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 Outcomes

Students will be able to:

- 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.
- Describe how social, institutional, governance, and economic factors affect allocation and management of water resources
- Analyze, and interpret meteorological, hydrological, and water quality, water use and management data.
- Analyze watershed problems and sustainability challenges using geospatial data, field observations, sensor data, and watershed models.
- Demonstrate strong critical thinking, writing, and oral communication skills.

Requirements Effective Fall 2022

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	Exploring Earth - Physical Geology (GT-SC2)	3A	
GEOL 122	The Blue Planet - Geology of Our Environment (GT-SC2)	3A	
GEOL 124	Geology of Natural Resources (GT-SC2)	3A	
GEOL 150	Physical Geology for Scientists and Engineers	3A	
Diversity, Equity, and Inclusion (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-equity-inclusion)		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		3
BUS 100	Introduction to Business		1
BUS 201	Foundations of Sustainable Enterprise		1
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
	Total Credits		**30-31**
Summer			
NR 220	Natural Resource Ecology and Measurements		5
	Total Credits		**5**
Junior			
ESS 312	Sustainability Science		3
NR 322	Intro. to Geographic Information Systems		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)			3
Sustainability Elective List (see list below)			9
Electives[1]			11-13
	Total Credits		**26-28**
	Program Total Credits:		**120**

Sustainability Elective List

Select a minimum of 9 credits from courses not taken elsewhere in the program. Additional coursework may be required due to prerequisites.

Code	Title	Credits
AREC 341	Environmental Economics	3
AREC 442	Water Resource Economics	3
ECON 340/AREC 340	Introduction-Economics of Natural Resources	3
ESS 353	Global Change Impacts, Adaptation, Mitigation	3
ESS 365	Global Climate Justice	3
ESS 400	Global Perspectives on Sustainability	3
GES 460	Law and Sustainability	3

GR 331	Geography of Farming Systems	3
NR 425	Natural Resource Policy and Sustainability	3
SOC 322	Environmental Justice	3
SOC 362	Social Change	3
SOC 461	Water and Social Justice	3

Watershed Science Elective List

Select a minimum of 6 credits from courses not taken elsewhere in the program. Additional coursework may be required due to prerequisites.

Code	Title	Credits
AREC 305	Agricultural and Resource Enterprise Analysis	3
AREC 310	Agricultural Marketing	3
AREC 375	Agricultural Law	3
ATS 350	Introduction to Weather and Climate	2
ATS 351	Introduction to Weather and Climate Lab	1
BSPM 445	Aquatic Insects	4
BZ 440	Plant Physiology	3
BZ 441	Plant Physiology Laboratory	2
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 413	Environmental River Mechanics	3
CIVE 423	Groundwater Engineering	3
CIVE 425	Soil and Water Engineering	3
CIVE 440	Nonpoint Source Pollution	3
ERHS 448	Environmental Contaminants	3
ESS 311	Ecosystem Ecology	3
ESS 471	Special Topics in Ecosystem Sustainability	1-6
ESS 474	Limnology	3
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
GEOL 551	Groundwater Modeling	3
GEOL 552	Advanced Topics in Hydrogeology	2-3
GEOL 553	Use of Tracers in Hydrogeology	3
GES 440	Sea Level Rise and a Sustainable Future	3
GES 470	Applications of Environmental Sustainability	3
GR 320	Cultural Geography	3
GR 330	Urban Geography	3
GR 333	Glaciers and Climate Change	3
GR 345	Geography of Hazards	3
GR 348	Biogeography	3
GR 410	Climate Change: Science, Policy, Implications	3
GRAD 592	Water Resources Seminar	1
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 365	Environmental Education	3
NR 370	Coastal Environmental Ecology	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 450	Geospatial Project Design and Analysis	4
NRRT 330	Social Aspects of Natural Resource Management	3
NRRT 362	Environmental Conflict Management	3
RS 478	Ecological Restoration	3
SOC 323	Soc. of Environmental Cooperation & Conflict	3
SOC 324	Food Justice	3
SOC 463	Sociology of Disaster	3
SOCR 322	Principles of Microclimatology	3
SOCR 370	Irrigation Principles	2
SOCR 371	Irrigation of Field Crops	1
SOCR 375	Soil Biogeochemistry	3
SOCR 440	Pedology	4
SOCR 500	Environmental Measurement Laboratory	1
WR 406	Seasonal Snow Environments	3
WR 492	Seminar	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	Exploring Earth - Physical Geology (GT-SC2)			3A	
GEOL 122	The Blue Planet - Geology of Our Environment (GT-SC2)			3A	
GEOL 124	Geology of Natural Resources (GT-SC2)			3A	
GEOL 150	Physical Geology for Scientists and Engineers			3A	
Diversity, Equity, and Inclusion (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-equity-inclusion)		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	X			3
BUS 100	Introduction to Business	X			1
BUS 201	Foundations of Sustainable Enterprise	X			1
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	
	Total Credits				**14-15**
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 322	Intro. to Geographic Information Systems				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**
Sustainability Elective List (see list on Concentration Requirements tab)			X		6
Watershed Science Department List (see list on Concentration Requirements tab)			X		3
Electives			X		3
	Total Credits				**12**

Semester 9		**Critical**	**Recommended**	**AUCC**	**Credits**
WR 440	Watershed Problem Analysis	X		4A,4B,4C	3
Sustainability Elective List (see list on Concentration Requirements tab)		X			3
Electives		X			8-10
The benchmark courses for the 9th semester are the remaining courses in the entire program of study.		X			
	Total Credits				**14-16**
	Program Total Credits:				**120**