

Environmental and Conservation Sciences Program Course Requirements

Requirements for M.S. Degree in Environmental and Conservation Sciences

Thirty credits are required for an Environmental and Conservation Sciences M.S. degree, including 6-10 thesis credits. Each M.S. student will complete a minimum of 20 credits of courses, of which 16 credits must be didactic (601-689, 701-789, 801-889, 691, 791, 891) plus ECS graduate seminar (**ECS 790; 1 credit**). The didactic credits must include **at least 1 ECS cross-disciplinary course** (3 credits) and Scientific Integrity (**Micr 720; 1 credit**). Pre-approved cross-disciplinary courses are listed for each track in the table below, however other courses that are clearly outside the student's home discipline may be used upon approval by the student's advisory committee and the ECS Director.

Requirements for Ph.D. Degree in Environmental and Conservation Sciences

Each Ph.D. student will complete at least 27 credits of didactic courses plus the ECS graduate seminar (1 credit; taken near the defense). The didactic courses will include **2 cross-disciplinary courses** (6 credits) and **MICR 720-Scientific Integrity** (1 credit). Pre-approved cross-disciplinary courses are listed for each track in the table below, however other courses that are clearly outside the student's home discipline may be used upon approval by the student's advisory committee and the ECS Director. Ph.D. students may count one "tools" course as a cross-disciplinary course (see Research Tools Section), but the other cross-disciplinary course must be a concept-based course. A total of 90 credits are required.

For students entering the program with a Master's Degree or previous graduate coursework, up to 12 credits of previous graduate work can transfer and be counted toward the 27 credits. Students may include a transfer course to substitute for one of the two required cross-disciplinary courses, but the proposed cross-disciplinary course must be approved by the advisor and program director. Such transferred credits must be approved by the student's advisory committee, the program director and the NDSU registrar. The student must earn no fewer than 60 graduate credits at NDSU, including 15 didactic credits at the 700-800 level.

<u>ECS COURSE CREDITS SUMMARY</u>	<u>M.S.</u>	<u>Ph.D.**</u>
CROSS DISCIPLINARY COURSE(S)	3cr*	6cr*
SCIENTIFIC INTEGRITY (MICR 720)	1cr*	1cr*
ECS SEMINAR (ECS 790)	1cr	1cr
TRACK COURSES (can include research tools)	15cr*	20cr*
THESIS / DISSERTATION (ECS 798 / 898)	6-10cr	up to 62cr
TOTAL	30	90**

*** DIDACTIC COURSE REQUIRMENTS:**

- Didactic courses are numbered 601-689,691, 701-789, 791, 801-889, 891

Master's Degree

- Minimum 30 credits total
- 16 of the 30 must be didactic credits*
- Thesis (ECS 798) – 6 to 10 credits can count toward total of 30 credits

****Bachelor's to Doctoral Degree**

- Minimum 90 credits total
- 27 of the 90 must be didactic credits*
- Including 15 didactic credits at the 700/800 level

****Master's to Doctoral Degree**

- Minimum 60 credits total completed at NDSU
- Including 15 didactic credits at the 700/800 level

ECS PROGRAM PRE-APPROVED CROSS DISCIPLINARY COURSES†

Conservation Biology Track	Credits	Environmental Science Track	Credits	Environmental Social Sciences Track	Credits
Emerging Trends in Teaching & Learning Online (COMM 791)	3	Emerging Trends in Teaching & Learning Online (COMM 791)	3	Emerging Trends in Teaching & Learning Online (COMM 791)	3
Environmental History (HIST 634) OR Hist 710		Environmental History (HIST 634) OR Hist 710		Conservation Biology (ZOO 675 OR ZOO 850)	3
Environmental Sociology (SOC 631)	3	Environmental Sociology (SOC 631)	3	Advanced Ecology (BIOL 850)	3
Environmental Law and Policy (ECS 770)	3	Environmental Law and Policy (ECS 770)	3	Environment & Adaptation (BOT 862)	3
Natural Resources Economics (ECON 681) OR Environmental Economics (ECON 682)	3	Natural Resources Economics (ECON 681) OR Environmental Economics (ECON 682)	3	Evolutionary Ecology (ZOO 860)	3
National Environmental Policy Act and Environmental Impact Assessment (NRM 631)	3	National Environmental Policy Act and Environmental Impact Assessment (NRM 631)	3	Evolution (BIOL 859)	3
Natural Resources Management Planning (NRM 702)	3	Natural Resources Management Planning (NRM 702)	3	Hydrogeology (GEOL 614)	3
Hydrogeology (GEOL 614)	3	Evolution (BIOL 859)	3	Geochemistry (GEOL 628)	3
Glacial Geology (GEOL 613)	3	Advanced Ecology (BIOL 850)	3	Glacial Geology (GEOL 613)	3
GIS Introduction (GEOL 655) OR Advanced GIS (GEOG 656) OR Remote Sensing (GEOG 670) OR GIS-pattern analysis & modeling (GEOG 680)	3-4	GIS Introduction (GEOG 655) OR Advanced GIS (GEOG 656) OR Remote Sensing (GEOG 670) OR GIS-pattern analysis & modeling (GEOG 680)	3-4	GIS Introduction (GEOG 655) OR Advanced GIS (GEOG 656) OR Remote Sensing (GEOG 670) OR GIS-pattern analysis & modeling (GEOG 680)	3-4
Soil and Land Use (SOIL 610)	3	Soil and Land Use (SOIL 610)	3	Soil and Land Use (SOIL 610)	3
Environmental Management (ECS 740)	3	Environmental Management (ECS 740)	3	Environmental Management (ECS 740)	3
Environmental Health (PH 720)	3	Environmental Health (PH 720)	3	Environmental Health (PH 720)	3
Geochemistry (GEOL 628)	3	Microbial Ecology (MICR 652)	3	Microbial Ecology (MICR 652)	3
Watershed Water Quality Modeling (CE 779)	3	Conservation Biology (ZOO 675 <u>or</u> ZOO 850)	3	Watershed Water Quality Modeling (CE 779)	3
Water Quality Management (CE 678)	3			Water Quality Management (CE 678)	3

† **MUST STILL BE APPROVED BY GRADUATE ADVISORY COMMITTEE**
COURSE DESCRIPTIONS AVAILABLE AT <https://bulletin.ndsu.edu/course-catalog/descriptions/>

TRACK DISCIPLINARY COURSES ARE PROVIDED BELOW AND ORGANIZED BY GENERAL CONCEPTUAL AREA. RESEARCH TOOLS ARE LISTED SEPARATELY.

Conservation Biology Track – Disciplinary Courses

NOTE: Students may take other NDSU graduate level courses not listed below as approved by their committee.

BIODIVERSITY COURSES

Biological Sciences BOT 717 Aquatic Vascular Plants 3
 Biological Sciences ZOO 650 Invertebrate Zoology 3
 Biological Sciences ZOO 652 Ichthyology 3
 Biological Sciences ZOO 654 Herpetology
 Biological Sciences ZOO 656 Ornithology 3
 Biological Sciences ZOO 658 Mammalogy 3
 Biological Sciences BIOL 681 Wetland Science 3
 Entomology ENT 750 Systematic Entomology 5

ECOLOGY & EVOLUTION COURSES

Biological Sciences BIOL 659 or BIOL 859 Evolution 3
 Biological Sciences BIOL 640 Microbial Ecology 3
 Biological Sciences BOT 660 Plant Ecology 3
 Biological Sciences ZOO 665 Hormones and Behavior
 Biological Sciences ZOO 662 Physiological Ecology 3
 Biological Sciences BIOL 825 Biology of Aging 3
 Biological Sciences ZOO 850 Advanced Ecology 3
 Biological Sciences BIOL 859 Evolution 3
 Biological Sciences ZOO 860 Evolutionary Ecology 3
 Biological Sciences BOT 862 Environment and Adaptation 3
 Biological Sciences BOT 864 Ecological Processes 3
 Biological Sciences BIOL 865 Biological Rhythms 3
 Biological Sciences ZOO 866 Advanced Animal Behavior 3
 Biological Sciences BIOL 876 Population Dynamics 4
 Entomology ENT 741 Insect-Plant Interactions 3
 Entomology ENT 770 Insect Ecology 3
 Plant Sciences PLSC 611 Genomics 3
 Plant Sciences PLSC 631 Intermediate Genetics 3
 Plant Sciences PLSC 711 Professional Development 1
 Plant Sciences PLSC 731 Plant Molecular Genetics 3
 Plant Sciences PLSC 751 Advanced Plant Genetics 3
 Plant Sciences PLSC 780 Population Genetics 2
 Plant Sciences PLSC 781 Quantitative Genetics 2
 Plant Sciences PLSC 782 Population and Quantitative Genetics 4
 Range Science RNG 650 Range plants 3
 Range Science RNG 651 Ecology of Fire-Dependent Ecosystems 3
 Range Science RNG 658 Grazing Ecology 3
 Range Science RNG 656 Ecological Restoration
 Range Science RNG 749 Applied Global Change Ecology 3
 Soil Science SOIL 610 Soil and the Environment 3
 Soil Science SOIL 647 Microclimatology 3

HUMAN DIMENSIONS

Biological Sciences ZOO 675 Conservation Biology 3
 Biological Sciences ZOO 676 Wildlife Ecology and Management 3
 Biological Sciences ZOO 850 Advanced Conservation Biology 3
 Communication COMM 706 Advanced Interpersonal Communication 3
 Communication COMM 783 Advanced Organizational Communication-I. 3
 Communication COMM 784 Advanced Organizational Communication-II. 3
 Communication COMM 785 Advanced Crisis Communication in Public Relations 3
 Natural Resources Management NRM 601 Urban-Ecosystem Management 3

Natural Resources Management NRM 602 River and Stream Resource Management 3
 Natural Resources Management NRM 620 Sustainable Scenarios in Natural Resources Management 3
 Natural Resources Management NRM 621 Environmental Outreach Methods 3
 Natural Resources Management NRM 631 National Environmental Policy Act & Environmental Impact Assessment 3
 Natural Resources Management NRM 632 Environmental Impact Statement 2
 Natural Resources Management NRM 653 Rangeland Resource/Watershed Management 3

Conservation Biology Track – Disciplinary Courses

HUMAN DIMENSIONS (continued)

Natural Resources Management NRM 654 Wetland Resource Management 3
 Natural Resources Management NRM 662 Natural Resource and Rangeland Planning 3
 Natural Resources Management NRM 701 Terrestrial Resources Management. 3
 Natural Resources Management NRM 702 Natural Resource Management Planning 3
 Natural Resources Management NRM 720 Natural Resource Administration and Policy 2
 Natural Resources Management NRM 730 Environmental Law 1
 Natural Resources Management NRM 761 Current Issues in Natural Resource Management 1
 Political Science POLS 642 Global Policy Issues 3
 Political Science POLS 650 Politics of Developing Countries 3
 Range Sciences RNG 656 Range Habitat Management 3
 Range Science RNG 737 Agroecosystem Management & Conservation 3
 Social Science/Anthropology ANTH SOC 639: Social Change
 Social Science/Anthropology SOC 603 Sociology of the Great Plains 3
 Soil Science SOIL 680 Soils and Pollutions 3

NOTE: ECS often recruits students with varying backgrounds, thus all students should verify with course instructors whether their prior coursework is adequate preparation for any course prior to enrollment.

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Environmental Sciences Track – Disciplinary Courses

NOTE: Students may take other NDSU graduate level courses not listed below as approved by their committee.

WATER SCIENCE COURSES

Agriculture & Biosystems Engineering ABEN 644 Transport Process in Biological and Environmental Systems 3
 Agriculture & Biosystems Engineering ABEN 664 Resource Conservation and Irrigation Engineering 4
 Agriculture & Biosystems Engineering ABEN 684 Drainage and Wetland Engineering 3
 Agriculture & Biosystems Engineering ABEN 765 Small Watershed Hydrology and Modeling 3
 Biological Sciences BIOL 681 Wetland Science 3
 Civil Engineering CE 610 Water and Wastewater Engineering 3
 Civil Engineering CE 676 Watershed Modeling 3
 Civil Engineering CE 677 Applied Hydrology 3
 Civil Engineering CE 678 Water Quality Management 3
 Civil Engineering CE 679 Advanced Water and Wastewater Treatment 3
 Civil Engineering CE 776 Groundwater Modeling 3
 Geosciences GEOL 628 Geochemistry 3
 Geosciences GEOL 613 Glacial Geology 3
 Geosciences GEOL 614 Hydrogeology 3

SOIL & SOLID WASTE COURSES

Civil Engineering CE 671 Environmental Nanotechnology 3
 Civil Engineering CE 672 Solid Waste Management 3
 Civil Engineering CE 686 Nanotechnology and Nanomaterials 3
 Civil Engineering CE 770 Hazardous Waste Site Remediation 3
 Civil Engineering CE 775 Industrial Waste Management 3
 Soil Science SOIL 610 Soil and Land Use 3
 Soil Science SOIL 633 Soil Physics 3
 Soil Science SOIL 733 Advanced Soil Nutrient Cycling 3
 Soil Science SOIL 755 Soil Chemistry 3
 Soil Science SOIL 763 Advanced Soil Physics 3
 Soil Science SOIL 784 Advanced Soil Genesis, Morphology and Classification 2

ENVIRONMENTAL MANAGEMENT

Biological Sciences ZOO 675 Conservation Biology 3
 Biological Sciences ZOO 676 Wildlife Ecology and Management 3
 Biological Sciences ZOO 677 Wildlife and Fisheries Management Techniques 3
 Biological Sciences ZOO 850 Advanced Conservation Biology 3
 Civil Engineering CE 678 Water quality Management 3
 Civil Engineering CE 672 Solid Waste Management 3
 Communication COMM 706 Advanced Interpersonal Communication 3
 Communication COMM 783 Advanced Organizational Communication-I. 3
 Communication COMM 784 Advanced Organizational Communication-II. 3
 Communication COMM 785 Advanced Crisis Communication in Public Relations 3
 Natural Resources Management NRM 702 Natural Resource Management 3
 Natural Resources Management NRM 601 Urban-Ecosystem Management 3
 Natural Resources Management NRM 602 River and Stream Resource Management 3
 Natural Resources Management NRM 620 Sustainable Scenarios in Natural Resources Management 3
 Natural Resources Management NRM 621 Environmental Outreach Methods 3
 Natural Resources Management NRM 631 National Environmental Policy Act & Environmental Impact Assessment 3
 Natural Resources Management NRM 632 Environmental Impact Statement 2
 Natural Resources Management NRM 653 Rangeland Resource/Watershed Management 3
 Natural Resources Management NRM 654 Wetland Resource Management 3
 Natural Resources Management NRM 662 Natural Resource and Rangeland Planning 3
 Natural Resources Management NRM 701 Terrestrial Resources Management. 3
 Natural Resources Management NRM 702 Natural Resource Management Planning 3
 Natural Resources Management NRM 720 Natural Resource Administration and Policy 2
 Natural Resources Management NRM 730 Environmental Law 1
 Natural Resources Management NRM 761 Current Issues in Natural Resource Management 1

Environmental Sciences Track – Disciplinary Courses

ENVIRONMENTAL MANAGEMENT (continued)

Range Sciences RNG 656 Range Habitat Management 3

Range Science RNG 737 Agroecosystem Management & Conservation 3

Social Science/Anthropology SOC 603 Sociology of the Great Plains 3

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Environmental Social Sciences Track–Disciplinary Courses

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SOCIAL SCIENCE THEORY

Agricultural Economics AGEC 741 Advanced Microeconomics 3
 Anthropology ANTH 680 Development of Anthropological Theory 3
 Sociology SOC 622 Development of Social Theory 3
 Sociology SOC 723 Social Theory 3
 Communication COMM 705 Advanced Communication Theory 3
 Communication COMM 711 Communication Theory 3
 Communication COMM 783 Advanced Organizational Communication-I. 3
 Communication COMM 784 Advanced Organizational Communication-II. 3
 Communication COMM 785 Advanced Crisis Communication in Public Relations 3
 Economics ECON 640 Game Theory and Strategy 3
 Political Science POLS 720 Theoretical Perspectives to the Study of Political Science 3

CULTURAL AND BEHAVIORAL ASPECTS

Agricultural Economics AGEC 711 Applied Risk Analysis I 3
 Anthropology ANTH 662 Anthropology and the Environment 3
 Anthropology ANTH 664 Disaster and Culture 3
 Economics ECON 656 History of Economic Thought 3
 Economics ECON 681 Natural Resource Economics 3
 Economics ECON 682 Environmental Economics 3
 History 634 Environmental History 3
 Political Science POLS 642 Global Policy Issues 3
 Political Science POLS 650 Politics of Developing Countries 3
 Political Science POLS 653 Environmental Policy and Politics 3
 Sociology SOC 631 Environmental Sociology 3
 Sociology SOC 643 International Disasters 3
 Sociology SOC 639 Social Change 3
 Social Science/Anthropology SOC 603 Sociology of the Great Plains 3

MANAGEMENT TECHNIQUES

Biological Sciences ZOO 675 Conservation Biology 3
 Biological Sciences ZOO 676 Wildlife Ecology and Management 3
 Biological Sciences ZOO 677 Wildlife and Fisheries Management Techniques 3
 Biological Sciences ZOO 750 Advanced Conservation Biology 3
 Communication COMM 706 Advanced Interpersonal Communication 3
 Communication COMM 783 Advanced Organizational Communication-I. 3
 Communication COMM 784 Advanced Organizational Communication-II. 3
 Communication COMM 785 Advanced Crisis Communication in Public Relations 3
 Natural Resources Management NRM 601 Urban-Ecosystem Management 3
 Natural Resources Management NRM 602 River and Stream Resource Management 3
 Natural Resources Management NRM 620 Sustainable Scenarios in Natural Resources Management 3
 Natural Resources Management NRM 621 Environmental Outreach Methods 3
 Natural Resources Management NRM 631 National Environmental Policy Act & Environmental Impact Assessment 3
 Natural Resources Management NRM 632 Environmental Impact Statement 2
 Natural Resources Management NRM 653 Rangeland Resource/Watershed Management 3
 Natural Resources Management NRM 654 Wetland Resource Management 3
 Natural Resources Management NRM 662 Natural Resource and Rangeland Planning 3
 Natural Resources Management NRM 701 Terrestrial Resource Management 3
 Natural Resources Management NRM 702 Natural Resource Management Planning 3
 Natural Resources Management NRM 720 Natural Resource Administration and Policy 2
 Natural Resources Management NRM 730 Environmental Law 1
 Natural Resources Management NRM 761 Current Issues in Natural Resource Management 1
 Range Sciences RNG 656 Range Habitat Management 3
 Range Science RNG 737 Agroecosystem Management & Conservation 3
 Sociology SOC 604 Community Assessment 3
 Transportation & Logistics TL 755 Context Sensitive Solutions 3

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RESEARCH TOOLS (ALL TRACKS)

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Agriculture & Biosystems Engineering ABEN 644 Transport Process in Biological and Environmental Systems 3
 Agriculture & Biosystems Engineering ABEN 682 Instrumentation and Measurements 3
 Agriculture & Biosystems Engineering ABEN 747 Numerical Modeling of Environmental & Biological Systems 3
 Agricultural Economics AGECE 739 Analytical Methods for Applied Economics 3
 Agricultural Economics AGECE 701 Research Philosophy 1
 Animal Sciences ANSC 740 Data Analysis and Design of Experiments 3
 Animal Sciences ANSC 759 Application of Quantitative Genetics in R Software
 Anthropology ANTH 681 Qualitative Methods in Cultural Anthropology 3
 Biological Sciences ZOO 677 Wildlife and Fisheries Management Techniques 3
 Biological Sciences BIOL 678 Methods in Animal Physiology 3
 Biological Sciences BIOL 680 Ecotoxicology 3
 Biological Sciences BIOL 842 (ENT 842) Quantitative Biology 3
 Biological Sciences BIOL 877 Analysis of Population and Demographic Data 3
 Biological Sciences BIOL 884 Biological Research Principles 3
 Civil Engineering CE 677 Applied Hydrology 3
 Communication COMM 700 Research Methods in Communication 3
 Communication COMM 704 Qualitative Research Methods in Communication 3
 Communication COMM 707 Quantitative Research Methods in Communication 3
 Communication COMM 708 Advanced Qualitative Methods in Communication Research
 Communication COMM 710 Advanced Quantitative Methods in Communication Research
 Economics ECON 610 Econometrics 3
 Economics ECON 710 Advanced Econometrics 3
 Emergency MGMT EMGT 614: Spatial Analysis in Emergency Management
 English ENGL 659 Grant/Proposal Writing 3
 English ENGL 758 Topics in Rhetoric and Writing 3
 Geosciences GEOG 655 Introduction to GIS 3
 Geosciences GEOG 656 Advanced GIS 3
 Geosciences GEOL 670 Remote Sensing 3
 Geosciences GEOL 680. Geographic Information Systems Pattern Analysis and Modeling 3
 Industrial & Manufacturing Engineering IME 660 Evaluation of Engineering Data 3
 Plant Sciences PLSC 724 Field Design I 3
 Plant Sciences PLSC 710 Professional Development I 1
 Plant Sciences PLSC 711 Professional Development II 1
 Plant Sciences PLSC 721 Genomics Techniques 2
 Plant Sciences PLSC 724 Field Design-I 3
 Plant Sciences PLSC 731 Plant Molecular Genetics 3
 Plant Sciences PLSC 734 Field Design-II 3
 Psychology PSYC 640 Experimental Methods 3
 Range Science RNG 652 Geographic Information Systems in Range Survey 3
 Range Science RNG 765 Analysis of ecosystems 3
 Range Science RNG 790 Graduate Seminar_ Coding in "R" _will count as didactic
 Sociology 700: Qualitative Methods
 Sociology SOC 701 Quantitative Methods 3
 Soil Science SOIL 665 Soil and Plant Analysis 3
 Soil Science SOIL 721 Environmental Field Instrumentation and Sampling 2
 Soil Science SOIL 784 Advanced Soil Genesis, Morphology & Classification 2
 Statistics STAT 650 Stochastic Processes 3
 Statistics STAT 660 Applied Survey Sampling
 Statistics STAT 661 Applied Regression Models 3
 Statistics STAT 662 Introduction to Experimental Design 3
 Statistics STAT 663 Non-parametric Statistics 3
 Statistics STAT 664 Discrete Data Analysis 3
 Statistics STAT 665 Meta-analyses Methods 3
 Statistics STAT 669 Introduction to Biostatistics 3
 Statistics STAT 670 Statistical SAS programming 3
 Statistics STAT 671 Introduction to the R Language 3

RESEARCH TOOLS (ALL TRACKS; continued)

Statistics STAT 672 Time Series 3
Statistics STAT 677 Introductory Survival and Risk Analysis-I. 3
Statistics STAT 678 Introductory Survival and Risk Analysis-II. 3
Statistics STAT 725 Applied Statistics 3
Statistics STAT 726 Applied Regression and Analysis of Variance 3
Statistics STAT 730 Bio-statistics 3
Statistics STAT 732 Introduction to Bioinformatics 3
Statistics STAT 761 Advanced Regression 3
Statistics STAT 764 Multivariate Methods 3
Statistics STAT 770 Survival Analyses 3
Statistics STAT 772 Computational Statistics 3
Statistics STAT 774 Linear Models I. 3
Statistics STAT 777 Multivariate Theory 3

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