

# PH.D. IN ECOSYSTEM SUSTAINABILITY

Many physical, ecological, and social factors interact to shape the future of our ecosystems and societies. CSU's innovative Ph.D. in Ecosystem Sustainability enables students to develop core competencies in ecosystem science—the study of organisms and the environment—and apply that knowledge to address real-world issues. We help develop leaders in sustainability science: a new generation of practitioners able to address complex, integrated social-ecological problems in collaborative partnerships with researchers, resource users, and decision-makers.

Our graduates have the tools to understand complex scientific questions in sustainability, and the leadership and collaborative skills required to address current and future issues in sustainability. The program serves as a foundation for a wide range of careers, including academic and scholarly professions, and work in government agencies, non-governmental organizations, and corporate and entrepreneurial environments.

## A focus on solutions

Students work at the cutting edge of new research on ecosystem sustainability. Collaborating with some of the world's leading ecosystem and sustainability scientists, students explore solutions to global problems related to water and natural resources, food supplies, energy, greenhouse gas management, land-use change, climate change, and environmental justice, among others.

## Learning Objectives

Upon successful completion, students will have:

1. Detailed knowledge of quantitative and qualitative methods.
2. Understanding of complex ecosystem functioning.
3. Transdisciplinary understanding of social-ecological processes.
4. Ability to work in teams across disciplines and with decision-makers, resource users, and team members outside of academia.
5. Skills to conduct integrated assessments using systems approaches, conceptual, mathematical, geospatial, and statistical models, and innovative collaborative processes.
6. Ability to apply critical thinking in the development of sustainable systems at local and global scales.
7. Advanced training in the methods of urban ecology and on managing the sustainable cities of the future.

## Local and Global Relevance

Our graduate community benefits from a highly networked program with close working links to the city governments of Fort Collins, Boulder, and Denver, and to local agencies, farming communities, and non-profits across the Front Range. We work at the highest elevations of the Rockies, in the lowest short grass steppe regions, in cities, and in neighborhoods. Our active research programs are spread around the globe: from northern, eastern, and southern Africa to China, Mongolia, Nepal, Tibet, Honduras, and Mexico.

[Students interested in graduate work should refer to the Graduate and Professional Bulletin.](#)

## Requirements Effective Fall 2023

Code	Title	Credits
<b>Required Core Courses:</b>		
ESS 501	Principles of Ecosystem Sustainability	3
ESS 692	Seminar	1
<b>Areas – Select a minimum of 20 credits from the four Areas indicated below:</b>		<b>20</b>
<b>Ecosystem Science</b>		
At least one course must be selected from the following (2-3 credits):		
ESS 524	Foundations for Carbon/Greenhouse Gas Mgmt	
ESS 543/ATS 543	Global Climate Change	
ESS 625/F 625	Ecology of Forest Production	
ESS 660	Biogeochemical Cycling in Ecosystems	
Additional courses may be selected from the following:		
ATS 753	Global Hydrologic Cycle	
ATS 760	Global Carbon Cycle	
BZ 572	Phytoremediation	
BZ 642	Plant Metabolism	
ECOL 505	Foundations of Ecology	
ECOL 600	Community Ecology	
ECOL 620	Applications in Landscape Ecology	
F 510	Ecophysiology of Trees	
F 624	Fire Ecology	
FW 555	Conservation Biology	
HORT 571	Soil-Plant-Water Relations/Water Stress	
RS 531	World Grassland Ecogeography	
RS 630	Ecology of Grasslands and Shrublands	
SOCR 522	Micrometeorology	
SOCR 540	Soil-Plant-Nutrient Relationships	
WR 574	Advanced Snow Hydrology	
WR 616	Hillslope Hydrology and Runoff Processes	
<b>Ecosystem Sustainability</b>		
The following course must be taken (2 credits):		
ESS 542	Greenhouse Gas Policies	
Additional courses may be selected from the following:		
AGRI 500	Advanced Issues in Agriculture	
AGRI 521	Emerging Issues and Challenges for Global Agr	
AGRI 602	Bioenergy Policy, Economics, and Assessment	
AGRI 632	Managing for Ecosystem Sustainability	
AGRI 635	Integrated Forage Management	
AGRI 637	Understanding Policy and Emerging Issues	
AGRI 638	Ecosystem Services on Agricultural Lands	
ANTH 529	Anthropology and Sustainable Development	
ANTH 530	Human-Environment Interactions	
ANEQ 548	Issues in Manure Management	

AREC 542	Applied Advanced Water Resource Economics
AREC 566/ SOC 566	Contemporary Issues in Developing Countries
ECOL 592	Interdisciplinary Seminar in Ecology
GES 542	Biobased Fuels, Energy, and Chemicals
NR 515	Natural Resources Policy and Biodiversity
NR 535	Action for Sustainable Behavior
NR 550	Sustainable Military Lands Management
PHIL 565	Seminar in Environmental Philosophy
POLS 670	Politics of Environment and Sustainability
POLS 709	Environmental Politics in the U.S.
POLS 729	Political Theory and the Environment
POLS 739	International Environmental Politics
POLS 749	Comparative Environmental Politics
POLS 759	Environmental Policy and Administration
RS 565	Riparian Ecology and Management
SOC 564	Environmental Justice
SOC 666	Globalization and Socioeconomic Restructuring
SOC 668	Environmental Sociology
SOC 669	Global Inequality and Change
WR 510	Watershed Management in Developing Countries

**Quantitative Methods**

At least one course must be selected from the following (4 credits):

ESS 545	Applications in Greenhouse Gas Inventories
ESS 565	Niche Models
ESS 575	Models for Ecological Data

Additional courses may be selected from the following:

ANTH 554/ ESS 554	Ecological and Social Agent-based Modeling
AREC 535/ ECON 535	Applied Econometrics
AREC 540/ ECON 540	Environmental and Natural Resource Economics
ECOL 620	Applications in Landscape Ecology
F 521	Advanced Quantitative Methods in Forestry II
GEOL 551	Groundwater Modeling
LAND 520	Geographic Information Systems
NR 503/GR 503	Remote Sensing and Image Analysis
NR 505	Concepts in GIS
NR 512	Spatial Statistical Modeling-Natural Resources
NR 523/STAT 523	Quantitative Spatial Analysis
NR 565	Principles of Natural Resources Ecology
RS 532	Rangeland Ecosystem Sampling
SOCR 620	Modeling Ecosystem Biogeochemistry
SOCR 670	Terrestrial Ecosystems Isotope Ecology
STAA 551	Regression Models and Applications
STAA 552	Generalized Regression Models
STAA 553	Experimental Design

STAA 554	Mixed Models
STAA 561	Probability with Applications
STAA 562	Mathematical Statistics with Applications
STAA 565	Quantitative Reasoning
STAA 566	Data Visualization Methods
STAA 567	Computational and Simulation Methods
STAA 571	Survey Statistics
STAA 572	Nonparametric Methods
STAA 573	Analysis of Time Series
STAA 574	Methods in Multivariate Analysis
STAA 575	Applied Bayesian Statistics
STAA 576	Methods in Spatial Statistics
STAR 511	Design and Data Analysis for Researchers I
STAR 512	Design and Data Analysis for Researchers II
STAT 521	Stochastic Processes I
STAT 525	Analysis of Time Series I
STAT 540	Data Analysis and Regression
STAT 544/ ERHS 544	Biostatistical Methods for Quantitative Data
STAT 547/ CIVE 547	Statistics for Environmental Monitoring
STAT 560	Applied Multivariate Analysis
STAT 570	Nonparametric Statistics
STAT 600	Statistical Computing
STAT 605	Theory of Sampling Techniques
STAT 640	Design and Linear Modeling I
STAT 645	Categorical Data Analysis and GLIM
STAT 650	Design and Linear Modeling II
WR 524/CIVE 524	Modeling Watershed Hydrology
WR 575	Snow Hydrology Field Methods
WR 674	Data Issues in Hydrology

**Communication/Collaboration**

At least one course must be selected from the following (1-3 credits):

ECOL 693	Research Seminar
JTC 614	Public Communication Campaigns
JTC 660	Communication and Innovation
JTC 661	Information Design
JTC 662	Communicating Science and Technology
NR 501	Leadership and Public Communications

**Research and Dissertation (minimum credits required):**

ESS 798	Research	3
ESS 799	Dissertation	3

**Additional credits required to complete this degree may include: 42**

Master's Degree Credit (a maximum of 30 credits may be accepted from a master's degree)

Additional courses not taken previously from the Areas listed above

Additional credits completed under ESS 798 or ESS 799 beyond the minimum credits required above

**Program Total Credits:**

**72**

A minimum of 72 credits are required to complete this program.

## Requirements for All Graduate Degrees

For more information, please visit Requirements for All Graduate Degrees (<https://catalog.colostate.edu/general-catalog/graduate-bulletin/graduate-study/procedures-requirements-all-degrees/>) in the Graduate and Professional Bulletin (<https://catalog.colostate.edu/general-catalog/graduate-bulletin/>).

## Summary of Procedures for the Master's and Doctoral Degrees

NOTE: Each semester the Graduate School publishes a schedule of deadlines. Deadlines are available on the Graduate School website (<https://graduateschool.colostate.edu/deadline-dates/>). Students should consult this schedule whenever they approach important steps in their careers.

Forms (<https://graduateschool.colostate.edu/forms/>) are available online.

Step	Due Date
1. Application for admission (online)	Six months before first registration
2. Diagnostic examination when required	Before first registration
3. Appointment of advisor	Before first registration
4. Selection of graduate committee	Before the time of fourth regular semester registration
5. Filing of program of study (GS Form 6)	Before the time of fourth regular semester registration
6. Preliminary examination (Ph.D. and PD)	Two terms prior to final examination
7. Report of preliminary examination (GS Form 16) - (Ph.D. and PD)	Within two working days after results are known
8. Changes in committee (GS Form 9A)	When change is made
9. Application for Graduation (GS Form 25)	Refer to published deadlines from the Graduate School Website
9a. Reapplication for Graduation (online)	Failure to graduate requires Reapplication for Graduation (online) for the next time term for which you are applying
10. Submit thesis or dissertation to committee	At least two weeks prior to the examination or at the discretion of the graduate committee
11. Final examination	Refer to published deadlines from the Graduate School Website
12. Report of final examination (GS Form 24)	Within two working days after results are known; refer to published deadlines from the Graduate School website
13. Submit a signed Thesis/Dissertation Submission Form (GS Form 30) to the Graduate School and Submit the Survey of Earned Doctorates (Ph.D. only) prior to submitting the electronic thesis/dissertation	Refer to published deadlines from the Graduate School website.

14. Submit the thesis/dissertation electronically	Refer to published deadlines from the Graduate School website
15. Graduation	Ceremony information is available from the Graduate School website