



ENVIRONMENTAL SCIENCES GRADUATE PROGRAM AREA OF CONCENTRATION IN WATER RESOURCES

PURPOSE

The Area of Concentration in Water Resources is designed for students who have a strong natural science, policy, or management background and want to develop an understanding of water resources in relation to environmental issues. Water Resources is the study of spatial and temporal variations and movement of water within and between earth systems, and the physical, chemical, biological, and social processes that affect and accompany the movement of water. Within the Water Resources track, students may choose to focus on integrated aspects of aquatic, terrestrial, atmospheric, marine and social systems.

PROGRAM OF STUDY

The Water Resources track includes courses in 7 categories: the ES Core courses, Methods and Numerical Skills courses, Basic Environmental Systems courses, Basic Human Systems courses, Science Focal Area courses, Elective courses and Thesis. Total credits required are a minimum of 45 Cr. for the M.S. and 108 Cr. for the Ph.D. degree. Typical Programs of Study will include minimum credits as follow:

<u>Subject Area</u>	<u>M.S. & M.A. Degrees</u>	<u>Ph. D. Degree</u>
ES Core Courses	9-12 Cr	10-12 Cr
Methods and Numerical Skills	6 Cr	9 Cr
Basic Environmental Systems	6 Cr	6 Cr
Basic Human Systems	6 Cr	6 Cr
Focal Area Courses	9 Cr	15 Cr
Electives	0 Cr	0-14 Cr
Thesis	9 Cr	45-59 Cr
Total	45 Cr	108 Cr

CORE COURSES

9-12 Cr. for the M.S and M.A. degree (required are ENSC 515, 520, 508 and one class from the approved list of core courses- below) and 10-12 Cr. for the Ph. D. degree. (required are ENSC 515, 520, 508 and classes from the approved list of core courses- below). These courses include Environmental Perspectives, Environmental Analysis, Environmental Profiles, and the Joint-Campus Workshop in Environmental Science, Studies, and Policy.

Approved Core Course List:

ANTH 581	Natural Resources and Community Values
ANTH 582	World Food and the Cultural Implications of International Development
BI/BOT 589	Analysis of Environmental Issues
BI 570	Community Structure and Analysis
BI 670	Community Structure and Analysis
Comm 540	Theories of Conflict and Conflict Management
EC 539	Public Policy Analysis
FOR 561	Forest Policy Analysis
FS520	Posing Researchable Questions
FS521	Natural Resource Research Plan
FS565	Forest Ecosystem Management
FS646	Ecosystem Analysis and Evaluation
FW 515	Model Selection and Inference
GEO 520	Geography of Resource Use
H524	Health Data Analysis
H525	Intro Epidemiology
H526	Epidemiological Methods
H549	Health Risk Communication

H575	Evaluation
H576	Proposal Writing
HIST 569	History of the Pacific Northwest
LA 607	Experimental Seminar in Biocomplexity and Alternative Futures
MRM515	Coastal Resources Management
PS 574	Bureaucratic Politics and Policy
PS 575	Politics of Environmental Problems
PS 576	Science and Politics
RNG 650	GIS Watersheds Analysis
SED 580	Research and Evaluation
SOC 581	Society and Natural Resources
Z582	Molecular Methods in Ecology and Evolution

METHODS AND NUMERICAL SKILLS

These courses are to ensure that students have sufficient skills in research methods including mathematics, statistics, and computer science.

CS 540 Database Management Systems
 CS 515 Algorithms and Data Structures
 GEO 541 Spatial Variation in Ecology and Earth Science
 GEO 565 Geographic Information Systems
 MTH 581 Mathematical Methods for Engineers and Scientists
 MTH 582 Mathematical Methods for Engineers and Scientists
 MTH 583 Mathematical Methods for Engineers and Scientists
 ST 511 Methods of Data Analysis
 ST 512 Methods of Data Analysis
 ST 513 Methods of Data Analysis
 ST 515 Design and Analysis of Planned Experiments
 ST 522 Introduction to Mathematical Statistics
 ST 531 Sampling Methods
 ST 571 Environmental Sampling

BASIC ENVIRONMENTAL SYSTEMS

Basic Earth System courses are intended to develop basic knowledge of hydrologic concepts and elements of the hydrologic cycle.

ATS 520 Principles of Atmospheric Science
 BRE 512 Physical Hydrology (cross listed as CE 512)
 BRE 514 Groundwater Hydraulics (CE, GEO)
 CE 556 Environmental Assessment
 CSS 535 Soil Ecosystem Properties and Processes
 FE 530 Watershed Processes
 GEO 531 Applied Climatology

BASIC HUMAN SYSTEMS

Basic Human Systems courses are intended to develop basic knowledge of social and political concepts relating to water resources.

AREC 553 Public Land and Resource Law
 ANTH 581 Natural Resources and Community Values
 FOR 562 Natural Resource Policy and Law
 GEO 522 Ecological Knowledge and Environmental Problems
 GEO 525 Water Resources Management in the United States
 HORT 590 Systems Thinking and Practice (H 590, BUS 565)
 H 511 Environmental Health Policy and Regulations
 SOC 580 Environmental Sociology

FOCAL AREA COURSES

Focal area courses are intended to develop depth of student understanding in water resources and related disciplines. The courses below are examples of 3 possible areas of focus that fall within water resources. The program of study is intended to be flexible to accommodate other areas of study, so that students may tailor their

program to match their specific area of interest. Other examples of possible focal areas include Riparian Restoration, International Water Resources, Watershed Analysis, Remote Sensing Hydrology and Vegetation-Atmosphere Interactions.

Hydrology

ATS 564 Interactions of Vegetation and the Atmosphere (FS)
BOT 634 Plant-water Relations
BRE 540 Field and Laboratory Techniques in Subsurface Hydrology (CE)
BRE 542 Vadose Zone Transport
BRE 525 Stochastic Hydrology (CE)
BRE 544 Hydraulics of Open Channels
BRE 549 Regional Hydrologic Modeling
CE 543 Applied Hydrology CE 518 Groundwater Modeling (BRE)
CE 545 Sediment Transport
FE 532 Forest Hydrology
FW 580 Stream Ecology
GEO 583 Geomorphology of Mountain Streams
GEO 691 Mass and Heat Transport in the Environment

Water Quality and Land Use

CE 548 Water Quality Dynamics
CSS 568 Soil Landscape Analysis
CSS 585 Environmental Applications of Soil Science
BRE 548 Nonpoint Source Pollution Assessment and Control
BRE 571 Biosystems Modeling Techniques
ENVE 531 Transport/Fate of Organic Chemicals in Environmental Systems
ENVE 532 Aqueous Environmental Chemistry
ENVE 541 Microbial Processes in Environmental Systems
FE 535 Water Quality and Forest Land Use
FE 630 Watershed Analysis
FW 579 Wetlands and Riparian Ecology
FW 580 Stream Ecology
H 543 Environmental Sampling and Analysis
RNG 555 Riparian Ecology and Management

Policy and Management

AREC 550 Environmental Economics
AREC 534 Environmental and Resource Economics (ECON)
AREC 551 Natural Resource Economics
FOR 563 Environmental Policy and Law Interactions
GEO 520 Advanced Topics in Water Resources Management
GEO 524 Water Resources Geography
GEO 529 Topics in Resource Geography
GEO 553 Resource Evaluation Methods / EIS
H 541 Environmental Health
MRM 515 Coastal Resources Management
RNG 555 Riparian Ecology and Management
SOC 556 Science and Technology in Social Context
SOC 581 Society and Natural Resources
SOC 585 Consensus and Natural Resources (ANS/FW/HORT/PS)
STC 520 Foundations of Scientific and Technical Communication (WR)
STC 562 Science Writing (WR)

ELECTIVE COURSES

0 Credits for M.S. and M.A. degrees and 0-14 Credit for Ph.D. degree. Students will work with their graduate advisor and committee to select elective courses to develop necessary background and to add depth to the student's Program of Study.

THESIS:

The thesis requirement includes 9 Cr for a M.S. and M.A. degree and 45-59 Cr for a Ph. D. degree.