



Twin Cities Campus

Environmental Sciences, Policy and Management B.S.

College of Food, Agri & Natural Resource Sciences

College of Food, Agricultural and Natural Resource Sciences

- Program Type: Baccalaureate
- Requirements for this program are current for Spring 2021
- Required credits to graduate with this degree: 120
- Required credits within the major: 75 to 92
- This program requires summer terms.
- Degree: Bachelor of Science

The environmental sciences, policy and management (ESPM) major is designed to address the needs posed by the complexity of environmental and renewable resource issues that are faced on a state, national, and global level. This interdisciplinary, environmental major prepares graduates to solve environmental problems from an integrated knowledge base.

The mission of the ESPM major is to:

Improve the basis for environmental decision-making by integrating physical, biological, and social sciences with policy analysis and management;

Educate the next generation of environmental professionals and leaders;

Foster innovative approaches for the education of environmental professionals;

Facilitate science/social science/policy linkages within and beyond the University.

Students complete a set of common "integrated core" courses that focus on integrated problem-solving using environmental sciences, policy, ethics, management models, and communication theory. Students also incorporate classroom and fieldwork.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Admission Requirements

For information about University of Minnesota admission requirements, visit the [Office of Admissions website](#).

General Requirements

All students are required to complete general University and college requirements including writing and liberal education courses. For more information about University-wide requirements, see the [liberal education requirements](#). Required courses for the major or minor in which a student receives a D grade (with or without plus or minus) do not count toward the major or minor (including transfer courses).

Program Requirements

All students complete required courses below and choose one of the following ESPM tracks:

- conservation and resource management (CRM)
- environmental education and communication (EEC)
- policy, planning, law, and society (PPLS)
- environmental science (ES)

Students are strongly encouraged to have an international experience before graduation. Courses completed during an international experience (study, work, volunteer, research) can meet program requirements, liberal education requirements, and/or electives. Discussion with an advisor prior to commencing an international experience is required to plan how courses meet requirements in the ESPM major.

At least 15 upper division credits in the major must be taken at the University of Minnesota Twin Cities campus.

Integrated ESPM Core

[ESPM 1011](#) - Issues in the Environment [ENV] (3.0 cr)

[ESPM 2021](#) - Environmental Sciences: Integrated Problem Solving (3.0 cr)

[ESPM 3000](#) - Seminar on Current Issues for ESPM (1.0 cr)

[ESPM 1001](#) - Freshmen Orientation to Environmental Sciences, Policy, and Management (1.0 cr)

or [ESPM 1002](#) - Transfer Orientation Seminar (1.0 cr)



Experiential and Interdisciplinary Learning

ESPM Capstone

Take exactly 1 course(s) from the following:

- [ESPM 4021W](#) - Problem Solving: Environmental Review [WI] (4.0 cr)
- [ESPM 4041W](#) - Problem Solving for Environmental Change [WI] (4.0 cr)

Upper Division Writing Intensive within the Major

Students are required to take one upper division writing intensive course within the major. If that requirement has not been satisfied within the core major requirements, students must choose one course from the following list. Some of these courses may also fulfill other major requirements.

Take 0 - 1 course(s) from the following:

- [ESPM 4021W](#) - Problem Solving: Environmental Review [WI] (4.0 cr)
- [ESPM 4041W](#) - Problem Solving for Environmental Change [WI] (4.0 cr)

Communication Skills

[COMM 1101](#) - Introduction to Public Speaking [CIV] (3.0 cr)

or [AECM 2421W](#) - Professional and Oral Communication for Agriculture, Food & the Environment [WI] (3.0 cr)

Biological Sciences

CRM track: BIOL 1009 is required when taking BIOC 2011

[BIOL 1001](#) - Introductory Biology: Evolutionary and Ecological Perspectives [BIOL] (4.0 cr)

or [BIOL 1009](#) - General Biology [BIOL] (4.0 cr)

Program Sub-plans

Students are required to complete one of the following sub-plans.

Conservation and Resource Management

Students in the CRM sub-plan are involved in what Thoreau suggested was "environmental wisdom," or the ability to make effective decisions about the environment by synthesizing natural and human created facts and information. Students integrate this understanding with diverse economic and social insight to make effective decisions for the environment and society.

This sub-plan prepares students for technical support, operational, and managerial positions in diverse aspects of resource conservation and management with local, state, and federal agencies and the private sector. This sub-plan also prepares students for graduate study in a wide range of areas.

Students solve problems in field settings and communicate their understanding, synthesis, and decision-making to diverse audiences. They gain experience in the actual implementation of decisions. Students may also develop special skills through electives (e.g., geographic information systems, geospatial analysis).

CRM Core Courses

Additional Mathematical Thinking

[MATH 1142](#) - Short Calculus [MATH] (4.0 cr)

or [MATH 1271](#) - Calculus I [MATH] (4.0 cr)

Statistics

[ESPM 3012](#) - Statistical Methods for Environmental Scientists and Managers [MATH] (4.0 cr)

or [STAT 3011](#) - Introduction to Statistical Analysis [MATH] (4.0 cr)

Additional Biological Thinking

[PMB 2022](#) - General Botany (3.0 cr)

or [BIOL 2012](#) - General Zoology (4.0 cr)

or [ESPM 3108](#) - Ecology of Managed Systems [ENV] (3.0 cr)

or [ESPM 3612W](#) - Soil and Environmental Biology [WI] (4.0 cr)

or [FNRM 1101](#) - Dendrology: Identifying Forest Trees and Shrubs (3.0 cr)

or [FNRM 3104](#) - Forest Ecology (4.0 cr)

Soils

[SOIL 2125](#) - Basic Soil Science [PHYS, ENV] (4.0 cr)

Additional Physical Science

[CHEM 1061](#) - Chemical Principles I [PHYS] (3.0 cr)

[CHEM 1065](#) - Chemical Principles I Laboratory [PHYS] (1.0 cr)

[CHEM 1062](#) - Chemical Principles II [PHYS] (3.0 cr)

[CHEM 1066](#) - Chemical Principles II Laboratory [PHYS] (1.0 cr)

or [CHEM 1015](#) - Introductory Chemistry: Lecture [PHYS] (3.0 cr)

[CHEM 1017](#) - Introductory Chemistry: Laboratory [PHYS] (1.0 cr)



BIOC 2011 - Biochemistry for the Agricultural and Health Sciences (3.0 cr)
or SOIL 3416 - Plant Nutrients in the Environment (3.0 cr)
or CHEM 1061 - Chemical Principles I [PHYS] (3.0 cr)
CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)
BIOC 2011 - Biochemistry for the Agricultural and Health Sciences (3.0 cr)
or SOIL 3416 - Plant Nutrients in the Environment (3.0 cr)

GIS

FNRM 3131 - Geographical Information Systems (GIS) for Natural Resources [TS] (4.0 cr)
or GEOG 3561 - Principles of Geographic Information Science (4.0 cr)

Additional Geospatial/Resource Analysis

Take 1 or more course(s) totaling 3 or more credit(s) from the following:

- ESPM 3031 - Applied Global Positioning Systems for Geographic Information Systems (3.0 cr)
- ESPM 3211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
- ESPM 4295W - GIS in Environmental Science and Management [WI] (4.0 cr)
- FNRM 3218 - Measuring and Modeling Forests (3.0 cr)
- FNRM 3262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)

Social Sciences

Economics

ESPM 3261 - Economics and Natural Resources Management [SOCS, ENV] (4.0 cr)
or APEC 1101 - Principles of Microeconomics [SOCS, GP] (4.0 cr)
or ECON 1101 - Principles of Microeconomics [SOCS, GP] (4.0 cr)

Policy

ESPM 3241W - Natural Resource and Environmental Policy [SOCS, CIV, WI] (3.0 cr)
or ESPM 3271 - Environmental Policy, Law, and Human Behavior [CIV, SOCS] (3.0 cr)

Additional Social Systems

ESPM 3202W - Environmental Conflict Management, Leadership, and Planning [WI] (3.0 cr)
or ESPM 3241W - Natural Resource and Environmental Policy [SOCS, CIV, WI] (3.0 cr)
or ESPM 3271 - Environmental Policy, Law, and Human Behavior [CIV, SOCS] (3.0 cr)
or ESPM 3602 - Regulations and Corporate Environmental Management (3.0 cr)
or ESPM 3604 - Environmental Management Systems and Strategy (3.0 cr)
or ESPM 4242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)

Field Experience

Take 1 or more course(s) totaling 2 or more credit(s) including 0 or more sub-requirements(s) from the following:

- ESPM 3031 - Applied Global Positioning Systems for Geographic Information Systems (3.0 cr)
- ESPM 3111 - Hydrology and Water Quality Field Methods (3.0 cr)
- PMB 4321 - Minnesota Flora (3.0 cr)
- SOIL 4511 - Field Study of Soils (2.0 cr)
- FNRM 3206 - Park and Protected Area Management Field Studies (2.0 cr)
- FNRM 3362 - Drones: Data, Analysis, and Operations (3.0 cr)
- FNRM 2101 - Identifying Forest Plants (1.0 cr)
- FNRM 2102 - Northern Forests Field Ecology (2.0 cr)
- FNRM 2104 - Measuring Forest Resources (1.0 cr)

Internship

Requires advance approval by ESPM Internship Coordinator. See academic advisor and ESPM website to determine which course to take.

ESPM 4096 - Professional Experience Program: Internship (1.0 cr)
or CFAN 3096 - Making the Most of your Professional Experience (1.0 cr)

CRM Contract Courses

Courses taken to meet other ESPM requirements cannot be counted here. A contract, signed by your faculty mentor, is required. All courses must be upper division. Sample courses are listed below; consult with faculty mentor about courses not on this list.

Take 23 or more credit(s) from the following:

Conservation and Management

Take 0 or more course(s) from the following:

- ESPM 3108 - Ecology of Managed Systems [ENV] (3.0 cr)
- ESPM 3221 - Soil Conservation and Land-Use Management (3.0 cr)
- ESPM 3575 - Wetlands (3.0 cr)
- ESPM 3602 - Regulations and Corporate Environmental Management (3.0 cr)
- ESPM 3603 - Environmental Life Cycle Analysis (3.0 cr)
- ESPM 3607 - Natural Resources Consumption and Sustainability [GP] (3.0 cr)
- ESPM 3612W - Soil and Environmental Biology [WI] (4.0 cr)
- ESPM 3921 - Science and Critical Thinking for Understanding Our World [CIV] (3.0 cr)
- ESPM 4061W - Water Quality and Natural Resources [ENV, WI] (3.0 cr)
- ESPM 4216 - Contaminant Hydrology (3.0 cr)
- ESPM 4601 - Environmental Pollution (3.0 cr)
- BBE 4535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)



- BBE 4608 - Environmental and Industrial Microbiology (3.0 cr)
- EEB 3603 - Science, Protection, and Management of Aquatic Environments (3.0 cr)
- ENT 3925 - Insects, Aquatic Habitats, and Pollution (3.0 cr)
- ENT 4251 - Forest and Shade Tree Entomology (3.0 cr)
- FNRM 3104 - Forest Ecology (4.0 cr)
- FNRM 3114 - Hydrology and Watershed Management (3.0 cr)
- FNRM 3411 - Managing Forest Ecosystems: Silviculture (3.0 cr)
- FNRM 3462 - Advanced Remote Sensing and Geospatial Analysis (3.0 cr)
- FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
- FW 4102 - Principles of Conservation Biology [ENV] (3.0 cr)
- FW 4103 - Principles of Wildlife Management (3.0 cr)
- SOIL 3416 - Plant Nutrients in the Environment (3.0 cr)
- SSM 4504W - Sustainable Products Systems Management [WI] (3.0 cr)
- ENGL 3501 - Public Discourse: Coming to Terms with the Environment [LITR, ENV] (3.0 cr)
- HSCI 3244 - Nature's History: Science, Humans, and the Environment [HIS, ENV] (3.0 cr)
- WRIT 3315 - Writing on Issues of Land and the Environment [AH, DSJ] (3.0 cr)
- ESPM 5071 - Ecological Restoration (4.0 cr)
or HORT 5071 - Ecological Restoration (4.0 cr)
- SOIL 5555 - Wetland Soils (3.0 cr)
or ESPM 5555 - Wetland Soils (3.0 cr)
- Geospatial/Resource Analysis**
Take 0 or more course(s) from the following:
 - ESPM 3031 - Applied Global Positioning Systems for Geographic Information Systems (3.0 cr)
 - ESPM 3211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
 - ESPM 4295W - GIS in Environmental Science and Management [WI] (4.0 cr)
 - FNRM 3218 - Measuring and Modeling Forests (3.0 cr)
 - FNRM 3262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
- Grand Challenge Courses**
Take 0 or more course(s) from the following:
 - GCC 3004 - The Fracking Boom: Promises and Challenges of the Hydrocarbon Renaissance [ENV] (3.0 cr)
 - GCC 3011 - Pathways to Renewable Energy [TS] (3.0 cr)
 - GCC 5008 - Policy and Science of Global Environmental Change [ENV] (3.0 cr)
 - GCC 5011 - Pathways to Renewable Energy [TS] (3.0 cr)

Environmental Education & Communication

Students in the EEC sub-plan gain a solid base of knowledge in the environmental sciences, environmental ethics, and the social context of environmental issues, and they develop a practical set of skills for teaching effectively in informal settings and for communicating clearly in written, oral, and electronic forms. This sub-plan prepares students to work at government agencies, nature centers, parks, non-governmental organizations, and similar institutions, and is appropriate for students who wish to gain a broad understanding of environmental issues and the choices humans can make to mitigate unwanted impacts of human behavior on the environment.

Students are encouraged to study abroad in ESPM topics, and/or a student designed area making choices that strengthen their expertise in an area and/or provide comparative understanding from another culture or discipline. Students should see their advisor for a list of suggestions and recommended minors.

Mathematical Thinking

- STAT 3011 - Introduction to Statistical Analysis [MATH] (4.0 cr)
- or SOC 3811 - Social Statistics [MATH] (4.0 cr)
- or ESPM 3012 - Statistical Methods for Environmental Scientists and Managers [MATH] (4.0 cr)

Physical Science

- CHEM 1015 - Introductory Chemistry: Lecture [PHYS] (3.0 cr)
- CHEM 1017 - Introductory Chemistry: Laboratory [PHYS] (1.0 cr)
- or CHEM 1061 - Chemical Principles I [PHYS] (3.0 cr)
- CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)

Social Sciences

- APEC 1101 - Principles of Microeconomics [SOCS, GP] (4.0 cr)
- or ECON 1101 - Principles of Microeconomics [SOCS, GP] (4.0 cr)
- or ESPM 3261 - Economics and Natural Resources Management [SOCS, ENV] (4.0 cr)
- ESPM 3241W - Natural Resource and Environmental Policy [SOCS, CIV, WI] (3.0 cr)
- or ESPM 3271 - Environmental Policy, Law, and Human Behavior [CIV, SOCS] (3.0 cr)

Education and Communication

- Take 12 or more credit(s) from the following:
- ESPM 2401 - Environmental Education/Interpretation (3.0 cr)
- ESPM 4811 - Environmental Interpretation (3.0 cr)



- [AECM 3431](#) - Communicating Food, Agriculture & Environmental Science to the Public (3.0 cr)
- [COMM 3401](#) - Introduction to Communication Theory (3.0 cr)
- [COMM 3451W](#) - Intercultural Communication: Theory and Practice [WI] (3.0 cr)
- [COMM 4251](#) - Environmental Communication [ENV] (3.0 cr)
- [ENGL 3501](#) - Public Discourse: Coming to Terms with the Environment [LITR, ENV] (3.0 cr)
- [JOUR 3006](#) - Visual Communication (3.0 cr)
- [JOUR 3775](#) - Administrative Law and Regulation for Strategic Communication [CIV] (3.0 cr)
- [WRIT 3102W](#) - Public Writing [CIV, WI] (3.0 cr)
- [WRIT 3152W](#) - Writing on Issues of Science and Technology [WI] (3.0 cr)
- [WRIT 3221W](#) - Communication Modes and Methods [WI] (3.0 cr)
- [WRIT 3315](#) - Writing on Issues of Land and the Environment [AH, DSJ] (3.0 cr)
- [WRIT 3441](#) - Editing, Critique, and Style (3.0 cr)
- [WRIT 3701W](#) - Rhetorical Theory for Writing Studies [WI] (3.0 cr)
- Take exactly 1 course(s) from the following:
 - [EPSY 5243](#) - Principles and Methods of Evaluation (3.0 cr)
 - [OLPD 5501](#) - Principles and Methods of Evaluation (3.0 cr)
 - [FNRM 5259](#) - Visitor Behavior Analysis (3.0 cr)

Human Dimensions

- [ESPM 3011W](#) - Ethics in Natural Resources [CIV, WI] (3.0 cr)
or [PHIL 3301](#) - Environmental Ethics [ENV] (4.0 cr)

Take 2 or more course(s) from the following:

- [ESPM 3607](#) - Natural Resources Consumption and Sustainability [GP] (3.0 cr)
- [ESPM 3202W](#) - Environmental Conflict Management, Leadership, and Planning [WI] (3.0 cr)
- [ESPM 3245](#) - Sustainable Land Use Planning and Policy [ENV] (3.0 cr)
- [GEOG 3371W](#) - Cities, Citizens, and Communities [DSJ, WI] (3.0 cr)
- [GEOG 3376](#) - Political Ecology of North America [ENV] (3.0 cr)
- [HSCI 3244](#) - Nature's History: Science, Humans, and the Environment [HIS, ENV] (3.0 cr)
- [SOC 3451W](#) - Cities & Social Change [WI] (3.0 cr)
- [WRIT 3315](#) - Writing on Issues of Land and the Environment [AH, DSJ] (3.0 cr)
- [GLOS 4311](#) - Power, Justice & the Environment [DSJ] (3.0 cr)
or [SOC 4311](#) - Power, Justice & the Environment [DSJ] (3.0 cr)
- [CSCL 3322](#) - Visions of Nature: The Natural World and Political Thought [ENV] (3.0 cr)

Natural Sciences

Ecology

- [FNRM 3104](#) - Forest Ecology (4.0 cr)
or [EEB 3407](#) - Ecology (3.0 cr)
or [EEB 3408W](#) - Ecology [WI] (4.0 cr)
or [EEB 3001](#) - Ecology and Society [ENV] (3.0 cr)
or [FW 2003](#) - Introduction to Marine Biology (3.0 cr)

Physical Environment

- [ESPM 4061W](#) - Water Quality and Natural Resources [ENV, WI] (3.0 cr)
or [BBE 2201](#) - Renewable Energy and the Environment [TS] (3.0 cr)
or [EEB 3603](#) - Science, Protection, and Management of Aquatic Environments (3.0 cr)
or [EEB 5601](#) - Limnology (3.0 cr)
or [FNRM 3114](#) - Hydrology and Watershed Management (3.0 cr)
or [ESCI 1001](#) - Earth and Its Environments [PHYS, ENV] (4.0 cr)
or [PHYS 1001W](#) - Energy and the Environment [PHYS, ENV, WI] (4.0 cr)
or [SOIL 2125](#) - Basic Soil Science [PHYS, ENV] (4.0 cr)

Organismal Biology

Take 3 or more course(s) including exactly 2 sub-requirements(s) from the following:

Plant

Take 1 or more course(s) from the following:

- [FNRM 1101](#) - Dendrology: Identifying Forest Trees and Shrubs (3.0 cr)
- [PMB 2022](#) - General Botany (3.0 cr)
- [PMB 4321](#) - Minnesota Flora (3.0 cr)
- [PMB 4511](#) - Flowering Plant Diversity (3.0 cr)

Animal

Take 1 or more course(s) from the following:

- [BIOL 2012](#) - General Zoology (4.0 cr)
- [EEB 4129](#) - Mammalogy (4.0 cr)
- [EEB 4134](#) - Introduction to Ornithology (4.0 cr)
- [ENT 1005](#) - Insect Biology with Lab [BIOL] (4.0 cr)
- [ENT 5361](#) - Aquatic Insects (4.0 cr)
- [FW 4101](#) - Herpetology (4.0 cr)
- [FW 4136](#) - Ichthyology (4.0 cr)



Complex Human and Natural Systems

- [ESPM 3108](#) - Ecology of Managed Systems [ENV] (3.0 cr)
or [ESPM 5071](#) - Ecological Restoration (4.0 cr)
or [FNRM 4501](#) - Urban Forest Management: Managing Greenspaces for People (3.0 cr)
or [FW 2001W](#) - Introduction to Fisheries, Wildlife, and Conservation Biology [ENV, WI] (3.0 cr)
or [FW 4102](#) - Principles of Conservation Biology [ENV] (3.0 cr)
or [GCC 5008](#) - Policy and Science of Global Environmental Change [ENV] (3.0 cr)
or [HORT 5071](#) - Ecological Restoration (4.0 cr)
or [LA 3501](#) - Environmental Design and Its Biological and Physical Context [ENV] (3.0 cr)
or [URBS 3751](#) - Understanding the Urban Environment [ENV] (3.0 cr)

Field Experience or Internship

- Take from below or other similar field coursework
[ESPM 4096](#) - Professional Experience Program: Internship (1.0 cr)
or [CFAN 3096](#) - Making the Most of your Professional Experience (1.0 cr)
or [FNRM 3206](#) - Park and Protected Area Management Field Studies (2.0 cr)
or [FNRM 2101](#) - Identifying Forest Plants (1.0 cr)
[FNRM 2102](#) - Northern Forests Field Ecology (2.0 cr)
[FNRM 2104](#) - Measuring Forest Resources (1.0 cr)

Environmental Science

The ES sub-plan focuses on the application and integration of basic and applied sciences to solve complex environmental problems. Students can earn professional licenses and certification in several areas and will be qualified to work as soil scientists, hydrologists, water quality and wetland ecology scientists, environmental remediation scientists, climatologists, and atmospheric scientists. Graduates find jobs with environmental regulatory agencies, private consulting firms, and nonprofit organizations. This sub-plan provides a diverse basic and applied science background that also prepares students for scientific research through advanced graduate studies.

Students in this sub-plan use an understanding of biology, chemistry, physics, and mathematics to develop a broad knowledge base in soil, hydrologic, atmospheric, and biological sciences. Students study the interaction between science and the functioning of urban, forested, and agricultural lands, as well as hydrologic, atmospheric, soil, and wetland resources.

Social Sciences

- [ESPM 3261](#) - Economics and Natural Resources Management [SOCS, ENV] (4.0 cr)
or [APEC 1101](#) - Principles of Microeconomics [SOCS, GP] (4.0 cr)
or [ECON 1101](#) - Principles of Microeconomics [SOCS, GP] (4.0 cr)
[ESPM 3241W](#) - Natural Resource and Environmental Policy [SOCS, CIV, WI] (3.0 cr)
or [ESPM 3271](#) - Environmental Policy, Law, and Human Behavior [CIV, SOCS] (3.0 cr)

Additional Basic Science and Math Courses

- [CHEM 1061](#) - Chemical Principles I [PHYS] (3.0 cr)
[CHEM 1065](#) - Chemical Principles I Laboratory [PHYS] (1.0 cr)
[CHEM 1062](#) - Chemical Principles II [PHYS] (3.0 cr)
[CHEM 1066](#) - Chemical Principles II Laboratory [PHYS] (1.0 cr)
[MATH 1142](#) - Short Calculus [MATH] (4.0 cr)
or [MATH 1271](#) - Calculus I [MATH] (4.0 cr)
[PHYS 1101W](#) - Introductory College Physics I [PHYS, WI] (4.0 cr)
[ESPM 3131](#) - Environmental Physics (3.0 cr)
or [ESPM 3777](#) - Climate Change- Physics, Myths, Mysteries, and Uncertainties (3.0 cr)
[BIOC 2011](#) - Biochemistry for the Agricultural and Health Sciences (3.0 cr)
or [BIOL 2012](#) - General Zoology (4.0 cr)
or [PMB 2022](#) - General Botany (3.0 cr)
[ESPM 3012](#) - Statistical Methods for Environmental Scientists and Managers [MATH] (4.0 cr)
or [STAT 3011](#) - Introduction to Statistical Analysis [MATH] (4.0 cr)

Applied Sciences and Technology Courses

- [FNRM 3114](#) - Hydrology and Watershed Management (3.0 cr)
[ESCI 1001](#) - Earth and Its Environments [PHYS, ENV] (4.0 cr)
[SOIL 2125](#) - Basic Soil Science [PHYS, ENV] (4.0 cr)
[ESPM 1425](#) - Introduction to Weather and Climate [PHYS, ENV] (4.0 cr)
or [GEOG 1425](#) - Introduction to Weather and Climate [PHYS, ENV] (4.0 cr)
[FNRM 3131](#) - Geographical Information Systems (GIS) for Natural Resources [TS] (4.0 cr)
or [GEOG 3561](#) - Principles of Geographic Information Science (4.0 cr)
[ESPM 3108](#) - Ecology of Managed Systems [ENV] (3.0 cr)
or [FNRM 3104](#) - Forest Ecology (4.0 cr)
or [FNRM 3411](#) - Managing Forest Ecosystems: Silviculture (3.0 cr)
or [EEB 3407](#) - Ecology (3.0 cr)
or [EEB 3408W](#) - Ecology [WI] (4.0 cr)



Internship

- [ESPM 4096](#) - Professional Experience Program: Internship (1.0 cr)
- or [CFAN 3096](#) - Making the Most of your Professional Experience (1.0 cr)

Take 2 or more credits from the following:

- [ESPM 3031](#) - Applied Global Positioning Systems for Geographic Information Systems (3.0 cr)
- or [ESPM 3111](#) - Hydrology and Water Quality Field Methods (3.0 cr)
- or [FNRM 3206](#) - Park and Protected Area Management Field Studies (2.0 cr)
- or [PMB 4321](#) - Minnesota Flora (3.0 cr)
- or [SOIL 3521](#) - Soil Judging (1.0 cr)
- or [SOIL 4511](#) - Field Study of Soils (2.0 cr)
- or [FNRM 3362](#) - Drones: Data, Analysis, and Operations (3.0 cr)
- or [FNRM 2101](#) - Identifying Forest Plants (1.0 cr)
- [FNRM 2102](#) - Northern Forests Field Ecology (2.0 cr)
- [FNRM 2104](#) - Measuring Forest Resources (1.0 cr)

ES Contract Courses

Based on course selection, students have the opportunity to become certified or licensed as a professional soil scientist, hydrologist, wetland delineator, erosion control specialist, or site evaluator for individual sewage treatment system. Courses taken to meet other requirements cannot be counted here, nor can courses count for multiple groups. A contract, signed by your faculty mentor, is required. All courses must be upper division. Sample courses are listed below.

Take 9 or more credit(s) from the following:

Earth Sciences

Take 0 or more course(s) from the following:

- [ESPM 3221](#) - Soil Conservation and Land-Use Management (3.0 cr)
- [ESPM 3612W](#) - Soil and Environmental Biology [WI] (4.0 cr)
- [LAAS 5515](#) - Soil Formation: Earth Surface Processes and Biogeochemistry (3.0 cr)
- [SOIL 3416](#) - Plant Nutrients in the Environment (3.0 cr)
- [SOIL 3521](#) - Soil Judging (1.0 cr)
- [SOIL 4511](#) - Field Study of Soils (2.0 cr)
- [ESCI 4703](#) - Glacial Geology (4.0 cr)
- [WRIT 3315](#) - Writing on Issues of Land and the Environment [AH, DSJ] (3.0 cr)
- [SOIL 5555](#) - Wetland Soils (3.0 cr)
- or [ESPM 5555](#) - Wetland Soils (3.0 cr)

Water Sciences

Take 0 or more course(s) from the following:

- [ESPM 4061W](#) - Water Quality and Natural Resources [ENV, WI] (3.0 cr)
- [ESPM 4216](#) - Contaminant Hydrology (3.0 cr)
- [EEB 3603](#) - Science, Protection, and Management of Aquatic Environments (3.0 cr)
- [EEB 5605](#) - Limnology Laboratory (2.0 cr)
- [FNRM 5153](#) - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
- [PUBH 6190](#) - Environmental Chemistry (3.0 cr)
- [WRS 5101](#) - Water Policy (3.0 cr)

Biological and Ecological Sciences

Take 0 or more course(s) from the following:

- [ESPM 3612W](#) - Soil and Environmental Biology [WI] (4.0 cr)
- [ESPM 3921](#) - Science and Critical Thinking for Understanding Our World [CIV] (3.0 cr)
- [ESPM 5402](#) - Biometeorology (3.0 cr)
- [AGRO 4505](#) - Biology, Ecology, and Management of Invasive Plants (3.0 cr)
- [AGRO 5321](#) - Ecology of Agricultural Systems (3.0 cr)
- [EEB 4609W](#) - Ecosystem Ecology [ENV, WI] (3.0 cr)
- [EEB 4611](#) - Biogeochemical Processes (3.0 cr)
- [ENGL 3501](#) - Public Discourse: Coming to Terms with the Environment [LITR, ENV] (3.0 cr)
- [ENT 5361](#) - Aquatic Insects (4.0 cr)
- [FNRM 3104](#) - Forest Ecology (4.0 cr)
- [FNRM 3203](#) - Forest Fire and Disturbance Ecology (3.0 cr)
- [FNRM 3204](#) - Landscape Ecology and Management (3.0 cr)
- [FNRM 3411](#) - Managing Forest Ecosystems: Silviculture (3.0 cr)
- [GCC 5008](#) - Policy and Science of Global Environmental Change [ENV] (3.0 cr)
- [HIST 3417W](#) - Food in History [HIS, ENV, WI] (3.0 cr)
- [HORT 5071](#) - Ecological Restoration (4.0 cr)
- [LA 3204](#) - Holistic Landscape Ecology and Bioregional Practice (3.0 cr)
- [PMB 3002](#) - Plant Biology: Function (2.0 cr)
- [PMB 3005W](#) - Plant Function Laboratory [WI] (2.0 cr)
- [PMB 3007W](#) - Plant, Algal, and Fungal Diversity and Adaptation [WI] (4.0 cr)
- [PMB 4121](#) - Microbial Ecology and Applied Microbiology (3.0 cr)
- [AGRO 3203W](#) - Environment, Global Food Production, and the Citizen [GP, WI] (3.0 cr)



or [ANSC 3203W](#) - Environment, Global Food Production, and the Citizen [GP, WI] (3.0 cr)

•Take 0 or more course(s) from the following:

Ecology

•[EEB 3407](#) - Ecology (3.0 cr)

or [EEB 3408W](#) - Ecology [WI] (4.0 cr)

•**Atmospheric Sciences**

Take 0 or more course(s) from the following:

•[ESCI 3002](#) - Climate Change and Human History [ENV] (3.0 cr)

•[ESCI 3402](#) - Science and Politics of Global Warming [ENV] (3.0 cr)

•[ESPM 3425](#) - Atmospheric Pollution: From Smog to Climate Change (3.0 cr)

•[ESPM 3777](#) - Climate Change- Physics, Myths, Mysteries, and Uncertainties (3.0 cr)

•[ESPM 3993](#) - Directed Study (1.0 - 4.0 cr)

•[ESPM 5402](#) - Biometeorology (3.0 cr)

•[LAAS 5425](#) - Atmospheric Processes I: Thermodynamics and Dynamics of the Atmosphere (3.0 cr)

•[LAAS 5426](#) - Atmospheric Processes II: Radiation, Composition, and Climate (3.0 cr)

•[GEOG 3401](#) - Geography of Environmental Systems and Global Change [ENV] (3.0 cr)

•[GEOG 3423](#) - Urban Climatology (3.0 cr)

•[GEOG 5426](#) - Climatic Variations (3.0 cr)

•[PUBH 6154](#) - Climate Change and Global Health (3.0 cr)

•**Environmental Analysis and Assessment**

Take 0 or more course(s) from the following:

•[ESPM 3211](#) - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)

•[ESPM 3603](#) - Environmental Life Cycle Analysis (3.0 cr)

•[ESPM 4216](#) - Contaminant Hydrology (3.0 cr)

•[ESPM 4295W](#) - GIS in Environmental Science and Management [WI] (4.0 cr)

•[ESPM 4601](#) - Environmental Pollution (3.0 cr)

•[ESPM 5601](#) ~~(Inactive)~~ (3.0 cr)

•[CEGE 3501](#) - Introduction to Environmental Engineering [ENV] (3.0 cr)

•[CHEM 2301](#) - Organic Chemistry I (3.0 cr)

•[FNRM 3218](#) - Measuring and Modeling Forests (3.0 cr)

•[FNRM 3262](#) - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)

•[FNRM 3462](#) - Advanced Remote Sensing and Geospatial Analysis (3.0 cr)

•[GEOG 3401](#) - Geography of Environmental Systems and Global Change [ENV] (3.0 cr)

•[GEOG 3531](#) - Numerical Spatial Analysis (4.0 cr)

•[GEOG 5563](#) - Advanced Geographic Information Science (3.0 cr)

•[GIS 5571](#) - ArcGIS I (3.0 cr)

•[PUBH 6132](#) - Air, Water, and Health (2.0 cr)

•[PUBH 6175](#) - Environmental Measurements Laboratory (2.0 cr)

•**Grand Challenge Courses**

Take 0 or more course(s) from the following:

•[GCC 3004](#) - The Fracking Boom: Promises and Challenges of the Hydrocarbon Renaissance [ENV] (3.0 cr)

•[GCC 3031](#) - The Global Climate Challenge: Creating an Empowered Movement for Change [CIV] (3.0 cr)

•[GCC 3011](#) - Pathways to Renewable Energy [TS] (3.0 cr)

•[GCC 5008](#) - Policy and Science of Global Environmental Change [ENV] (3.0 cr)

•[GCC 5031](#) - The Global Climate Challenge: Creating an Empowered Movement for Change [CIV] (3.0 cr)

•[GCC 5011](#) - Pathways to Renewable Energy [TS] (3.0 cr)

Policy, Planning, Law and Society

The PPLS sub-plan focuses on developing understanding and problem-solving skills germane to the interaction between human and natural systems. Students will be well-prepared for policy development and analysis, strategy development, and decision-making in a range of positions and institutional settings. Example positions include those as a policy analyst, community planner, social researcher, or lawyer in public agencies, with legislative bodies, consulting firms, and conservation organizations. This sub-plan also prepares students for graduate study in policy, planning, and law programs.

Students study concepts, issues, and problem-solving approaches that address the policy, legal, economic, political, planning, and sociological aspects of environment and natural resource management. This study includes ethics and conflict management. The sub-plan further emphasizes an interdisciplinary approach for examining problems, such as sustainable land use planning, resource conservation and management, law, and environmental protection at a range of political levels and spatial scales and developing effective and innovative solutions. Students develop skill in integrating knowledge from the physical, biological, and social sciences to develop policy and planning alternatives and appropriate strategies to provide real solutions to complex problems.

Physical Science

Introductory Chemistry

[CHEM 1015](#) - Introductory Chemistry: Lecture [PHYS] (3.0 cr)

[CHEM 1017](#) - Introductory Chemistry: Laboratory [PHYS] (1.0 cr)



or **Chemistry Principles**

[CHEM 1061](#) - Chemical Principles I [PHYS] (3.0 cr)

[CHEM 1065](#) - Chemical Principles I Laboratory [PHYS] (1.0 cr)

Mathematical Thinking

[ESPM 3012](#) - Statistical Methods for Environmental Scientists and Managers [MATH] (4.0 cr)

or [STAT 3011](#) - Introduction to Statistical Analysis [MATH] (4.0 cr)

or [SOC 3811](#) - Social Statistics [MATH] (4.0 cr)

PPLS Core Courses

[ESPM 3241W](#) - Natural Resource and Environmental Policy [SOCS, CIV, WI] (3.0 cr)

[ESPM 3261](#) - Economics and Natural Resources Management [SOCS, ENV] (4.0 cr)

[ESPM 3271](#) - Environmental Policy, Law, and Human Behavior [CIV, SOCS] (3.0 cr)

Policy and Planning

[ESPM 3202W](#) - Environmental Conflict Management, Leadership, and Planning [WI] (3.0 cr)

[ESPM 3245](#) - Sustainable Land Use Planning and Policy [ENV] (3.0 cr)

[ESPM 4242](#) - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)

[ESPM 4256](#) - Natural Resource Law and the Management of Public Lands and Waters (3.0 cr)

International Development

[ESPM 3251](#) - Natural Resources in Sustainable International Development [GP] (3.0 cr)

or Appropriate Study Abroad

Field Session Options

[ESPM 4096](#) - Professional Experience Program: Internship (1.0 cr)

or [CFAN 3096](#) - Making the Most of your Professional Experience (1.0 cr)

or [FNRM 3206](#) - Park and Protected Area Management Field Studies (2.0 cr)

or **Cloquet Field Session**

Summer

[FNRM 2101](#) - Identifying Forest Plants (1.0 cr)

[FNRM 2102](#) - Northern Forests Field Ecology (2.0 cr)

[FNRM 2104](#) - Measuring Forest Resources (1.0 cr)

Methods

Choose one course from the following.

[ESPM 3211](#) - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)

or [POL 3085](#) - Quantitative Analysis in Political Science [MATH] (4.0 cr)

or [PSY 3001W](#) - Introduction to Research Methods [WI] (4.0 cr)

or [FNRM 5259](#) - Visitor Behavior Analysis (3.0 cr)

Geospatial Resource Analysis

Take exactly one course from the following:

[FNRM 3131](#) - Geographical Information Systems (GIS) for Natural Resources [TS] (4.0 cr)

or [GEOG 3561](#) - Principles of Geographic Information Science (4.0 cr)

Ecology and Management

Choose 3 credits from the following.

[ESPM 3108](#) - Ecology of Managed Systems [ENV] (3.0 cr)

or [ESPM 3575](#) - Wetlands (3.0 cr)

or [FNRM 3104](#) - Forest Ecology (4.0 cr)

or [FNRM 3411](#) - Managing Forest Ecosystems: Silviculture (3.0 cr)

Environmental and Systems Management

Choose 6-8 credits from the following.

[BBE 2201](#) - Renewable Energy and the Environment [TS] (3.0 cr)

or [ESPM 3603](#) - Environmental Life Cycle Analysis (3.0 cr)

or [ESPM 3604](#) - Environmental Management Systems and Strategy (3.0 cr)

or [ESPM 4021W](#) - Problem Solving: Environmental Review [WI] (4.0 cr)

or [ESPM 4061W](#) - Water Quality and Natural Resources [ENV, WI] (3.0 cr)

or [FNRM 3101](#) - Park and Protected Area Tourism (3.0 cr)

or [FNRM 3114](#) - Hydrology and Watershed Management (3.0 cr)

or [FNRM 4232W](#) - Managing Recreational Lands [WI] (4.0 cr)

or [GCC 5008](#) - Policy and Science of Global Environmental Change [ENV] (3.0 cr)

or [SOIL 2125](#) - Basic Soil Science [PHYS, ENV] (4.0 cr)

PPLS Contract Courses

Students must specialize in a content area to strengthen their expertise. This can be done with a minor, appropriate study abroad experience, and/or a student designed area. Courses listed in the sub-plan but not taken are good choices for use in a content area. Students should consult their faculty mentor for appropriate minors. A contract for 12 credits, signed by your faculty mentor, is required. All courses must be 3xxx level or above except for one course which could be 1xxx or 2xxx level.