Environmental and Conservation Sciences

Program and Application Information
Program Director: Dr. Craig Stockwell
Department Location: Department of Biological Sciences, Stevens 119
Department Phone: (701) 231-7717
Department Web Site: www.ndsu.edu/ecs/
Application Deadline: International applications are due May 1 for fall semester and August 1 for spring semester. Domestic applicants should apply at least one month prior to the start of classes.

Degrees Offered: Ph.D., M.S.
English Proficiency Requirements: TOEFL ibT 79 IELTS 6.5

Program Description
The graduate program leading to an M.S. or a Ph.D. in Environmental and Conservation Sciences (ECS) rests on an integrative curriculum and a multidisciplinary team approach. The program emphasizes the common ground shared by all sciences, and seeks to bridge methodological and philosophical boundaries that might hinder interdisciplinary communication and cooperation. The program offers three tracks: Environmental Science, Conservation Biology and Environmental Social Sciences. The Environmental Science track focuses on abiotic environmental issues, such as water, air, and land pollution. The Conservation Biology track focuses on biotic issues, such as the preservation of biodiversity and ecosystem function. The Environmental Social Sciences track emphasizes relationships between humans and the natural environment such as cultural and behavioral issues, policy, business and economics, and sustainable development.

The interdisciplinary nature of this program is reflected by the participation of faculty from across the campus, including the Colleges of Agriculture, Food Systems, and Natural Resources; Arts, Humanities, and Social Sciences; Engineering; and Science and Mathematics.

Environmental Science
Areas of Environmental Science, such as climate change, groundwater, hazardous waste, and water chemistry, require broad training across discipline lines for successful application. To better predict anthropogenic environmental impacts, the engineering, earth material, chemical, and biological data must be considered in an integrated manner.

Conservation Biology
Conservation Biology offers a new philosophy of looking at complex problems. This discipline focuses on the loss of regional and global biodiversity, but considers the human element as well in its approach to resource issues. As an example, landscape ecology, sustainable development, and conflict resolution are themes promoted by the field of Conservation Biology.

Environmental Social Sciences
Environmental Social Sciences discipline looks at interactions between humans and the environment which tend to be complex and often require interdisciplinary efforts to understand and manage. Environmental policy, environmental economics, environmental history, environmental communication, environmental sociology, and human ecology are examples of the fields of study.

Admissions Requirements
To be admitted to the Environmental and Conservation Sciences program, the applicant must meet the Graduate School requirements.

Financial Assistance
The applicant should contact a prospective mentor to identify sources of financial aid. Teaching and research assistantships may be available through funded research or participating departments. Applicants are considered on the basis of scholarship and potential to undertake advanced study and research. Contact the office of Financial Aid and Scholarships for information and applications regarding scholarships.

Program Administration
The graduate program is administered by the ECS Steering Committee. The committee is composed of four ECS graduate faculty members representing four different colleges: Agriculture, Food Systems, and Natural Resources; Arts, Humanities, and Social Sciences; Engineering; and Science and Mathematics. Four alternate members are also selected to substitute on the committee when necessary. Steering Committee members, who serve overlapping three-year terms, are elected at a yearly meeting of the ECS faculty. The committee also includes a student member which is nominated annually by the ECS Graduate Student Association.
The ECS Program Director presides over ECS Steering Committee meetings. The duties of the ECS Steering Committee include:

1. review of requests to join the ECS faculty and
2. program review and administration.

By the end of the second semester, the student and academic adviser will arrange for the appointment of a Graduate Supervisory Committee. For Ph.D. study, the Graduate Supervisory Committee will consist of at least four members of the NDSU graduate faculty. The committee must include the student’s adviser, two additional ECS faculty members, and a Graduate School representative. One committee member must be from outside the student’s home college.

For M.S. study, the Graduate Supervisory Committee will consist of at least three members of the NDSU graduate faculty and will include the student’s adviser, an ECS faculty member and a faculty from outside the student’s home college. The plan of study will be prepared by the student, in consultation with the major adviser, by the end of the first year in residence.

**Master of Science in Environmental and Conservation Sciences**

The total credits will be not less than 30 graduate credits, with at least 16 credits of graduate courses numbered 601-689, 691; 700-789, 791 or 800-889, 891 plus the ECS graduate seminar for 1 credit, and research credits (798) not fewer than 6 nor more than 10 thesis credits. The didactic credits must include at least 1 ECS core course; 1 ECS track course and UNIV 720 Scientific Integrity. All M.S. students must complete a thesis and pass a final examination as described in The Graduate School Policies section of the Graduate Bulletin. An overall GPA of 3.0 or better must be maintained.

**Doctor of Philosophy in Environmental and Conservation Sciences**

Each Ph.D. student will complete at least 27 credits of didactic courses plus the ECS graduate seminar for 1 credit. The didactic courses will include: 3 core courses (9 credits), UNIV 720 Scientific Integrity, a minimum of 14-15 credits from a chosen track, and 2-3 credits of electives from another track or other NDSU courses numbered 601-689, 691; 700-789, 791 or 800-889, 891. The 15 track credits must be from at least 2 course categories. Two of the three courses must come from outside of the student’s chosen track. Of the 27 didactic course credits, a total of 15 must be at the 700-800 level. 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. Such transferred credits must be approved by the student’s supervisory committee, the program director and the Graduate Dean. The student must earn no fewer than 60 graduate credits at NDSU. Of these, no fewer than 15 credits must be at the 700 or 800 level (700-789, 791; 800-889 and 891).

### Course Catalog

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<tr>
<th>Code</th>
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<td>ECS 770</td>
<td>Environmental Law and Policy</td>
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<td>HIST 634</td>
<td>Environmental History</td>
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<tr>
<td>or HIST 710</td>
<td>Research Seminar in North American History</td>
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<tr>
<td>or HIST 780</td>
<td>Readings in World History</td>
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<td>NRM 631</td>
<td>National Environmental Policy Act &amp; Environmental Impact Assessment</td>
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<td>NRM 702</td>
<td>Natural Resources Management Planning</td>
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<td>SOC 631</td>
<td>Environmental Sociology</td>
<td>3</td>
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<td>CE 770</td>
<td>Hazardous Waste Site Remediation</td>
<td>3</td>
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<tr>
<td>GEOL 614</td>
<td>Hydrogeology</td>
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<td>MICR 652</td>
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<td>PH 720</td>
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<td>BOT 864</td>
<td>Ecological Processes</td>
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<td>ZOO 675</td>
<td>Conservation Biology</td>
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<td>ZOO 850</td>
<td>Advanced Conservation Biology</td>
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### CONSERVATIVE BIOLOGY TRACK - TOTAL 18 CREDITS

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<td>Biodiversity</td>
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BIOL 681  Wetland Science
BOT 717  Aquatic Vascular Plants
ENT 750  Systematic Entomology
RNG 716  Agrostology
ZOO 650  Invertebrate Zoology
ZOO 652  Ichthyology
ZOO 654  Herpetology
ZOO 658  Mammalogy

Ecology and Evolution
Select 3-9 credits of the following:

  BIOL 850  Advanced Ecology
  BIOL 859  Evolution
  BOT 660  Plant Ecology
  BOT 862  Environment and Adaptation
  BOT 864  Ecological Processes
  ENT 765  Biological Control of Insects and Weeds
  ENT 770  Writing a Scientific Literature Review
  GEOL 640  Quaternary Biology
  MICR 652  Microbial Ecology
  PLSC 631  Intermediate Genetics
  PLSC 751  Advanced Plant Genetics
  PLSC 781  Quantitative Genetics
  RNG 765  Analysis Of Ecosystems
  SOIL 610  Soils and Land Use
  SOIL 647  Microclimatology
  ZOO 662  Physiological Ecology
  ZOO 670  Limnology
  ZOO 850  Advanced Conservation Biology
  ZOO 860  Evolutionary Ecology
  ZOO 870  Aquatic Community Ecology

Human Dimensions and Management
Select 3-9 credits of the following:

  ANTH 662  Anthropology and the Environment
  COMM 783  Advanced Organizational Communication I
  CE 678  Water Quality Management
  ECON 682  Environmental Economics
  POLS 642  Global Policy Issues
  POLS 650  Politics of the Developing Countries
  RNG 656  Range Habitat Management
  ZOO 675  Conservation Biology
  ZOO 676  Wildlife Ecology and Management
  ZOO 677  Wildlife and Fisheries Management Techniques
  ZOO 850  Advanced Conservation Biology

Research Tools
Select 3-9 credits of the following:

  CE 677  Applied Hydrology
  GEOG 655  Introduction to Geographic Information Systems
  GEOG 656  Advanced Geographic Information Systems
  GEOL 660  Biogeochemistry
  GEOL 760  Advanced Biogeochemistry
  PLSC 724  Field Design I
  PSYC 640  Experimental Methods
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<td>Applied Regression Models</td>
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<td>Introduction to Experimental Design</td>
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<td>STAT 663</td>
<td>Nonparametric Statistics</td>
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<td>Meta-Analysis Methods</td>
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<td>STAT 670</td>
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<td>STAT 770</td>
<td>Survival Analysis</td>
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**ENVIRONMENTAL SCIENCES TRACK-TOTAL 17 CREDITS**

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<td>Resource Conservation and Irrigation Engineering</td>
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<td>Small Watershed Hydrology and Modeling</td>
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<td>CE 610</td>
<td>Water &amp; Wastewater Engineering</td>
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<td>Wildlife Ecology and Management</td>
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<td>ABEN 682</td>
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<td>GEOG 656</td>
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### GEOL 660
Biogeochemistry

### GEOL 760
Advanced Biogeochemistry

### IME 660
Evaluation of Engineering Data

### RNG 650
Range Plants

### STAT 662
Introduction to Experimental Design

### STAT 725
Applied Statistics

### STAT 761
Advanced Regression

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### ENVIRONMENTAL AND SOCIAL SCIENCES TRACK-TOTAL 17 CREDITS

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<td>ANTH 662</td>
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<td>ANTH 664</td>
<td>Disaster and Culture</td>
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<td>ECON 656</td>
<td>History of Economic Thought</td>
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<td>SOC 639</td>
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<td>SOC 643</td>
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<td>Environmental Impact Statement</td>
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<td>SOC 604</td>
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<td>TL 755</td>
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<td>AGEC 701</td>
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Preliminary Examinations for Doctoral Students

The written preliminary examination will cover the core areas for ECS and each of the core topic areas for the appropriate track. The preliminary examination will typically be taken in the middle of the third year. The written exam must be passed before the comprehensive oral examination can be scheduled.

The comprehensive oral examination will be taken no later than the end of the third year in residence. The examination will cover the topic areas for the appropriate track.

Dissertation Research

A proposal describing research suitable for preparation of a dissertation in Environmental and Conservation Sciences will be prepared in the format of a NSF Dissertation Improvement Grant. Alternative formats must be agreed to by the Graduate Supervisory Committee. The proposal will be submitted to the student's Graduate Supervisory Committee for review and approval. The dissertation must show originality and demonstrate the student's capacity for independent research.

F. Adnan Akyuz, Ph.D.
University of Missouri-Columbia, 1994
Research Interests: Applied Climatology and Microclimatology/Climate Based Agriculture

Allan C. Ashworth, Ph.D.
University of Birmingham, 1969
Research Interests: Quaternary Paleoecology, Paleoclimatology

Peter Bergholz, Ph.D.
Michigan State University, 2007
Research Interests: Food Safety and Environmental Microbiology, Landscape Genomics
Achintya Bezbaruah, Ph.D.
University of Nebraska-Lincoln, 2002
Research Interests: Nanomaterials for Pollution Control, Recalcitrant and Micro Pollutants, Contaminant Fate and Transport, Small Community Water and Wastewater Treatment, Environmental Sensors, Environmental Management

Julia Bowsher, Ph.D.
Duke University, 2007
Research Interests: Evolutionary and Developmental Biology

Malcolm G. Butler, Ph.D.
University of Michigan, 1980
Research Interests: Aquatic Invertebrate Biology, Limnology, Wetland Ecology

Igathinathane Cannayen, Ph.D.
Indian Institute of Technology, 1997
Research Interests: Biomass Harvest, Storage, Collection and Pre-Processing

Frank X.M. Casey, Ph.D.
Iowa State University, 2000
Research Interests: Field and Laboratory Studies of Water Flow and Chemical Transport Processes

Amitava Chatterjee, Ph.D.
University of Wyoming, 2007
Research Area/Activity: Soil Fertility Management, Greenhouse Gas Emissions

Xuefeng (Michael) Chu, Ph.D.
University of California, Davis, 2002

Larry Cihacek, Ph.D.
Iowa State University, 1979
Research Interests: Carbon Sequestration in Soils, Soil Physical Properties, Soil Management for Waste Disposal

Gary K. Clambey, Ph.D.
Iowa State University, 1975
Research Interests: Ecology and Biogeography, Environmental Analysis and Planning, Structure Function Relations in the Midwestern Ecosystems

Mark E. Clark, Ph.D.
University of Tennessee, 1996

Dennis Cooley, Ph.D.
University of Rochester, 1995
Research Interests: Ethics of Science

Aaron Daigh, Ph.D.
Iowa State University, 2013
Research Interests: Soil Physics, Transport in Soils, Soil Residue and Water Management, Crop Rotations, and Nutrient/Agrochemical/Industrial Byproduct Soil Amendment Impacts on Soil Physical Properties

Stephanie Day, Ph.D.
University of Minnesota, 2012
Research Interests: Fluvial Geomorphology, Slope Stability, Geospatial Sciences

Edward (Shawn) DeKeyser, Ph.D.
North Dakota State University, 2000
Research Interests: Wetland Ecology, Wetland Assessment and Monitoring, Invasive Species Ecology and Management, Native Prairie Restoration

Anne Denton, Ph.D.
University of Mainz, 1996
Research Interests: Data Mining, Bioinformatics, Scientific Informatics, Educational Technology, Model Building, Databases

Thomas M. DeSutter, Ph.D.
Kansas State University, 2004
Research Interest: Trace Gas Fluxes, Inorganic Soil Chemistry, Soil Environmental Conditions

Ned Dochtermann, Ph.D.
University of Nevada, Reno, 2009
Research Interests: Ecological and Evolutionary Causes and Consequences of Phenotypic Variation

Nathan Fisher, Ph.D.
University of Michigan, 2006
Research Interests: Ecological and Evolutionary of Bacterial Virulence

Ann-Marie Fortuna, Ph.D.
Michigan State University, 2001
Research Interests: Microbial and Soil Process Regulating Nutrient Cycling, Soil Health and Global Climate Change, Soil Health Indicators

Erin Gillam, Ph.D.
University of Tennessee, 2007
Research Interests: Behavioral ecology of bats, ecological and evolutionary basis of behavior in all animal groups, behavioral, ecological, and evolutionary factors influence the structure of animal communication signals and wildlife ecology and conservation.

Gary A. Goreham, Ph.D.
South Dakota State University, 1985
Research Interests: Rural Sociology, Community, Family Research Methods, Sociology of Religion, Sociology of Agriculture

Kendra Greenlee, Ph.D.
Arizona State University-Tempe, 2004
Research interests: Environmental and respiratory physiology of insects; insect immunology.

Timothy Greives, Ph.D.
Indiana University, 2009
Research Interests: Physiology and Behavior of Animals in Response to Environmental Signals

James W. Grier, Ph.D.
Cornell University, 1975

Jill Hamilton, Ph.D.
University of British Columbia, 2012
Research Interests: Plant Evolutionary Genomics

Jason Harmon, Ph.D.
University of Minnesota, 2003
Research Interests: Environmental change; ecosystem services; population and community ecology

Marion O. Harris, Ph.D.
Michigan State University, 1986
Research Interests: Insect-Pest Management, Host-Plant Relationships

Mark Harvey, Ph.D.
University of Wyoming, 1986
Research Interests: American West, Environmental History, Public History

Harlene Hatterman-Valenti, Ph.D.
Iowa State University, 1993
Research Interests: High-Value Crop Production

Robert R. Hearne, Ph.D.
University of Minnesota, 1995
Research Interests: Economic Analysis of Emerging Environmental and Resource Issues in the Northern Great Plains

Britt Heidinger, Ph.D.
Indiana University, 2007
Research Interests: Physiological Ecology, Senescence, Stress Physiology

Linda Helstern, Ph.D.
Southern Illinois University-Carbondale, 2001
Research Interests: Writing, Literature and the Environment, Multicultural Literature

David Hopkins, Ph.D.
North Dakota State University, 1997
Research Interests: Soil Formation and Chemistry

Tom Isern, Ph.D.
Oklahoma State University, 1977
Research Interests: History of Agriculture, History of Great Plains

Donna Jacob, Ph.D.
University College, 2004
Research Interests: Wetland ecology, biogeochemistry, ecophysiology and ecotoxicology

Sivaguru Jayaraman, Ph.D.
Tulane University, 2003
Research Interests: Photocatalysis, Photochemistry, Green Chemistry

Xinhua Jia, Ph.D.
University of Arizona, 2004
Research Interests: Evapotranspiration, Subsurface drainage and Water quality

Dinesh Katti, Ph.D.
University of Arizona, 1991
Research Interests: Geotechnical Engineering, Constitutive Modeling of Geologic Materials, Expansive Soils, Multiscale Modeling, Steered Molecular Dynamics, Computational Mechanics, Nanocomposite, and Bio-nanocomposites. Computational Biophysics

Eakalak Khan, Ph.D.
University of California Los Angeles, 1997
Research Interests: Water Quality, Biological Process Development for Water and Wastewater Treatment, Storm water and Non-Point Source Pollution Control

Kenneth E. Lepper, Ph.D.
Oklahoma State University, 2001
Research Interests: Quaternary Geology and Age Dating

Wei Lin, Ph.D.
SUNY at Buffalo, 1992
Research Interests: Water and Wastewater Treatment, Hazardous Waste Management

Zhulu Lin, Ph.D.
University of Georgia, 2003
Research Interests: Surface and Subsurface Hydrology and Modeling, Soil and Water Resources Management, Environmental Systems Analysis, Risk Identifications and Assessment, Geostatistics and Spatial Statistics

Guodong Liu, Ph.D.
Hunan University, 2001
Research Interests: Synthesis of Novel Nanomaterials, Biosensors, Bioassays

John McEvoy, Ph.D.
University of Ulster Northern Ireland, 2002
Research Interests: Cryptosporidium Virulence Factors and Mechanisms of Pathogenesis

Mark Meister, Ph.D.
University of Nebraska, 1997
Research Interests: Rhetorical and Critical Theory, Environmental Communication

Jennifer Momsen, Ph.D.
Rutgers, 2007
Research Interests: Biology Education, Systems Thinking in Introductory Biology, Visualization, Assessing the Cognitive Level of STEM Courses

Bakr Mourad Aly Ahmed, Ph.D.
Virginia Tech., 2001
Research Interests: Sustainability Indicators and Implementation, Carrying Capacity Measurements, Coastal Development, Built Environment and Natural Resources Conservation
Jack Norland, Ph.D.
North Dakota State University, 2008

Peter Oduor, Ph.D.
University of Missouri - Rolla, 2004
Research Interests: Geographic Information Systems, Groundwater Flow Modeling, Groundwater Contamination

Marinus Otte, Ph.D.
Vrije Universiteit, 1991
Research Interests: Wetland ecology, Biogeochemistry, Ecophysiology and Ecotoxicology

G. Padmanabhan, Ph.D.
Purdue University, 1980
Research Interests: Hydrology, Water Resources, Hydraulic Engineering

Birgit Pruess, Ph.D.
Ruhr- Universitat Bochum, 1991
Research Interest: Microbial Physiology and Gene Regulation

Scott Pryor, Ph.D.
Cornell University, 2005
Research Interests: Biofuel Production from Cellulosic Feedstocks, Biobased Chemicals and Materials, Bioprocess Engineering, Process Optimization, Solid State and Liquid Fermentation Systems

Shafiqur Rahman, Ph.D.
University of Manitoba, 2004
Research Interests: Animal Waste Management, Biosolids Management, Air Quality, Water Quality, Composting

Wendy L. Reed, Ph.D.
Iowa State University, 2000
Research Interests: Physiological Ecology, Wetland and Bird Ecology, Environmental Endocrinology

David A. Rider, Ph.D.
Louisiana State University, 1988
Research Interests: Insect Systematics, Biodiversity

David C. Roberts, Ph.D.
Oklahoma State University, 2009
Research Interests: Evaluation and Design of Economically Efficient Tools and Policies for Pollution Control, Economic Valuation of Environmental and Ecological Attributes Through Revealed and Stated Preference Methods, Valuation of Environmental Risk, and Low-Impact and Precision Agriculture

Bernhardt Saini-Eidukat, Ph.D.
University of Minnesota, 1991
Research Interests: Environmental Geochemistry, Igneous Petrology, Economic Geology

Donald P. Schwert, Ph.D.
University of Waterloo, 1978
Research Interests: Quaternary Paleoecology, Analysis of Fossil Insects

Halis Simsek, Ph.D.
North Dakota State University, 2012
Research Interests: Bioenvironmental Engineering

Dean D. Steele, Ph.D.
University of Minnesota, 1991
Research Interests: Irrigation and Environmental Engineering

Craig A. Stockwell, Ph.D.
University of Nevada, 1995
Research Interests: Conservation Biology, Evolutionary Ecology of Native Fishes, Human-Wildlife Interactions

Jon Sweetman, Ph.D.
Queen’s University, 2006
Research Interests: Aquatic Ecology and Environmental Change

Linda Tackett, Ph.D.
University of Southern California, 2014
Research Interests: Norian (and Mesozoic, generally) Paleoecological, Taxonomic, and Environmental Dynamics

Steve E. Travers, Ph.D.
University of California, 1998
Research Interests: Plant Evolutionary Ecology

Cheryl Wachenheim, Ph.D.
Michigan State University, 1994
Research Interests: Eliciting Perceptions and Valuations from Consumers, Firms, Students and Other Stakeholders and Decision Makers

Alexander Wagner, Ph.D.
Oxford University, 1997
Research Interests: Lattice Boltzmann, Spinodal Decomposition, Viscoelasticity, Drop Deformation and Break-up in a Shear Flow, Wetting, Non-equilibrium Thermodynamics, Complex systems

Dennis Wiesenborn, Ph.D.
Rice University, 1989
Research Interests: Refining, Fractionation and Conversion of Fats and Oils from Plants, Process Modeling for Biofuels and Renewable Products

Scott Wood, Ph.D.
Princeton University, 1985
Research Interests: Environmental Geochemistry, Radioactive Waste Disposal

Brian D. Wisenden, Ph.D.
University of Western Ontario, 1993
Research interests: Behavioral Ecology of Fishes, Chemical Ecology of Predator-Prey Interactions, Parental Care and Mating Systems