MAJOR IN ECOSYSTEM SCIENCE AND SUSTAINABILITY

The Bachelor of Science in Ecosystem Science and Sustainability (ESS) prepares students to understand and address the most complex environmental challenges of our time. Grounded in ecosystem ecology and integrated with the cultural, social, economic, and political dimensions of sustainability, the program equips students to translate science into real-world decision-making, developing strategies to maintain, improve, and steward ecosystems across diverse global contexts.

Research opportunities, internships, field experiences, and collaborative project-based learning, combined with traditional classroom study, build a strong foundation for applying sustainable resource management principles in diverse ecological-based sectors after graduation.

Learning Objectives

Upon completing this major, students will be able to:

1. Articulate core concepts from the natural and social sciences as they apply to ecosystem science and sustainability.
2. Explain how organisms interact with their environments and how ecosystems support well-being.
3. Analyze the complexities and connections within socio-ecological systems across scales.
4. Collect, analyze, and interpret quantitative and methodological data.
5. Communicate and collaborate to address real-world ecosystem and sustainability challenges.
6. Understand and integrate multicultural perspectives to advance equitable and sustainable outcomes.

Potential Occupations

Completion of this degree prepares students for a wide variety of careers related to sustainability and natural resource science. Examples include:

- Sustainability Coordinator
- Ecologist
- Environmental Educator
- Invasive Species Specialist
- Biological Science Technician
- Climate Change Scientist
- Natural Resource Specialist
- Corporate Environmental Consultant

And more!

Undergraduate Advising

Would you like to learn more from a Peer Mentor or Academic Success Coordinator?
Please visit our ESS Advising page here (https://warnercnr.colostate.edu/ess/advising-student-resources/).

Requirements
Effective Fall 2026

Freshman

		AUCC	Credits
CO 150	College Composition (GT-CO2)	1A	3
ESS 120	Intro to Ecosystem and Watershed Sciences		1
ESS 129	Information Management for Sustainability		1
ESS 130	Intro to Systems Theory for Sustainability		1
Select one course from the following:			3
AREC 240/ECON 240	Economics of Environmental Sustainability (GT-SS1)	3C	
ECON 241	Economics to Combat Climate Change	3C	
Select one group from the following:			4
Group A:			
BZ 110	Principles of Animal Biology (GT-SC2)	3A	
BZ 111	Animal Biology Laboratory (GT-SC1)	3A	
Group B:			
LIFE 102	Attributes of Living Systems (GT-SC1)	3A	
Select one group from the following:			5
Group A:			
CHEM 107	Fundamentals of Chemistry (GT-SC2)	3A	
CHEM 108	Fundamentals of Chemistry Laboratory (GT-SC1)	3A	
Group B:			
CHEM 111	General Chemistry I (GT-SC2)	3A	
CHEM 112	General Chemistry Lab I (GT-SC1)	3A	
Select one course from the following:			3
ATS 150	Science of Global Climate Change (GT-SC2)	3A	

GES 101	Foundations of Environmental Sustainability		
NR 120A	Environmental Conservation (GT-SC2)	3A	
Select one course from the following:			4
MATH 155	Calculus for Biological Scientists I (GT-MA1)	1B	
MATH 160	Calculus for Physical Scientists I (GT-MA1)	1B	
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B	3
	Total Credits		**28**

Sophomore

ESS 210/GR 210	Physical Geography		3
LIFE 320	Ecology		3
NRRT 279	Biodiversity and Conservation Social Science		3
Select one course from the following:			4
BZ 120	Principles of Plant Biology (GT-SC1)	3A	
LIFE 103	Biology of Organisms-Animals and Plants	3A	
Select one course from the following:			5
PH 121	General Physics I (GT-SC1)	3A	
PH 141	Physics for Scientists and Engineers I (GT-SC1)	3A	
Select one course from the following:			3
STAT 301	Introduction to Applied Statistical Methods		
STAT 307	Introduction to Biostatistics		
1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)		1C	3
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B	3
Electives			4
	Total Credits		**31**

Junior

ESS 311	Ecosystem Ecology		3
ESS 312	Sustainability Science		3
ESS 320	Internship and Career Preparation		1
ESS 330	Quantitative Reasoning for Ecosystem Science		3
NR 319	Introduction to Geospatial Science		4
WR 204/GR 204	Sustainable Watersheds	3A	3
Select one course from the following:			3
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)	2	
CO 301C	Writing in the Disciplines: Social Sciences (GT-CO3)	2	
JTC 300	Strategic Writing and Communication (GT-CO3)	2	
LB 300	Specialized Professional Writing	2	
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)		3D	3
Electives			5
	Total Credits		**28**

Summer

Professional Development and Engagement Requirement (see list below)			5
The timeline to complete this requirement may vary – plan in consultation with advisor.			
	Total Credits		**5**

Senior

ESS 415	Sustainability Solutions	4A,4B	3
ESS 440	Practicing Sustainability	4C	4

NR 400	Public Communication in Natural Resources	3
ESS Electives (see list below)		15
Elective[1]		3
	Total Credits	**28**
	Program Total Credits:	**120**

Professional Development and Engagement Requirement

The timeline to complete the Professional Development and Engagement may vary. Suggested completion of summer coursework (NR 220 and some department-approved study abroad programs) may occur between sophomore and junior years or between junior and senior years. ESS 487 has a prerequisite of ESS 320, so should be completed after junior year. ESS 220/ESS 221/ESS 498 may be completed during the academic year, ideally during junior or senior year, thus moving elective credits to freshman and sophomore years.

Code	Title	Credits
Select one group from the following:		
Group A:		5
NR 220	Natural Resource Ecology and Measurements	
Group B: Students must obtain department pre-approval before enrolling in the appropriate course.		5
ESS 487	Internship	
or ESS 495	Independent Study in Ecosystem Science	
Group C:		5
ESS 220	Research Skills for Ecosystem Science I	
ESS 221	Research Methods for Ecosystem Science II	
ESS 498	Research	
Group D:		5
Department-approved Study Abroad		

Ecosystem Science and Sustainability Electives

Select a minimum of 15 credits not taken elsewhere in the program from the list below. A minimum of 3 credits must be from each of the three categories (Ecosystem Science, Sustainability, and Tools/analysis). The additional 6 credits can be from any category or from the longer uncategorized list. Additional coursework may be required due to prerequisites.

Code	Title	Credits
Ecosystem Science selections: select a minimum of 3 credits from the following courses:		
ESS 353	Global Change Impacts, Adaptation, Mitigation [2]	3
ESS 405/SOCR 405	Global Agriculture and Environmental Change	3
ESS 411	Earth Systems Ecology	3
ESS 432/MIP 432	Microbial Ecology	3
ESS 433/MIP 433	Microbial Ecology Laboratory	1
ESS 474	Limnology	3
ESS 524	Foundations for Carbon/Greenhouse Gas Mgmt	3
ESS 543/ATS 543	Global Climate Change	2
Sustainability selections: select a minimum of 3 credits from the following courses:		
ESS 353	Global Change Impacts, Adaptation, Mitigation [2]	3
ESS 365	Global Climate Justice	3
ESS 400	Global Perspectives on Sustainability	3
ESS 401	Sustainability of Parks and Protected Places	3
ESS 501	Ecosystem Sustainability for Researchers	3
ESS 505	International Climate Negotiations	2
ESS 506	Virtual International Climate Negotiations	1
ESS 542	Greenhouse Gas Policies	2
ESS 582A	Study Abroad--Europe and British Isles: UN Climate Change Conference (COP)	1
ESS 582B	Study Abroad--Americas: UN Climate Change Conference (COP)	1
ESS 582C	Study Abroad--Asia/Oceania: UN Climate Change Conference (COP)	1
ESS 582D	Study Abroad--Africa: UN Climate Change Conference (COP)	1
WR 512	Water Law for Non-Lawyers	3
WR 513	Water Sustainability in the Western US	3
Tools and analysis selections: select a minimum of 3 credits from the following courses:		
ESS 523A	Environmental Data Science Applications: Introduction	5
ESS 523B/ SOCR 523B	Environmental Data Science Applications: Food and Agriculture	2
ESS 523C/WR 523C	Environmental Data Science Applications: Water Resources	2
ESS 555/ANEQ 555	Life Cycle Assessment for Sustainability	3
NR 323/GR 323	Remote Sensing and Image Interpretation	3
NR 426	Programming for GIS I	2
NR 427	Programming for GIS II	2
NR 453	Geospatial Field Methods in Natural Resources	2
NR 450	Geospatial Project Design and Analysis	4
NRRT 376	Methods for Conservation Social Science	3
WR 416	Land Use Hydrology	3
WR 417	Watershed Measurements	3
WR 418	Land Use and Water Quality	3
WR 474	Snow Hydrology	3
WR 514	GIS and Data Analysis in Water Resources	3
Select 0-6 credits from the following courses:		
ANTH 329	Cultural Change	3

ANTH 330/CLMT 330	Human Ecology	3
ANTH 414/ETST 414	Development in Indian Country	3
ANTH 415	Indigenous Ecologies and the Modern World	3
ANTH 453	Impacts on Ancient Environments	3
ANTH 479/IE 479	International Development Theory and Practice	3
AREC 340/ECON 340	Introduction-Economics of Natural Resources	3
AREC 341	Environmental Economics	3
AREC 440	Advanced Environmental and Resource Economics	3
AREC 444/ECON 444	Economics of Energy Resources	3
ATS 350	Introduction to Weather and Climate	2
ATS 351	Introduction to Weather and Climate Lab	1
ATS 556	Climate Intervention to Cool a Warming Planet	2
BSPM 302	Applied and General Entomology	2
BSPM 308	Ecology and Management of Weeds	3
BSPM 361	Elements of Plant Pathology	3
BSPM 365	Integrated Tree Health Management	4
BZ 440	Plant Physiology	3
BZ 441	Plant Physiology Laboratory	2
BZ 450	Plant Ecology	4
BZ 471	Stream Biology and Ecology	3
BZ 472	Stream Biology and Ecology Laboratory	1
CHEM 338	Environmental Chemistry	3
ECON 304	Intermediate Macroeconomics	3
ECON 306	Intermediate Microeconomics	3
ECON 317	Population Economics	3
ERHS 448	Environmental Contaminants	3
ETST 352/SOWK 352	Indigenous Women, Children, and Tribes	3
ETST 365	Global Environmental Justice Movements	3
ETST 420	Disability, Race, Gender in the Environment	3
ETST 444/SOC 444	Federal Indian Law and Policy	3
F 311	Forest Ecology	3
F 322	Economics of the Forest Environment	3
F 324	Fire Effects and Adaptations	3
F 466/HORT 466	Urban and Community Forestry	3
FW 204	Introduction to Fishery Biology	3
FW 260	Principles of Wildlife Management	3
FW 300	Biology and Diversity of Fishes	2
FW 301	Ichthyology Laboratory	1
FW 375	Field Wildlife Studies	3
FW 400	Conservation of Fish in Aquatic Ecosystems	3
FW 477	Wildlife Habitat Use and Management	3
GES 440/ATS 440	Sea Level Rise and a Sustainable Future	3
GES 470	Applications of Environmental Sustainability	3
GR 303	Mountain Geography	3
GR 320	Cultural Geography	3
GR 330	Urban Geography	3
GR 348	Biogeography	3
GR 410	Climate Change: Science, Policy, Implications	3
GR 430	Land Change Science and Remote Sensing	3
GR 431	Land Change Science Lab	1
GR 448	Forest Biogeography and Climate Change	3
HIST 355	American Environmental History	3
HIST 476	History of America's National Parks	3
NR 300	Biological Diversity	3
NR 320	Natural Resources History and Policy	3
NR 321	Natural Resource Rights and Reconciliation	3
NR 370	Coastal Environmental Ecology	3
NR 422	GIS Applications in Natural Resource Management	4
NR 425	Natural Resource Policy and Sustainability	3
NRRT 231	Principles-Parks/Protected Area Management	3
NRRT 262	Principles of Environmental Communication	3
NRRT 270	Tourism and Recreation for People and Planet	3
NRRT 320	International Issues-Recreation and Tourism	3
NRRT 340	Principles in Conservation Planning and Mgmt	3
NRRT 400	Environmental Governance	3
NRRT 401	Collaborative Solutions to Conservation	3
NRRT 402	Cultural and Political Ecology	3
NRRT 403	Conservation for Climate Change Action	3
NRRT 404	Designing Nature-Based Programs for Impact	3
NRRT 412	Social Change for Conservation	3
PHIL 320	Ethics of Sustainability	3
PHIL 345	Environmental Ethics	3
POLS 361	U.S. Environmental Politics and Policy	3
POLS 362	Global Environmental Politics	3
POLS 364	Air, Climate, and Energy Policy Analysis	3
POLS 442	Environmental Politics in Developing World	3
POLS 462	Globalization, Sustainability, and Justice	3
POLS 463	Urban Policy and Management	3
RS 300	Rangeland Conservation and Stewardship	3
RS 313/F 313	Dendrology and Herbaceous Plant ID	3
RS 432	Rangeland Measurements and Monitoring	2
RS 452	Rangeland Herbivore Ecology and Management	3
RS 478	Ecological Restoration	3
SOC 320	Population-Natural Resources and Environment	3
SOC 322	Environmental Justice	3
SOC 324	Food Justice	3
SOC 362	Social Change	3
SOC 364	Food, Agriculture and Global Society	3
SOC 460	Environmental and Natural Resource Sociology	3

SOC 461	Water and Social Justice	3
SOCR 322	Principles of Microclimatology	3
SOCR 375	Soil Biogeochemistry	3
SOCR 400	Soils and Global Change-Impacts and Solutions	3
SOCR 441	Soil Ecology	3
SOCR 442	Forest and Range Soils	3
SOCR 455	Microbiomes of Soil Systems	3
SOCR 500	Environmental Measurement Laboratory	1
WR 511	Water Resource Development	3

[1] Select enough elective credits to bring the program total to a minimum of 120 credits, of which at least 42 must be upper-division (300- to 400-level).

[2] Can be either Ecosystem Science or Sustainability selection.

Major Completion Map

Freshman

Semester 1		**Critical**	**Recommended**	**AUCC**	**Credits**
ESS 120	Intro to Ecosystem and Watershed Sciences	X			1
ESS 129	Information Management for Sustainability	X			1
Select one group from the following:		X			4
Group A:					
BZ 110	Principles of Animal Biology (GT-SC2)			3A	
BZ 111	Animal Biology Laboratory (GT-SC1)			3A	
Group B:					
LIFE 102	Attributes of Living Systems (GT-SC1)			3A	
Select one course from the following:		X			3
ATS 150	Science of Global Climate Change (GT-SC2)			3A	
GES 101	Foundations of Environmental Sustainability				
NR 120A	Environmental Conservation (GT-SC2)			3A	
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-and-humanities)			X	3B	3
	Total Credits				**12**

Semester 2		**Critical**	**Recommended**	**AUCC**	**Credits**
CO 150	College Composition (GT-CO2)	X		1A	3
ESS 130	Intro to Systems Theory for Sustainability	X			1
Select one course from the following:		X			3
AREC 240/ ECON 240	Economics of Environmental Sustainability (GT-SS1)			3C	
ECON 241	Economics to Combat Climate Change			3C	
Select one group from the following:		X			5
Group A:					
CHEM 107	Fundamentals of Chemistry (GT-SC2)			3A	
CHEM 108	Fundamentals of Chemistry Laboratory (GT-SC1)			3A	
Group B:					
CHEM 111	General Chemistry I (GT-SC2)			3A	
CHEM 112	General Chemistry Lab I (GT-SC1)			3A	
Select one course from the following:		X			4
MATH 155	Calculus for Biological Scientists I (GT-MA1)			1B	
MATH 160	Calculus for Physical Scientists I (GT-MA1)			1B	
CO 150, and AUCC 1B must be completed by the end of Semester 2.		X			
	Total Credits				**16**

Sophomore

Semester 3		**Critical**	**Recommended**	**AUCC**	**Credits**
ESS 210/GR 210	Physical Geography	X			3
Select one course from the following:		X			4
BZ 120	Principles of Plant Biology (GT-SC1)			3A	
LIFE 103	Biology of Organisms-Animals and Plants			3A	

1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)			X	1C	3
Electives			X		4
MATH 155 or MATH 160 must be completed by the end of Semester 3.		X			
	Total Credits				**14**
Semester 4		**Critical**	**Recommended**	**AUCC**	**Credits**
LIFE 320	Ecology	X			3
NRRT 279	Biodiversity and Conservation Social Science	X			3
Select one course from the following:		X			5
PH 121	General Physics I (GT-SC1)			3A	
PH 141	Physics for Scientists and Engineers I (GT-SC1)			3A	
Select one course from the following:		X			3
STAT 301	Introduction to Applied Statistical Methods				
STAT 307	Introduction to Biostatistics				
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-and-humanities)			X	3B	3
	Total Credits				**17**
Junior					
Semester 5		**Critical**	**Recommended**	**AUCC**	**Credits**
ESS 311	Ecosystem Ecology	X			3
NR 319	Introduction to Geospatial Science	X			4
WR 204/GR 204	Sustainable Watersheds	X		3A	3
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)			X	3D	3
	Total Credits				**13**
Semester 6		**Critical**	**Recommended**	**AUCC**	**Credits**
ESS 312	Sustainability Science	X			3
ESS 320	Internship and Career Preparation	X			1
ESS 330	Quantitative Reasoning for Ecosystem Science	X			3
Select one course from the following:		X			3
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)			2	
CO 301C	Writing in the Disciplines: Social Sciences (GT-CO3)			2	
JTC 300	Strategic Writing and Communication (GT-CO3)			2	
LB 300	Specialized Professional Writing			2	
Electives			X		5
	Total Credits				**15**
Semester 7		**Critical**	**Recommended**	**AUCC**	**Credits**
Professional Development and Engagement Requirement (see list on Requirements tab) The timeline to complete this requirement may vary – plan in consultation with advisor.		X			5
	Total Credits				**5**
Senior					
Semester 8		**Critical**	**Recommended**	**AUCC**	**Credits**
ESS 415	Sustainability Solutions	X		4A,4B	3
Ecosystem Science and Sustainability Electives (See Department List on Concentration Requirements tab)		X			9
	Total Credits				**12**
Semester 9		**Critical**	**Recommended**	**AUCC**	**Credits**
ESS 440	Practicing Sustainability	X		4C	4
NR 400	Public Communication in Natural Resources	X			3
Ecosystem Science and Sustainability Electives (See Department List on Concentration Requirements tab)		X			6

Elective	X	3
ESS 400 or ESS 411 MUST be completed by the end of Semester 9.	X	
The benchmark courses for the 9th semester are the remaining courses in the entire program of study.	X	
Total Credits		**16**
Program Total Credits:		**120**