MAJOR IN WATERSHED SCIENCE AND SUSTAINABILITY, WATERSHED SUSTAINABILITY CONCENTRATION

In the Watershed Sustainability concentration, students will focus on how human systems interact with the physical, chemical, and biological processes in watersheds. They will combine foundational science courses with background in sociology and economics, in preparation for upper division courses on water resources, water economics, and sustainability.

Learning Objectives

Upon successful completion, students will be able to:

1. Articulate core concepts in watershed science and sustainability including climate processes, surface and subsurface hydrology, water quality, human uses of water, and sustainable water management.
2. Describe how social, institutional, governance, and economic factors affect allocation and management of water resources
3. Analyze, and interpret meteorological, hydrological, and water quality, water use and management data.
4. Analyze watershed problems and sustainability challenges using geospatial data, field observations, sensor data, and watershed models.
5. Demonstrate strong critical thinking, writing, and oral communication skills.

Requirements Effective Fall 2024

Freshman

		AUCC	Credits
CHEM 103	Chemistry in Context (GT-SC2)	3A	3
CO 150	College Composition (GT-CO2)	1A	3
ESS 120	Intro to Ecosystem and Watershed Sciences		1
ESS 129	Information Management for Sustainability		1
GES 120	Water Sustainability in the Western US		3
GR 204/WR 204	Sustainable Watersheds (GT-SC2)	3A	3
Select 4 credits from the following:			4
BZ 110 & BZ 111	Principles of Animal Biology (GT-SC2)	3A	
BZ 120	Principles of Plant Biology (GT-SC1)	3A	
Select one course from the following:			3-4
ESS 210/GR 210	Physical Geography		
GEOL 110	Introduction to Geology-Parks and Monuments (GT-SC2)	3A	
GEOL 120	Geology and Society (GT-SC2)	3A	
GEOL 122	Geoscience--Climate and Environmental Change (GT-SC2)	3A	
GEOL 124	Earth Resources and Sustainability (GT-SC2)	3A	
GEOL 150	Dynamic Earth (GT-SC2)	3A	
1C (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)		1C	3
Historical Perspectives (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)		3D	3
	Total Credits		**27-28**

Sophomore

AREC 342	Water Law, Policy, and Institutions		3
ATS 150	Science of Global Climate Change (GT-SC2)	3A	3
LIFE 320	Ecology		3
PH 110	Physics of Everyday Phenomena (GT-SC2)	3A	3
STAT 158	Introduction to R Programming		1
Select one course from the following:			3
AREC 202	Agricultural and Resource Economics (GT-SS1)	3C	
ECON 202	Principles of Microeconomics (GT-SS1)	3C	
Select one course from the following:			3-4

MATH 141	Calculus in Management Sciences (GT-MA1)	1B	
MATH 155	Calculus for Biological Scientists I (GT-MA1)	1B	
MATH 160	Calculus for Physical Scientists I (GT-MA1)	1B	
Select one course from the following:			3
SOC 100	Introduction to Sociology (GT-SS3)	3C	
SOC 105	Social Problems (GT-SS3)	3C	
Select one course from the following:			3
STAT 301	Introduction to Applied Statistical Methods		
STAT 315	Intro to Theory and Practice of Statistics		
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B	3
Electives			3
	Total Credits		**31-32**
Summer			
NR 220	Natural Resource Ecology and Measurements		5
	Total Credits		**5**
Junior			
ESS 312	Sustainability Science		3
NR 319	Introduction to Geospatial Science		4
WR 416	Land Use Hydrology	4B	3
WR 418	Land Use and Water Quality		3
WR 486	Watershed Field Practicum		2
Select one course from the following:		2	3
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)	2	
JTC 300	Strategic Writing and Communication (GT-CO3)	2	
LB 300	Specialized Professional Writing	2	
Select one course from the following:			3
NR 310	Ecosystem Services and Human Well-Being		
NR 320	Natural Resources History and Policy		
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B	3
Watershed Science Department List (see list below)			3
Electives			3
	Total Credits		**30**
Senior			
WR 440	Watershed Problem Analysis	4A,4B,4C	3
Watershed Science Department List (see list below)			12
Electives[1]			10-12
	Total Credits		**25-27**
	Program Total Credits:		**120**

Watershed Science Department List

Select a minimum of 15 credits from courses not taken elsewhere in the program. Additional coursework may be required due to prerequisites.

Code	Title	Credits
AREC 330	Data-Driven Ag and Res Econ Decision Making	3
AREC 335/ECON 335	Introduction to Econometrics	3
AREC 340/ECON 340	Introduction-Economics of Natural Resources	3
AREC 341	Environmental Economics	3
AREC 375	Agricultural Law	3
AREC 442	Water Resource Economics	3
ATS 350	Introduction to Weather and Climate	2
ATS 351	Introduction to Weather and Climate Lab	1
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 334	Quantitative Analysis Laboratory	1
CHEM 335	Introduction to Analytical Chemistry	3
CHEM 338	Environmental Chemistry	3
CIVE 322	Basic Hydrology	3
CIVE 330	Ecological Engineering	3
CIVE 421	Global Water Challenges	3
CIVE 423	Groundwater Engineering	3
CIVE 440	Nonpoint Source Pollution	3
CIVE 515	River Mechanics	3
CS 345	Machine Learning Foundations and Practice	3
DSCI 320	Optimization Methods in Data Science	3
DSCI 335	Inferential Reasoning in Data Analysis	3
DSCI 336	Data Graphics and Visualization	1
DSCI 445	Statistical Machine Learning	3
ERHS 320	Environmental Health--Water Quality	3
ERHS 448	Environmental Contaminants	3
ESS 311	Ecosystem Ecology	3
ESS 312	Sustainability Science	3
ESS 353	Global Change Impacts, Adaptation, Mitigation	3
ESS 365	Global Climate Justice	3
ESS 400	Global Perspectives on Sustainability	3
ESS 474	Limnology	3
ESS 523A	Environmental Data Science Applications: Introduction	5
ESS 523C/WR 523C	Environmental Data Science Applications: Water Resources	2
F 311	Forest Ecology	3
F 324	Fire Effects and Adaptations	3
FW 300	Biology and Diversity of Fishes	2
FW 301	Ichthyology Laboratory	1
GEOL 446	Environmental Geology	3
GEOL 452	Hydrogeology	4
GEOL 454	Geomorphology	4
GES 440/ATS 440	Sea Level Rise and a Sustainable Future	3
GES 450	Global Sustainability and Health	3
GES 460	Law and Sustainability	3
GES 470	Applications of Environmental Sustainability	3
GR 320	Cultural Geography	3
GR 330	Urban Geography	3
GR 331	Geography of Farming Systems	3
GR 333	Glaciers and Climate Change	3
GR 348	Biogeography	3
GR 410	Climate Change: Science, Policy, Implications	3
GRAD 592	Water Resources Seminar	1
HIST 355	American Environmental History	3
NR 310	Ecosystem Services and Human Well-Being	3
NR 320	Natural Resources History and Policy	3
NR 323/GR 323	Remote Sensing and Image Interpretation	3
NR 330	Human Dimensions in Natural Resources	3
NR 375	Environment and Natural Resources Leadership	1
NR 400	Public Communication in Natural Resources	3
NR 422	GIS Applications in Natural Resource Management	4
NR 425	Natural Resource Policy and Sustainability	3
NR 450	Geospatial Project Design and Analysis	4
NR 453	Geospatial Field Methods in Natural Resources	2
NRRT 330	Social Aspects of Natural Resource Management	3
NRRT 362	Environmental Conflict Management	3
RS 378	Disturbance Ecology	2
RS 432	Rangeland Measurements and Monitoring	2
RS 478	Ecological Restoration	3
SOC 322	Environmental Justice	3
SOC 323	Soc. of Environmental Cooperation & Conflict	3
SOC 362	Social Change	3
SOC 461	Water and Social Justice	3
SOCR 370	Climate-Smart Irrigation Principles	2
SOCR 371	Climate-Smart Irrigation Management	1
SOCR 375	Soil Biogeochemistry	3
SOCR 425	Internet of Ag Things--Sensors and Data Lab	2
SOCR 440	Pedology	4
SOCR 442	Forest and Range Soils	3
STAT 305	Sampling Techniques	3
STAT 342	Statistical Data Analysis II	3
WR 406	Seasonal Snow Environments	3
WR 575	Snow Hydrology Field Methods	1

[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).

Major Completion Map

Distinctive Requirements for Degree Program: This program assumes that students will either test out of or take the prerequisite Mathematics courses (MATH 117, MATH 118, MATH 124, MATH 125, MATH 126) prior to the courses listed in this plan.

Freshman

Semester 1		Critical	Recommended	AUCC	Credits
CHEM 103	Chemistry in Context (GT-SC2)	X		3A	3
CO 150	College Composition (GT-CO2)	X		1A	3

ESS 120	Intro to Ecosystem and Watershed Sciences	X			1
ESS 129	Information Management for Sustainability	X			1
GES 120	Water Sustainability in the Western US	X			3
GR 204/WR 204	Sustainable Watersheds (GT-SC2)	X		3A	3
	Total Credits				**14**
Semester 2		**Critical**	**Recommended**	**AUCC**	**Credits**
Select 4 credits from the following:		X			4
BZ 110 & BZ 111	Principles of Animal Biology (GT-SC2)			3A	
BZ 120	Principles of Plant Biology (GT-SC1)			3A	
Select one course from the following:		X			3-4
ESS 210/ GR 210	Physical Geography			3B	
GEOL 110	Introduction to Geology-Parks and Monuments (GT-SC2)			3A	
GEOL 120	Geology and Society (GT-SC2)			3A	
GEOL 122	Geoscience--Climate and Environmental Change (GT-SC2)			3A	
GEOL 124	Earth Resources and Sustainability (GT-SC2)			3A	
GEOL 150	Dynamic Earth (GT-SC2)			3A	
1C (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)		X		1C	3
Historical Perspectives (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)			X	3D	3
	Total Credits				**13-14**
Sophomore					
Semester 3		**Critical**	**Recommended**	**AUCC**	**Credits**
ATS 150	Science of Global Climate Change (GT-SC2)	X		3A	3
ECON 202 or AREC 202	Principles of Microeconomics (GT-SS1) Agricultural and Resource Economics (GT-SS1)	X		3C	3
PH 110	Physics of Everyday Phenomena (GT-SC2)	X		3A	3
Select one course from the following:		X			3-4
MATH 141	Calculus in Management Sciences (GT-MA1)			1B	
MATH 155	Calculus for Biological Scientists I (GT-MA1)			1B	
MATH 160	Calculus for Physical Scientists I (GT-MA1)			1B	
Electives					3
	Total Credits				**15-16**
Semester 4		**Critical**	**Recommended**	**AUCC**	**Credits**
AREC 342	Water Law, Policy, and Institutions	X			3
LIFE 320	Ecology	X			3
SOC 100 or 105	Introduction to Sociology (GT-SS3) Social Problems (GT-SS3)	X		3C	3
STAT 158	Introduction to R Programming	X			1
STAT 301 or 315	Introduction to Applied Statistical Methods Intro to Theory and Practice of Statistics	X			3
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)			X	3B	3
WR 204/GR 204 must be completed by the end of Semes		X			
	Total Credits				**16**
Semester 5		**Critical**	**Recommended**	**AUCC**	**Credits**
NR 220	Natural Resource Ecology and Measurements	X			5
	Total Credits				**5**

Junior

Semester 6		Critical	Recommended	AUCC	Credits
NR 320 or 310	Natural Resources History and Policy Ecosystem Services and Human Well-Being				3
NR 319	Introduction to Geospatial Science				4
WR 416	Land Use Hydrology	X		4B	3
WR 486	Watershed Field Practicum	X			2
Watershed Science Department List (see list on Concentration Requirements tab)					3
	Total Credits				**15**

Semester 7		Critical	Recommended	AUCC	Credits
ESS 312	Sustainability Science	X			3
WR 418	Land Use and Water Quality	X			3
Select one course from the following:		X			3
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)			2	
JTC 300	Strategic Writing and Communication (GT-CO3)			2	
LB 300	Specialized Professional Writing			2	
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)			X	3B	3
Electives			X		3
	Total Credits				**15**

Senior

Semester 8		Critical	Recommended	AUCC	Credits
Watershed Science Department List (see list on Concentration Requirements tab)			X		9
Electives			X		3
	Total Credits				**12**

Semester 9		Critical	Recommended	AUCC	Credits
WR 440	Watershed Problem Analysis	X		4A,4B,4C	3
Watershed Science Department List (see list on Concentration Requirements tab)		X			3
Electives		X			7-9
The benchmark courses for the 9th semester are the remaining courses in the entire program of study.		X			
	Total Credits				**13-15**
	Program Total Credits:				**120**