutions
- examine biodiversity in terms of biological structure, composition, and function at the genetic, species, ecosystem and landscape levels
- apply fundamental biological and ecological concepts to the examination of critical biological conservation issues

Gainful Employment

The US Department of Education requires colleges to disclose a variety of information for any program that is eligible for financial aid that "prepares students for gainful employment in a recognized occupation." The following link provides Gainful Employment Disclosure information for this certificate program:

[Gainful Employment Information for Environmental Conservation Technician \(Conservation/Restoration\) Certificate \(https://web.losrios.edu/gainful-emp-info/arc/39705/39705.htm\)](https://web.losrios.edu/gainful-emp-info/arc/39705/39705.htm)

Career Information

This program prepares students for entry-level conservation/restoration aide/technician positions in a variety of industries and settings, including private firms, nonprofit organizations, educational institutions, and government agencies at the local, state, and federal levels. Students receive not only rigorous instruction in the theory and application of environmental sciences but also unique hands-on training in conservation and restoration. Potential job opportunities include work in the areas of survey/monitoring of threatened and endangered species and habitats, planning and execution of restoration projects, climate change adaptation for human communities, conservation advocacy, and other fields.

Environmental Conservation Technician (Fisheries) Certificate

This certificate advances the understanding of ecological systems and their interrelationships, including those with human society. It focuses on ecology, field methods and study design, and conservation and management of ecosystems and natural resources, with an emphasis on fish evolution, ecology, conservation and management. Marine and freshwater fisheries, their impacts on society and the environment, and sustainability issues are investigated, including environmental, ecological, economic, and social aspects. Commercial and recreational fisheries management and aquaculture are also explored.

Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
NATR 300	Introduction to Natural Resource Conservation and Policy	4
NATR 305	Fisheries Ecology and Management	4
NATR 310	Study Design and Field Methods	4
NATR 320	Principles of Ecology	4
Total Units:		16

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- apply the scientific method and critical analysis to environmental investigations
- evaluate natural resource systems, including their past and present use and management and future sustainability
- analyze social, ethical, and biological implications of environmental management alternatives

- identify ecological phenomena in one's everyday experiences and apply ecological principles to understand local, national and global environmental issues
- assess the relationships of plants and animals to their environment and to each other
- measure and analyze the physical environment of plant and animal populations
- evaluate basic land survey, water quality, vegetation, and wildlife data
- examine the significance of biodiversity conservation
- analyze aspects of fish evolution and ecology important to their management and synthesize basic parameters of fish population dynamics in terms of rate functions and limiting factors
- analyze function and dynamics of freshwater and marine communities, emphasizing those in temperate North America, and their associated fisheries management issues
- interpret fisheries management data, define management problems and stakeholders involved, and suggest appropriate strategies to reach management objectives

Gainful Employment

The US Department of Education requires colleges to disclose a variety of information for any program that is eligible for financial aid that "prepares students for gainful employment in a recognized occupation." The following link provides Gainful Employment Disclosure information for this certificate program:

[Gainful Employment Information for Environmental Conservation Technician \(Fisheries\) Certificate \(https://web.losrios.edu/gainful-emp-info/arc/39700/39700.htm\)](https://web.losrios.edu/gainful-emp-info/arc/39700/39700.htm)

Career Information

This program prepares students for entry-level fisheries ecologist aide/technician positions in a variety of industries and settings, including private firms, nonprofit organizations, educational institutions, and government agencies at the local, state, and federal levels. Students receive not only rigorous instruction in the theory and application of environmental sciences but also unique hands-on training in fisheries ecology, conservation, and management. Students prepare for positions in areas such as fisheries conservation and management, basic fish biology research, and aquatic habitat restoration.

Environmental Conservation Technician (Forest/Rangeland) Certificate

This certificate advances the understanding of ecological systems and their interrelationships, including those with human society. It focuses on ecology, field methods and study design, and conservation and management of ecosystems and natural resources, with an emphasis on forests and rangelands. Basic biological and physical science concepts important to a general understanding of forest and rangeland/grassland ecology, forestry, and grazing by native herbivores and livestock are investigated. History of use and management, taxonomy and ecology of plant communities, soils, pests and diseases, and disturbance regimes of forested landscapes and rangelands are explored. Classes assess current policies, multiple-use management, and emerging threats related to forest and rangeland conservation.

Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
NATR 300	Introduction to Natural Resource Conservation and Policy	4
NATR 304	The Forest Environment (3)	3
or NATR 306	Introduction to Rangeland Ecology and Management (3)	
NATR 310	Study Design and Field Methods	4
NATR 320	Principles of Ecology	4
Total Units:		15

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- apply the scientific method and critical analysis to environmental investigations
- evaluate natural resource systems, including their past and present use and management and future sustainability
- analyze social, ethical, and biological implications of environmental management alternatives
- identify ecological phenomena in one's everyday experiences and apply ecological principles to understand local, national and global environmental issues
- assess the relationships of plants and animals to their environment and to each other
- measure and analyze the physical environment of plant and animal populations
- evaluate basic land survey, water quality, vegetation, and wildlife data
- examine the significance of biodiversity conservation
- analyze important characteristics, processes, and stressors of population, community, and ecosystem dynamics of forest/rangeland environments
- evaluate social, ethical, and biological implications of forest/rangeland conservation and management alternatives, including impacts of grazing and forestry

Career Information

This program prepares students for entry-level forest/rangeland ecologist aide/technician positions in a variety of industries and settings, including private firms, nonprofit organizations, educational institutions, and government agencies at the local, state, and federal levels. Students receive not only rigorous instruction in the theory and application of environmental sciences but also unique hands-on training in forest/rangeland ecology, conservation, and management. This program prepares students for work in forestry, conservation, land management, grassland and forest ecological research, and other fields.

Environmental Conservation Technician (Sustainability) Certificate

This certificate advances the understanding of ecological systems and their interrelationships, including those with human society. It focuses on ecology, field methods and study design, and conservation and management of ecosystems and natural resources, with an emphasis on sustainability. Theoretical and practical aspects of sustainability are explored including social, economic, and environmental dimensions. Sustainable principles and practices are examined in the context of energy production and consumption, transportation systems, food production, water resources, industry, and the built environment. Environmental as well as social and cultural impacts of industrialization, capitalism, and globalization are addressed at various scales, and potential solutions to current problems are discussed.

Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
NATR 300	Introduction to Natural Resource Conservation and Policy	4
NATR 303	Energy and Sustainability (3)	3 - 4
or NATR 307	Principles of Sustainability (4)	
NATR 310	Study Design and Field Methods	4
NATR 320	Principles of Ecology	4
Total Units:		15 - 16

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- apply the scientific method and critical analysis to environmental investigations
- evaluate natural resource systems, including their past and present use and management and future sustainability
- analyze social, ethical, and biological implications of environmental management alternatives
- identify ecological phenomena in one's everyday experiences and apply ecological principles to understand local, national, and global environmental issues
- assess the relationships of plants and animals to their environment and to each other
- measure and analyze the physical environment of plant and animal populations
- evaluate basic land survey, water quality, vegetation, and wildlife data
- examine the significance of biodiversity conservation
- examine technological, geographic, socioeconomic, cultural, and environmental considerations of alternative forms of energy production
- investigate theoretical and practical aspects of sustainability in the context of energy consumption, transportation systems, food production, water resources, industry, the built environment, and socio-cultural institutions and practices

Career Information

This program prepares students for entry-level sustainability consultant/technician positions in a variety of industries and settings, including private firms, nonprofit organizations, educational institutions, and government agencies at the local, state, and federal levels. Work opportunities for program graduates include positions in environmental economics, sustainable business practices, green building, as well as sustainable communities, food systems, energy, and transportation.

Environmental Conservation Technician (Vegetation) Certificate

This certificate advances the understanding of ecological systems and their interrelationships, including those with human society. It focuses on ecology, field methods and study design, and conservation and management of ecosystems and natural resources, with an emphasis on woody and herbaceous vegetation. Major topics include plant taxonomy, natural history and life cycle, physiology, evolution, human uses of--and threats to--California native plant communities and their component species.

Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
NATR 300	Introduction to Natural Resource Conservation and Policy	4
NATR 310	Study Design and Field Methods	4
NATR 320	Principles of Ecology	4
NATR 330	Native Trees and Shrubs of California (4)	3 - 4
or NATR 332	Wildflowers of California (3)	
Total Units:		15 - 16

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- apply the scientific method and critical analysis to environmental investigations
- evaluate natural resource systems, including their past and present use and management and future sustainability

- analyze social, ethical, and biological implications of environmental management alternatives
- identify ecological phenomena in one's everyday experiences and apply ecological principles to understand local, national and global environmental issues
- assess the relationships of plants and animals to their environment and to each other
- measure and analyze the physical environment of plant and animal populations
- evaluate basic land survey, water quality, vegetation, and wildlife data
- examine the significance of biodiversity conservation
- assess the structure and function of vegetative communities of California
- interpret plant keys and develop skills in their use in plant identification
- collect and prepare a plant collection of representative native California plants
- analyze plant adaptations and environmental gradients in a variety of ecosystems
- investigate the implications of plant conservation, restoration, and community management alternatives

Career Information

This program prepares students for entry-level plant ecologist aide/technician positions in a variety of industries and settings, including private firms, nonprofit organizations, educational institutions, and government agencies at the local, state, and federal levels. Students receive not only rigorous instruction in the theory and application of environmental sciences but also unique hands-on training in plant identification, ecology, conservation, and management. Skills developed support student preparation for positions related to plant taxonomy, dendrology, research and management (e.g., of California endemics, unique environments such as vernal pools, invasive species, etc.) and environmental restoration.

Environmental Conservation Technician (Water Resources) Certificate

This certificate advances the understanding of ecological systems and their interrelationships, including those with human society. It focuses on ecology, field methods and study design, and conservation and management of ecosystems and natural resources, with an emphasis on water resources. It provides a historical perspective on water development and explores current and projected water issues. Surface water and groundwater systems are considered, with an emphasis on the interdisciplinary nature of sustainable water resource management that balances urban, agricultural, industrial, and environmental water needs. The implications of water rights and key water policies are considered in evaluating how water is used and exploited.

Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
NATR 300	Introduction to Natural Resource Conservation and Policy	4
NATR 310	Study Design and Field Methods	4
NATR 320	Principles of Ecology	4
NATR 346	Water Resources and Conservation	3
Total Units:		15

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- apply the scientific method and critical analysis to environmental investigations
- evaluate natural resource systems, including their past and present use and management and future sustainability

- analyze social, ethical, and biological implications of environmental management alternatives
- identify ecological phenomena in one's everyday experiences and apply ecological principles to understand local, national and global environmental issues
- assess the relationships of plants and animals to their environment and to each other
- measure and analyze the physical environment of plant and animal populations
- evaluate basic land survey, water quality, vegetation, and wildlife data
- examine the significance of biodiversity conservation
- describe the hydrologic cycle in both natural and urban environments, including key characteristics of surface water and groundwater resources and the interactions between these
- investigate the components of integrated water resources planning and management, including evaluation of water policy initiatives and determination of water rights
- analyze future water sustainability scenarios under uncertain conditions, including impacts of drought and climate change

Career Information

This program prepares students for entry-level water resources aide/technician positions in a variety of industries and settings, including private firms, nonprofit organizations, educational institutions, and government agencies at the local, state, and federal levels. Students receive not only rigorous instruction in the theory and application of environmental sciences but also unique hands-on training in water resources conservation and management, preparing them for positions in environmental consulting and planning, water conservation, hydrological research, and other fields.

Environmental Conservation Technician (Wildlife) Certificate

This certificate advances the understanding of ecological systems and their interrelationships, including those with human society. It focuses on ecology, field methods and study design, and conservation and management of ecosystems and natural resources, with an emphasis on vertebrate wildlife. Major topics include population ecology; community dynamics; wildlife habitat; management of game, invasive, and non-game species; conservation of threatened and endangered wildlife; and theoretical and practical tools and methods for studying wildlife, such as sampling techniques, population modeling, habitat assessment, radiotelemetry, and remote sensing.

Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
NATR 300	Introduction to Natural Resource Conservation and Policy	4
NATR 302	Introduction to Wildlife Biology	4
NATR 310	Study Design and Field Methods	4
NATR 320	Principles of Ecology	4
Total Units:		16

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- apply the scientific method and critical analysis to environmental investigations
- evaluate natural resource systems, including their past and present use and management and future sustainability
- analyze social, ethical, and biological implications of environmental management alternatives

- identify ecological phenomena in one's everyday experiences and apply ecological principles to understand local, national and global environmental issues
- assess the relationships of plants and animals to their environment and to each other
- measure and analyze the physical environment of plant and animal populations
- evaluate basic land survey, water quality, vegetation, and wildlife data
- examine the significance of biodiversity conservation
- apply and compare various wildlife habitat and population assessment techniques across a variety of environmental settings
- interpret wildlife population data and construct a population model, evaluating alternative wildlife management decisions based on computer-simulation results
- evaluate alternative wildlife management decisions in the context of ecosystem dynamics as well as and social/cultural and economic considerations

Gainful Employment

The US Department of Education requires colleges to disclose a variety of information for any program that is eligible for financial aid that "prepares students for gainful employment in a recognized occupation." The following link provides Gainful Employment Disclosure information for this certificate program:

[Gainful Employment Information for Environmental Conservation Technician \(Wildlife\) Certificate \(https://web.losrios.edu/gainful-emp-info/arc/38580/38580.htm\)](https://web.losrios.edu/gainful-emp-info/arc/38580/38580.htm)

Career Information

This program prepares students for entry-level wildlife biologist aide/technician positions in a variety of industries and settings, including private firms, nonprofit organizations, educational institutions, and government agencies at the local, state, and federal levels. Students receive not only rigorous instruction in the theory and application of environmental sciences but also unique hands-on training in wildlife ecology, conservation, and management. Participants develop skills appropriate for positions dealing with aspects of wildlife such as population sampling and monitoring, data analysis, and management/conservation of threatened, endangered, and invasive species of wildlife.

Natural Resources (NATR)

NATR 294 Topics in Natural Resources

Units:	0.5 - 5
Hours:	9 - 72 hours LEC
Prerequisite:	None.

Current topics in natural resources conservation and management not covered by regular catalog offerings are examined. Topics and field locations vary, including advanced subjects related to wildlife, fisheries, soil and water resources, conservation biology, forest resources and management, restoration ecology and aquatic ecology. Field trips may be required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- evaluate current issues and management alternatives in natural resource systems
- apply hands-on experience using current techniques of natural resource management
- examine natural resource issues that affect daily lives

NATR 300 Introduction to Natural Resource Conservation and Policy

Units:	4
Hours:	72 hours LEC
Prerequisite:	None.
Transferable:	CSU; UC
General Education:	AA/AS Area IV

This course provides a survey of concepts, issues, laws and regulations relevant to natural resources, such as soils, water, wildlife, fisheries, rangelands, and forests, with a focus on their sustainable management and conservation. Overexploitation, pollution, land use, and waste issues are integrated throughout the course. Principles, problems, and solutions are explored in the context of economics, ethics, and past, present, and future natural resource issues. Critical thinking and ecological dynamics are stressed. Sustainability, global environmental problems, and energy are major themes. It also examines the environmental regulatory process in California. Federal and California environmental laws are studied and discussed. Field trips may be required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- evaluate natural resource systems, including their past and present use and management
- analyze social, ethical, and biological implications of natural resource management alternatives
- examine natural resource issues that affect one's life
- investigate careers in natural resource conservation and management
- assess sustainability of natural resource systems under various scenarios
- explain the background, requirements, and implementation of environmental regulations
- evaluate the policies of various governmental agencies as they pertain to environmental laws enacted by Congress and by the State

NATR 302 Introduction to Wildlife Biology

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	None.
Advisory:	Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340; AND eligible for transfer-level Math.
Transferable:	CSU; UC
General Education:	AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B; IGETC Area 5C

This course is an introduction to the science of wildlife biology and the basic principles and techniques involved in wildlife research, conservation, and management. It emphasizes ecological aspects of wildlife populations and communities such as predator-prey relationships, population dynamics, diseases and parasites of wildlife, and wildlife habitat. Animal behavior, nutritional ecology, and other aspects of wildlife biology are also explored. Human dimensions of wildlife management including wildlife restoration and conservation, human-wildlife conflicts, hunting, invasive species, impacts of global climate change, and other relevant issues are examined. Social, economic, and ecological implications of management alternatives are investigated. Additionally, this course provides hands-on experience with habitat and population sampling, data analysis and interpretation; radio telemetry; wildlife capture and handling; and critical analysis of wildlife management policies and the development of a wildlife management plan. Field trips are required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply the scientific method to wildlife investigations
- assess the relationships of plants and animals to their environment and to one another

- analyze the physical environment and apply wildlife inventory techniques
- apply ecological principles to understand local, national, and global wildlife issues
- explain the significance of biodiversity to wildlife management and conservation
- interpret wildlife population data, use actual data to construct a population model, and evaluate alternative wildlife management decisions based on computer-simulated model results
- evaluate alternative wildlife resource management decisions in the context of ecosystem dynamics as well as social/cultural and economic considerations

NATR 303 Energy and Sustainability

Same As:	ENERGY 303
Units:	3
Hours:	54 hours LEC
Prerequisite:	None.
Advisory:	MATH 120, 125, 129, 133 or higher; NATR 300, or an equivalent transferable life science course; and Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300, OR ESLR 340 AND ESLW 340.
Transferable:	CSU
General Education:	AA/AS Area IV

This course investigates fundamentals of energy and impacts of energy systems on society and the environment. It explores energy resources, efficiency, conservation, and emerging technologies. Specifically addressed are mechanics, advantages, disadvantages, and sustainability of current and future energy systems. This course also focuses on economic, cultural, political, and environmental aspects of energy production and consumption in the context of the built environment, transportation, food systems, manufacturing, and public services. Field trips may be required. This course is not open to students who have completed ENERGY 303 or ET 303.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- examine the concept of sustainability as it relates to energy
- examine geographic, socioeconomic, cultural, and environmental considerations of energy production and consumption
- explain technologies involved in solar thermal, solar photovoltaic, hydroelectric (large and small scale), nuclear fission, wave/current/tidal, geothermal, biomass, and wind (onshore and offshore) energy systems
- compare conventional fossil-fuel based energy systems with current alternatives
- examine the relationships between energy production and consumption scenarios and their contributions to atmospheric greenhouse gas concentrations and air, water, and soil pollution
- evaluate alternative energy policies for North America, Europe, and the world
- interpret the results of a residential energy audit and recommend actions
- critically evaluate more sustainable approaches and practices in energy use for heating, lighting, food systems, the built environment/transportation/infrastructure, manufacturing, and public services
- examine strategies for dealing with production and consumption fluctuations and energy storage issues
- understand considerations for energy systems related to temporal and spatial scale and connectivity, including potential for distributed energy systems, aging of the electrical grid, land use conflicts, and timelines for taking newer technologies to scale

- evaluate the potential for emerging opportunities in nanotechnology and biomimicry with respect to energy systems

NATR 304 The Forest Environment

Units:	3
Hours:	54 hours LEC
Prerequisite:	None.
Advisory:	(1) MATH 120 or higher; (2) eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.
Transferable:	CSU; UC
General Education:	AA/AS Area IV

This course covers basic biological and physical science concepts important to a general understanding of forest ecology and forestry. It investigates tree anatomy and basic physiology, forest types and distributions across the World, ecological processes and species adaptations, forests of the United States and the history of their use, California forests and major tree species, soils, fire ecology and natural selection, and pests and diseases of forest trees. Additional topics include the role of fire in forest management, the science of silviculture and forestry, forest management and harvest techniques, history of the forest conservation movement, and current issues and policies related to forest resource use. Field trips are required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- analyze forest ecosystem structure, function, and management
- evaluate social, ethical, and biological implications of forest management alternatives
- examine forest resource issues that affect one's life
- explore careers in forestry and natural resources management
- identify commercial tree species in California

NATR 305 Fisheries Ecology and Management

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	None.
Advisory:	Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340; AND eligible for transfer-level math.
Transferable:	CSU
General Education:	AA/AS Area IV; CSU Area B2; CSU Area B3

This course covers the fundamentals of marine and freshwater fisheries, ecosystems, and their impacts on society and the environment. Fish life history, ecology, habitats, and population dynamics are examined. Fisheries' sustainability issues are investigated, including environmental, ecological, economic, and social aspects. Commercial and recreational fisheries management and aquaculture are covered. Field trips are required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- examine basic aspects of fisheries management, including general objectives and limitations
- investigate basic aspects of fish biology, including taxonomy, anatomy, and ecology, as each relates to fisheries management
- investigate basic types of aquatic communities and their associated fisheries management problems
- analyze function and dynamics of freshwater and marine communities, emphasizing those in temperate North America

- assess principles of fisheries management as applied to historical and current recreational and commercial fisheries
- analyze fish population dynamics in terms of rate functions and limiting factors
- interpret fisheries management data, define management problems, and suggest appropriate strategies to reach management objectives
- evaluate basic principles of aquaculture practices
- synthesize and evaluate the economic, environmental, and social issues related to fisheries management and the stakeholders involved

NATR 306 Introduction to Rangeland Ecology and Management

Units:	3
Hours:	36 hours LEC; 54 hours LAB
Prerequisite:	None.
Transferable:	CSU
General Education:	AA/AS Area IV (effective Summer 2019)

This course introduces the science of range ecology and management. It covers ecological principles that apply to rangeland ecosystems and their conservation and management, as well as the history of rangelands and their management. This course focuses on the interactions among the different components of rangelands: soils, plants, non-human animals, and people. The effects of different management systems on ecosystem services provided by rangelands are studied, including food, fiber, fuel, water, habitat, and carbon sequestration. In addition, it explores current issues and research surrounding rangeland conservation, sustainability, restoration, and climate change. Field trips are required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply ecological principles to rangeland management decisions
- explain structure-function relationships of various rangeland ecosystems
- identify the different ecosystem services that rangelands provide
- analyze socio-economic and biological implications of range management alternatives
- evaluate various management strategies and their impact on rangelands
- describe current issues in rangeland conservation

NATR 307 Principles of Sustainability

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	None.
Transferable:	CSU; UC
General Education:	AA/AS Area V(b); CSU Area D7; IGETC Area 4

Theoretical and practical aspects of sustainability are explored including social, economic, and environmental dimensions. Sustainable principles and practices are examined in the context of energy production and consumption, transportation systems, food production, water resources, industry, and the built environment. The environmental as well as social and cultural impact of industrialization is addressed, and solutions to current problems are discussed. Field trips may be required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- define and explain sustainability (including underlying ecological concepts) and sustainable development
- analyze current global food production systems and assess shortcomings and successes in meeting present and future global food demands
- evaluate the sustainability of current global energy consumption patterns and discuss proposed solutions
- investigate the causes and consequences of global climate change and loss of biodiversity and compare proposed technological and economic solutions
- critique the role of economic institutions and policies in promoting or hindering sustainable development practices
- explain the role of social, cultural, religious, economic, and gender issues in promoting sustainable development and stabilizing global population growth
- assess problems with current patterns of urban and suburban development and transportation systems and propose effective alternatives
- describe the cultural, social, and political history of the sustainability movement
- identify key issues related to sustainability and propose and communicate solutions

NATR 310 Study Design and Field Methods

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	None.
Advisory:	NATR 300; MATH 120 or higher; eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.
Transferable:	CSU
General Education:	AA/AS Area IV; CSU Area B2; CSU Area B3

This course addresses study design and field methods important to the field of natural resources. It covers basic statistical approaches and sampling designs, and introduces a variety of sampling and monitoring protocols and techniques. Field labs provide practice with a variety of hands-on methods for vertebrate study, vegetation assessment, land survey, and aquatic studies. Specific portions of the course focus on (1) survey skills including distance and direction measurement, topographic map reading, and Geographic Information Systems (GIS); (2) woody and herbaceous vegetation sampling strategies such as transect and quadrat, and habitat assessment; (3) methods used in terrestrial vertebrate wildlife studies, such as radio telemetry, remote cameras, and live-trapping; and (4) techniques specific to aquatic ecology and water quality measurements. It also includes applications of GIS and Global Positioning Systems (GPS). Field trips may be required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- investigate advantages and limitations of a variety of environmental study designs, including field (descriptive) study, field experiment, natural experiment, and laboratory experiment.
- gather basic land survey, water quality, vegetation, and vertebrate wildlife data.
- manage, analyze, and interpret field data using different methods.
- compare and contrast various population sampling techniques.
- apply techniques for sampling and monitoring vertebrate wildlife, including capture and marking methodologies, radiotelemetry, remote cameras, and tracks and scat ID and analysis.
- evaluate protocols for and issues surrounding animal handling and chemical restraint.

- sample a variety of vegetation types using circular plot, quadrat, and transect techniques.
- interpret habitat suitability data.
- collect and analyze water quality data and relate to stream health.
- compare, contrast, and apply standard protocols for field investigation of common as well as special status species of plants and animals.
- use and create paper and digital maps of study areas by measuring horizontal and vertical distances and georeferencing sampling locations.

NATR 320 Principles of Ecology

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	None.
Transferable:	CSU; UC
General Education:	AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B; IGETC Area 5C

This course covers basic principles of ecology, including the physical and biological factors of different environments in relation to the distribution and abundance of plants and animals. Emphasis is on the management of ecosystems using ecological principles and the understanding of current ecological issues. Field trips are required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- assess the relationship of plants and animals to their environment and to each other
- measure and analyze the physical environment of plants and animals
- integrate ecological principles with ecological issues that affect the human condition
- identify ecological phenomena in one's everyday experiences

NATR 322 Environmental Restoration

Units:	2
Hours:	27 hours LEC; 27 hours LAB
Prerequisite:	None.
Advisory:	NATR 300, 302, 310, 320, and 330
Transferable:	CSU

This course covers fundamental principles and practices of environmental restoration--the process in which a damaged resource is renewed biologically, structurally, and functionally. Topics include both the causes of ecological degradation and biodiversity loss, as well as the science of development, management, monitoring, and sustainability of restored environments. Ecological principles, ecosystem processes, and biological interactions are covered in the context of restoration of wildlands and more urbanized areas. The course emphasizes hands-on experience with a variety of restoration techniques and materials in diverse habitats. Previously restored habitats in the Sacramento region are explored and current restoration sites are evaluated. Field trips may be required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- analyze basic principles of ecology and ecosystem science in the context of restored environments

- assess methods and materials for restoration of plant and animal populations and habitats
- analyze the causes of ecological degradation and biodiversity loss
- propose the methodologies involved in the development of a restoration plan for the creation/enhancement of an ecosystem
- apply techniques and materials used in environmental remediation/restoration
- evaluate environmental policies, laws, and regulations related to environmental restoration
- describe the significant challenges and priorities for wetland, woodland, and grassland restoration
- assess soil and water characteristics relevant to environmental restoration

NATR 324 Field Studies: Birds and Plants of the High Sierra

Units:	1.5
Hours:	9 hours LEC; 54 hours LAB
Prerequisite:	None.
Transferable:	CSU; UC

This field study course focuses on identification, distribution, abundance, ecological relationships, and conservation of bird and plant communities of the High Sierra. Primary environments explored include montane chaparral, riparian woodland, coniferous forest, montane bog and fen, rocky outcrop, montane meadow, subalpine woodland, and alpine tundra. Emphasis is placed on the natural history and life history characteristics of common birds and plants, as well as rare and endangered species and their conservation challenges. Field trips are required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- identify common species of birds and plants in High Sierra environments
- analyze species composition and community structure of High Sierra bird and plant communities
- demonstrate proficiency in the use of current identification and monitoring tools and techniques for bird and plant populations and communities
- critically analyze past, present, and future/predicted conservation and management issues for biological communities of the High Sierra

NATR 330 Native Trees and Shrubs of California

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	None.
Advisory:	Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340
Transferable:	CSU; UC
General Education:	AA/AS Area IV

This dendrology course covers classification and ecology of major natural plant communities of California and their component tree and shrub species. Emphasis is placed on biotic and abiotic factors of native woody plant distribution and abundance in northern California, focusing on characterization of the dominant vegetation types and identification of native woody species. Major topics include plant adaptation, evolution, and diversity in time and space; morphology and physiology; life history; soils, climate, and topography; endemism; interspecific and intraspecific interactions; invasive species; disease; anthropogenic and natural environmental change; human uses of native plants; and native plant restoration and conservation. This course involves the creation of a plant collection including at least 60 representative native woody species. Field trips are required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- assess the structure and function of vegetative communities of California
- interpret plant keys and develop skills in their use in plant identification
- collect and prepare a plant collection of representative native California plants
- identify (to species level) over 75 common native woody plants by sight
- analyze plant adaptations and environmental gradients in a variety of ecosystems
- apply ecological principles to observed phenomena at the species, population, and community levels of organization
- examine the structure and function of various morphological and physiological characteristics of plants
- investigate the implications of plant conservation, restoration, and community management alternatives

NATR 332 Wildflowers of California

Units:	3
Hours:	36 hours LEC; 54 hours LAB
Prerequisite:	None.
Advisory:	NATR 330
Transferable:	CSU; UC
General Education:	AA/AS Area IV

This course investigates biology, ecology, conservation, and management in the context of California wildflowers. Field labs focus on the California Floristic Province. The identification, distribution, and interrelationships of herbaceous plants in their natural environment, physical and biological influences, ecological relationships, and representative plant communities are examined. Special emphasis is given to the study of plant families in our local grasslands, vernal pools, oak woodlands, and foothills. Field trips may be required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply scientific approaches to the investigation of herbaceous terrestrial plants
- identify the common herbaceous flowering plants of our local grasslands, vernal pools, oak woodlands, and foothills
- investigate physical and biological factors that influence representative plant communities of California's foothill, valley, coast, mountain, and desert domains
- analyze factors influencing the distribution and abundance of wildflower species
- assess the structure and function of basic vegetative and reproductive anatomy including leaves, stems, roots, flowers, and fruits
- evaluate, through comparative analysis, the distinguishing characteristics of dominant herbaceous plant families of the Greater Sacramento area
- recognize at least 20 flowering plant families by sight
- analyze the ecological significance of California's diverse herbaceous plant communities

NATR 346 Water Resources and Conservation

Units:	3
Hours:	54 hours LEC
Prerequisite:	None.
Advisory:	MATH 120, 125, 129, 133 or higher; NATR 300, or an equivalent transferable life science course; and eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300, OR ESLR 340 AND ESLW 340.
Transferable:	CSU
General Education:	AA/AS Area IV

This course provides an introduction to water resource management with an emphasis on water issues in California. It provides a historical perspective on water development and explores current and projected water issues. Surface water and groundwater systems are considered, with an emphasis on the interdisciplinary nature of sustainable water resource management that balances urban, agricultural, industrial, and environmental water needs. The implications of water rights and key water policies are considered in evaluating how water is used and exploited. Field trips may be required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- describe the hydrologic cycle in both natural and urban environments
- describe the key characteristics of surface water and groundwater resources
- explain the interactions between surface water and groundwater resources
- describe the components of integrated water resources planning and management
- evaluate water policy initiatives and determination of water rights
- analyze future water sustainability scenarios under uncertain conditions, including climate change

NATR 495 Independent Studies in Natural Resources

Units:	1 - 3
Hours:	54 - 162 hours LAB
Prerequisite:	None.
Transferable:	CSU

Independent Study is an opportunity for the student to extend classroom experience in this subject, while working independently of a formal classroom situation. Independent study is an extension of work offered in a specific class in the college catalog. To be eligible for independent study, students must have completed the basic regular catalog course at American River College. They must also discuss the study with a professor in this subject and secure approval. Only one independent study for each catalog course will be allowed.

NATR 498 Work Experience in Natural Resources

Units:	1 - 4
Hours:	60 - 300 hours LAB
Prerequisite:	None.
Enrollment Limitation:	Students must be in a paid or unpaid internship, volunteer position, or job related to natural resources with a cooperating site supervisor. Students are advised to consult with the Natural Resources Department faculty to review specific certificate and degree work experience requirements.
Advisory:	Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.
Transferable:	CSU

General Education:

AA/AS Area III(b)

This course provides students with opportunities to develop marketable skills in preparation for employment or advancement within the field of natural resources. It is designed for students interested in work experience and/or internships in transfer-level degree occupational programs. Course content includes understanding the application of education to the workforce, completion of Title 5 required forms which document the student's progress and hours spent at the work site, and developing workplace skills and competencies.

During the semester, the student is required to complete 75 hours of related paid work experience, or 60 hours of related unpaid work experience for one unit. An additional 75 or 60 hours of related work experience is required for each additional unit. All students are required to attend the first class meeting, a mid-semester meeting, and a final meeting. Additionally, students who have not already successfully completed a Work Experience course will be required to attend weekly orientations while returning participants may meet individually with the instructor as needed. Students may take up to 16 units total across all Work Experience course offerings. This course may be taken up to four times when there are new or expanded learning objectives. Only one Work Experience course may be taken per semester.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate application of industry knowledge and theoretical concepts in the field of natural resources related to a transfer degree level career as written in the minimum three (3) learning objectives created by the student and his/her employer or work site supervisor at the start of the course
- make effective decisions, use workforce information, and manage his/her personal career plans.
- behave professionally, ethically, and legally at work, consistent with applicable laws, regulations, and organizational norms.
- behave responsibly at work, exhibiting initiative and self-management in situations where it is needed.
- apply effective leadership styles at work, with consideration to group dynamics, team and individual decision making, and workforce diversity.
- communicate in oral, written, and other formats, as needed, in a variety of contexts at work.
- locate, organize, evaluate, and reference information at work.
- demonstrate originality and inventiveness at work by combining ideas or information in new ways, making connections between seemingly unrelated ideas, and reshaping goals in ways that reveal new possibilities using critical and creative thinking skills such as logical reasoning, analytical thinking, and problem-solving.

Faculty

Christy Bowles

Adjunct Faculty

Office: ARC Main, Science

Email: BowlesC@arc.losrios.edu
(<mailto:BowlesC@arc.losrios.edu>)

Phone: (916) 286-3691 ext. 12186

Web: [Christy Bowles's Profile Page \(/about-us/faculty-and-staff-directory/christy-bowles\)](#)

Paul Cylinder

Adjunct Faculty

Office: ARC Main

Email: CylindP@arc.losrios.edu
(<mailto:CylindP@arc.losrios.edu>)

Phone: (916) 286-3691 ext. 12368

Web: [Paul Cylinder's Profile Page \(/about-us/faculty-and-staff-directory/paul-cylinder\)](#)

Jennifer Neale

Professor

Office: ARC Main, Lower Level Library, LL021

Chris Papouchis

Adjunct Faculty

Office: ARC Main

Email: PapoucC@arc.losrios.edu

Email: [NealeJ@arc.losrios.edu \(mailto:NealeJ@arc.losrios.edu\)](mailto:NealeJ@arc.losrios.edu)
Phone: (916) 484-8999
Web: [Jennifer Neale's Profile Page \(/about-us/faculty-and-staff-directory/jennifer-neale\)](#)

[\(mailto:PapoucC@arc.losrios.edu\)](mailto:PapoucC@arc.losrios.edu)
Phone: (916) 286-3691 ext. 12293
Web: [Chris Papouchis's Profile Page \(/about-us/faculty-and-staff-directory/chris-papouchis\)](#)

Robert Skillen

Adjunct Faculty

Office: ARC Main
Email: [SkilleR@arc.losrios.edu \(mailto:SkilleR@arc.losrios.edu\)](mailto:SkilleR@arc.losrios.edu)
Web: [Robert Skillen's Profile Page \(/about-us/faculty-and-staff-directory/robert-skillen\)](#)

Cookies Disclaimer

The American River College website uses cookies to enhance user experience and analyze site usage. By continuing to use this site, you are giving us consent to do this. Review our [Privacy Policy \(/about-us/our-values/privacy-policy\)](#) to learn more.

✕