

# NATURAL RESOURCES (NRES)

## NRES 800 Sampling, Data Management and Visualization

**Prerequisites:** Graduate standing is required.

**Description:** Implement best practices for scientific computing. Practice with a scientific workflow from the design of the sampling scheme, through generation of the data in the field or lab, up to the point of analysis. Understand cognitive constraints on visualization. Use modern software tools to produce publication quality data visualizations.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

## NRES 801 Topics in Applied Ecology

**Description:** A survey of ecological and sociological frameworks used in the applied ecological research. Emphasis on fisheries and wildlife, grasslands, forests, aquatic habitats, and human dimensions of natural resources.

**Credit Hours:** 2

**Max credits per semester:** 2

**Max credits per degree:** 2

**Grading Option:** Pass No-Pass

**Offered:** FALL

## NRES 802 Aquatic Insects

**Crosslisted with:** BIOS 485, BIOS 885, ENTO 402, ENTO 802, NRES 402

**Prerequisites:** 12 hrs biological sciences.

**Description:** Biology and ecology of aquatic insects.

**Credit Hours:** 2

**Max credits per semester:** 2

**Max credits per degree:** 2

**Grading Option:** Grade Pass/No Pass Option

**Prerequisite for:** BIOS 485L, BIOS 885L, ENTO 402L, ENTO 802L,

NRES 402L, NRES 802L

## NRES 802L Identification of Aquatic Insects

**Crosslisted with:** BIOS 485L, BIOS 885L, ENTO 402L, ENTO 802L, NRES 402L

**Prerequisites:** Parallel ENTO 802, NRES 402/802, BIOS 485/885.

**Description:** Identification of aquatic insects to the family level.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Grading Option:** Grade Pass/No Pass Option

**Course and Laboratory Fee:** \$25

## NRES 803 Ecological Statistics

**Crosslisted with:** STAT 803

**Prerequisites:** STAT 801 or equivalent; prior experience with "R" software

**Notes:** Available online.

**Description:** Model-based inference for ecological data, generalized linear and additive models, mixed models, survival analysis, multi-model inference and information theoretic model selection, and study design.

**Credit Hours:** 4

**Max credits per semester:** 4

**Max credits per degree:** 4

**Grading Option:** Grade Pass/No Pass Option

## NRES 804 Program Planning & Evaluation

**Description:** Learn concepts from the social sciences relevant to planning and evaluating education, extension, and behavior change programs and initiatives. Learn to develop an evaluation protocol and collect data for planning and evaluating programs.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded

**Offered:** SPRING

## NRES 805 Conservation Behavior

**Description:** Learn communication and social psychology theories and techniques to improve science communication, educational programs, and environmentally responsible behavior change.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded

**Offered:** FALL/SPR

## NRES 806 Plant Ecophysiology: Theory and Practice

**Crosslisted with:** AGRO 806, HORT 806, NRES 406, PLAS 406

**Prerequisites:** Junior standing; 4 hrs ecology; and 4 hrs botany or plant physiology.

**Description:** Principles of plant physiology which underlie the relationship between plants and their physical, chemical and biotic environments. An introduction to the ecological niche, limiting factors and adaptation. An overview of the seed germination and ecology, plant and soil water relations, nutrients, plant energy budgets, photosynthesis, carbon balance and plant-animal interactions. An introduction to various field equipment used in ecophysiological studies.

**Credit Hours:** 4

**Max credits per semester:** 4

**Max credits per degree:** 4

**Grading Option:** Grade Pass/No Pass Option

## NRES 807 Plant-Water Relations

**Crosslisted with:** AGRO 807

**Prerequisites:** AGRO 325 or equivalent; MATH 106 recommended

**Description:** Quantitative study of water relations in the soil-plant-atmosphere system. Basic physical processes, which describe the movement of water in the soil and the atmosphere, and the physiological processes, which describe water movement inside of the plant. Stomata physiology and the effects of internal water deficits on photosynthesis, respiration, nitrogen metabolism, cell division and cell enlargement. Results from integrative models used to study the relative importance of environmental versus physiological factors for several plant-environment systems.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**Offered:** FALL

**NRES 808 Microclimate: The Biological Environment**

**Crosslisted with:** PLAS 408, GEOG 408, METR 408, NRES 408, WATS 408, AGRO 808, GEOG 808, HORT 808, METR 808

**Prerequisites:** Junior standing, MATH 106 or equivalent, 5 hrs physics, major in any of the physical or biological sciences or engineering.

**Description:** Physical factors that create the biological environment. Radiation and energy balances of earth's surfaces, terrestrial and marine. Temperature, humidity, and wind regimes near the surface. Control of the physical environment through irrigation, windbreaks, frost protection, manipulation of light, and radiation. Applications to air pollution research. Instruments for measuring environmental conditions and remote sensing of the environment.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**Prerequisite for:** BSEN 954, NRES 954

**NRES 809 Laboratory Earth: Earth and Its Systems**

**Description:** The earth as a system and the "real world" applications of fundamental physical science processes in this system. Interaction of energy and matter in the geosphere, in the hydrosphere, and in the atmosphere. The earth's relationships to the sun, moon, and other astronomical objects in the solar system.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**NRES 810 Landscape Ecology**

**Crosslisted with:** HORT 812

**Prerequisites:** 12 hrs biological sciences or related fields including BIOS 320

**Description:** Spatial arrangements of ecosystems, the interaction among component ecosystems through the flow of energy, materials and organisms, and alteration of this structure through natural or anthropogenic forces.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**NRES 811 Plant Tissue Culture**

**Crosslisted with:** BIOS 811, HORT 811

**Description:** Survey of techniques used in plant cell, tissue and organ culture, including current research. Laboratory emphasizes practical manipulation of plant cells, tissues, and organs, including examples from woody and herbaceous plant species.

**Credit Hours:** 4

**Max credits per semester:** 4

**Max credits per degree:** 4

**Grading Option:** Grade Pass/No Pass Option

**Course and Laboratory Fee:** \$25

**NRES 812 Introduction to Geographic Information Systems**

**Crosslisted with:** GEOG 412, GEOG 812, NRES 412

**Description:** Introduction to conceptual foundations and applications of computer-based geographic information systems (GIS). GIS database development, spatial data analysis, spatial modeling, GIS implementation and administration.

**Credit Hours:** 4

**Max credits per semester:** 4

**Max credits per degree:** 4

**Grading Option:** Grade Pass/No Pass Option

**Prerequisite for:** GEOG 422, GEOG 822; GEOG 922, NRES 922

**Course and Laboratory Fee:** \$50

**NRES 813 Environmental Leadership**

**Crosslisted with:** ALEC 410, ALEC 810, NRES 413

**Prerequisites:** Junior standing.

**Notes:** Offered on the World Wide Web (WWW) fall semester of odd-numbered years and in the classroom fall semester of even numbered-years.

**Description:** Major leaders in conservation and ecology that emphasizes agricultural and cultural issues and relationships with the environment.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**NRES 814 Laboratory Earth: Earth's Natural Resource Systems**

**Description:** Fundamental concepts in the Earth and physical sciences in the understanding of Earth's natural resource systems. Rock and mineral, water, soil, and energy resources. Social factors, human dependence, and the impact of these on natural resource systems.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**NRES 815 GIS for Agriculture and Natural Resources**

**Crosslisted with:** NRES 415

**Description:** Principles of digitizing earth observations. Manipulate spatial data, create maps, and conduct spatial analyses. Use GIS to analyze and solve real-world questions in agriculture and natural resources.

**Credit Hours:** 4

**Max credits per semester:** 4

**Max credits per degree:** 4

**Grading Option:** Graded

**Offered:** FALL

**Course and Laboratory Fee:** \$50

**NRES 816A Conservation Storytelling**

**Description:** First in a two-part series developing narrated visual media to tell a conservation or natural resource story. Utilizes various technologies including trail cameras, time-lapse camera systems, GoPro's, traditional video and audio, as well as conventional photography and software editing programs.

**Credit Hours:** 2

**Max credits per semester:** 2

**Max credits per degree:** 2

**Grading Option:** Graded

**Offered:** SPRING

**Prerequisite for:** NRES 816B

**NRES 816B Conservation Storytelling****Prerequisites:** NRES 816A**Description:** Second in a two-part series finalizing a narrated visual media project that tells a conservation or natural resource story. Utilizes various technologies including trail cameras, time-lapse camera systems, GoPro's, traditional video and audio, as well as conventional photography and software editing programs.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Offered:** FALL**NRES 817 Agroforestry Systems in Sustainable Agriculture****Crosslisted with:** PLAS 418, HORT 818, NRES 417**Prerequisites:** 12 hours biological or agricultural sciences.**Description:** The roles of woody plants in sustainable agricultural systems of temperate regions. Emphasis on the ecological and economic benefits of trees and shrubs in the agricultural landscape. Topics include: habitat diversity and biological control; shelterbelts structure, function, benefits and design; intercropping systems; silvopastoral systems; riparian systems; and production of timber and specialty crops. Comparison of temperate agroforestry systems to those of tropical areas.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 818 Introduction to Remote Sensing****Crosslisted with:** GEOG 418, GEOG 818, NRES 418**Prerequisites:** Junior Standing**Description:** Remote sensing of the earth from aerial and satellite platforms. Aerial photography, multispectral scanning, thermal imaging, microwave remote sensing techniques. Data acquisition and image analysis. Physical foundations of remote sensing using electromagnetic energy and energy-matter interactions. Applications in geographic, agricultural, environmental and natural resources analyses.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**Prerequisite for:** GEOG 420, GEOG 820; GEOG 421, GEOG 821, NRES 421, NRES 821**Course and Laboratory Fee:** \$115**NRES 819 Chemistry of Natural Waters****Crosslisted with:** GEOL 418, GEOL 818, NRES 419, WATS 418**Prerequisites:** CHEM 109A/L and CHEM 110A/L, CHEM 113A/L and CHEM 114.**Description:** Principles of water chemistry and their use in precipitation, surface water, and groundwater studies. Groundwater applications used to determine the time and source of groundwater recharge, estimate groundwater residence time, identify aquifer mineralogy, examine the degree of mixing between waters of various sources and evaluate what types of biological and chemical processes have occurred during the water's journey through the aquifer system.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Prerequisite for:** GEOL 418L, GEOL 818L, NRES 419L, NRES 819L, WATS 418L; GEOL 917, NRES 917**Course and Laboratory Fee:** \$25**NRES 819L Chemistry of Natural Waters Laboratory****Crosslisted with:** GEOL 418L, GEOL 818L, NRES 419L, WATS 418L**Prerequisites:** CHEM 109A and 109L and CHEM 110A and 110L or CHEM 113A and 113L and CHEM 114; GEOL 418 or parallel.**Description:** Basic laboratory techniques used to perform water analysis including various wet chemical techniques, instrument use (AA, IC, UV-Visible) and computer modeling. Techniques for sample collection and preservation, parameter estimation and chemical analysis.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**NRES 820 Applications of Remote Sensing in Agriculture and Natural Resources****Crosslisted with:** PLAS 419, GEOG 419, GEOL 419, NRES 420, AGRO 819, GEOG 819, GEOL 819**Notes:** GEOG 418/NRES 418 recommended**Description:** Introduction to the practical uses of remote electromagnetic sensing in dealing with agricultural and water-resources issues.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Grade Pass/No Pass Option**Course and Laboratory Fee:** \$35**NRES 821 Field Techniques in Remote Sensing****Crosslisted with:** GEOG 421, GEOG 821, NRES 421**Prerequisites:** NRES 418/818**Description:** Field techniques as they relate to remote-sensing campaigns. Research methods, systematic approaches to data collection, field spectroscopy, collecting ancillary information linked with spectroscopic data sets as well as aircraft or satellite missions and subsequent analyses of acquired data.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Course and Laboratory Fee:** \$65

**NRES 822 Laboratory Earth: Earth's Changing Systems****Crosslisted with:** NRES 422**Description:** Fundamental concepts related to understanding Earth's changing natural systems in the past, present, and the future. The cycling of matter and energy; the relationship between human activity and environmental change; and the consequence of these relationships.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 823 Integrated Resources Management****Crosslisted with:** NRES 423**Prerequisites:** Natural resource science or related major**Description:** Integrated and multiple-use management. Economic, political, social, and physical impacts on natural resources management priorities.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 824 Forest Ecology****Crosslisted with:** NRES 424**Prerequisites:** NRES 220 or BIOS 207**Description:** The structure and function of forest ecosystems including their response to global change; emphasis on forest succession and disturbance regimes in order to understand the dynamics of forested landscapes.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**NRES 825 Geostatistics****Crosslisted with:** GEOL 825**Prerequisites:** MATH 106 and STAT 218**Notes:** Offered fall semester of odd-numbered calendar years.**Description:** Practical methods for solving spatial interpolation and related estimation problems with emphasis on geostatistical methods. Introduction to applied statistical simulation and prediction in geology, hydrogeology and environmental studies.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 826 Invasive Plants****Crosslisted with:** PLAS 426, AGRO 826, HORT 826, NRES 426**Prerequisites:** PLAS/SOIL 153; PLAS 131**Description:** Identification, biology and ecology of weedy and invasive plants. Principles of invasive plant management by preventative, cultural, biological, mechanical and chemical means using an adaptive management framework. Herbicide terminology and classification, plant-herbicide and soil-herbicide interactions, equipment calibration and dosage calculations.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**NRES 827 Introduction to the Global Positioning System (GPS)****Crosslisted with:** GEOG 427, GEOG 827, NRES 427**Prerequisites:** Junior standing.**Notes:** Familiarity with mapping and GIS recommended.**Description:** Integrated lectures, lab exercises and field experience provide an understanding of GPS technology and applications. Students will learn to collect, correct and use GPS data in a geographic information system (GIS) environment.**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Grade Pass/No Pass Option**Course and Laboratory Fee:** \$65**NRES 828 Leadership in Public Organizations****Crosslisted with:** ALEC 428, ALEC 828, NRES 428**Prerequisites:** Junior standing.**Description:** Leadership in theories, research, and practices in public organizations and natural resource agencies.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 829 Human Dimensions of Natural Resource Management****Description:** Introduction to, and understanding of, human dimensions of natural resource management. Interdisciplinary theories and frameworks for understanding and addressing natural resources management will be examined. Historical, psychological, cultural, and social influences will be reviewed. Integrative approaches to sustainable ecosystem management will also be explored.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 829A Food Security: A Global Perspective****Crosslisted with:** ANTH 429A, ANTH 829A, PLAS 429A, AGRO 829A, HORT 829A, NRES 429A, NUTR 429A, NUTR 829A**Prerequisites:** Junior standing**Description:** Overview of the technical and sociocultural dimensions of global food insecurity.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 830 Laboratory Earth: Climate Research Applications****Description:** Climate-change issues serve as a context to develop research questions and design a discrete, locally oriented research project through which they define a problem, analyze data, and develop conclusions to potentially impact decision-making in their community. Designed for science educators. NRES 830 is offered fall semesters.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option

**NRES 831 Waterfowl Ecology and Management****Crosslisted with:** NRES 431**Prerequisites:** NRES 311.**Description:** Ecology and identification of North American waterfowl, management of habitats and populations, and current management issues.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 832 Laboratory Earth: Human Dimensions of Climate Change****Description:** Examine science behind global climate change. Use primary data sets to understand the implications for climate change at global and regional/local scales. Focus on potential impacts on human systems including drought, sea level rise, severe weather and populations most likely to be impacted by climate change. Designed for science educators. NRES 832 is offered spring semesters.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 833 Wildlife Management Techniques****Crosslisted with:** NRES 433**Prerequisites:** NRES 311**Description:** Survey of methods used to obtain data and make decisions for wildlife management. Scientific methods for wildlife science; monitoring and surveys; construction of management plans; habitat use, classification, and management; harvest management.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Course and Laboratory Fee:** \$10**NRES 834 Environmental Education and Interpretation****Crosslisted with:** NRES 434, ENVR 434**Notes:** Requires 20 hours of service.**Description:** Examination of formal and informal environmental education and interpretation. Knowledge, application and practice relevant to science teachers and park, extension, museums, and zoo educators.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Course and Laboratory Fee:** \$40**NRES 835 Agroecology****Crosslisted with:** PLAS 435, AGRO 835, NRES 435**Prerequisites:** For PLAS/NRES 435: Senior standing. For AGRO/NRES 835: 12 hrs biological or agricultural sciences.**Description:** Integration of principles of ecology, plant and animal sciences, crop protection, and rural landscape planning and management for sustainable agriculture. Includes natural and cultivated ecosystems, population and community ecology, nutrient cycling, pest management, hydrologic cycles, cropping and grazing systems, landscape ecology, biodiversity, and socioeconomic evaluation of systems.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 836 Evolution of Cenozoic Mammals****Crosslisted with:** GEOL 436, GEOL 836, NRES 436**Prerequisites:** GEOL 103**Description:** Survey of mammalian evolution with emphasis on the origin, radiation, and phylogenetic relationships of Cenozoic fossil mammals. Overview of climatic and ecological changes affecting mammalian adaptations and hands on experience with specimens.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Prerequisite for:** GEOL 935**NRES 837 Adaptive Natural Resource Management****Description:** From cultural taboos to the current socio-ecological framework, the art and science of natural resource management has and continues to evolve. The primary focus of this course is to introduce students to the concepts of structured decision making and adaptive management, but in doing so the course will explore the history of natural resource management and the various management paradigms that have and continue to dominate resource management. At the completion of this course students will have an understanding of the theory and practice of adaptive management as well as an understanding of why we continue to move toward a more transparent and scientific methodology of natural resource management.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**NRES 838 Grassland Conservation: Planning and Management****Crosslisted with:** NRES 438**Prerequisites:** UG: Junior Standing; Grad: None**Notes:** Recommended: introductory ecology and introductory soils courses**Description:** Apply fundamental grassland ecology principles to grassland conservation and identify grassland establishment and management practices appropriate for different environmental and cultural situations. Based on field study, critically analyze management options and outcomes for several grasslands and develop a management plan for a grassland resource.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**Course and Laboratory Fee:** \$30



**NRES 839 Environmental Laboratory Instrumentation and Methods****Crosslisted with:** NRES 439**Prerequisites:** CHEM 106A & CHEM 106L or CHEM 110A and CHEM 110L

**Description:** Exposure to technologies such as spectroscopy, discrete automated colorimetry, chromatography and mass spectrometry used for environmental testing. Hands-on training in calibration, operation and sample analysis, proper use of analytical balance, volumetric glassware and micropipettes, creating and maintaining a laboratory notebook, and development and understanding standard operational procedures. Advanced in-lab training in analytical laboratory techniques and operation of advanced instrumentation used in commercial and research environmental laboratories.

**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Graded**Offered:** FALL/SPR**NRES 840 Great Plains Ecosystem****Crosslisted with:** PLAS 440, AGRO 840, RNGE 440, NRES 440, GRAS 440**Prerequisites:** Junior standing.

**Description:** Characteristics of Great Plains ecosystems, interrelationships of ecological factors and processes, and their application in the management of grasslands. Interactions of fire, vegetation, grazing animals and wildlife.

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**NRES 841 STEM Education Seminar****Crosslisted with:** GEOS 811**Prerequisites:** Graduate student in a science, technology, engineering, or mathematics (STEM) discipline.

**Notes:** This seminar is designed for graduate students interested in STEM education in formal or informal environments with children or adult learners.

**Description:** Acquire familiarity with the broad range of current STEM education research, outreach, and other activities taking place at UNL and across the nation in order to build a larger context for and connections to one's own STEM research and activities.

**Credit Hours:** 1-3**Min credits per semester:** 1**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 842 Wildland Plants****Crosslisted with:** PLAS 442, AGRO 842, RNGE 442, NRES 442, GRAS 442**Prerequisites:** Junior standing.**Notes:** PLAS 131 or LIFE 121 and 121L or equivalent recommended

**Description:** Wildland plants that are important to grassland and shrubland ecosystem management and production. Distribution, utilization, classification, identification (including identification by vegetative parts), uses by Native Americans, and recognition of grasses, forbs, shrubs, exotic and wetland plants.

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**NRES 844 Ecosystem Monitoring and Assessment****Crosslisted with:** PLAS 444, AGRO 844, RNGE 444, NRES 444, GRAS 444**Prerequisites:** Junior standing.**Notes:** NRES 220 or equivalent, recommended.

**Description:** Measurement and monitoring of the important vegetation and environmental factors used to develop management guidelines in grasslands, savannas, woodlands, and wetlands. Emphasis on using ecosystem monitoring protocols for assessment of wildlife habitat, fuels management for wild-land fire, livestock production, and watershed function. Requires field sampling and travel to local field sites.

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**NRES 846 Pollen Analysis for Behavioral, Biological and Forensic Science****Crosslisted with:** FORS 446, FORS 846, NRES 446**Prerequisites:** BIOS 109 and FORS 120.

**Description:** Collection, processing, identification of common North American pollen types. Pollination ecology relating to scene reconstruction. Fundamental statistics and presentation requirements for a legal and scientific audience.

**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**Course and Laboratory Fee:** \$90**NRES 847 Archaeoparasitology: The Archaeology of Disease****Crosslisted with:** NRES 447

**Description:** Study of parasites, their hosts, and the relationship between them. Human parasitology is especially interesting due to the adaptation of human populations to a great variety of parasites over long periods of time in the global diversity of environments. Fundamental understanding of human-parasite relations and methods of recovery of parasites from a variety of archaeological remains.

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**NRES 848 Advanced Topics in Wildlife Damage Management****Crosslisted with:** NRES 448**Prerequisites:** NRES 348

**Description:** Economic, global, and public policy issues relative to situations in which wildlife damage personal property or natural resources, threaten human health and safety, or are a nuisance. Demonstration and discussion of technological advances in fertility control, damage resistance, toxicology, behavioral modification, and biological management.

**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Grade Pass/No Pass Option

**NRES 849 Woody Plant Growth and Development****Crosslisted with:** BIOS 849, HORT 849**Prerequisites:** CHEM 251 and AGRO 325**Description:** Plant growth and development specifically of woody plants as viewed from an applied whole-plant physiological level. Plant growth regulators, structure and secondary growth characteristics of woody plants, juvenility, senescence, abscission and dormancy.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 850 Biology of Wildlife Populations****Crosslisted with:** BIOS 450, BIOS 850, NRES 450**Prerequisites:** NRES 311; MATH 104 or above; STAT 218 or equivalent**Description:** Principles of population dynamics. Management strategies (for consumptive and nonconsumptive fish and wildlife species) presented utilizing principles developed.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**Course and Laboratory Fee:** \$10**NRES 851 Soils, Water, and Environmental Chemistry****Crosslisted with:** ENVE 851, NRES 451**Prerequisites:** NRES/WATS/SOIL/PLAS/GEOL 361 or graduate standing**Description:** Environmental chemistry related to the fate and transport of organic contaminants in soil-water environments. Application of computer simulation models (i.e., MODFLOW) for predicting contaminant fate in aquifers. Basic chemical and biological principles of remediating contaminated soil and water.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**NRES 852 Climate and Society****Crosslisted with:** PLAS 450, GEOG 450, METR 450, NRES 452, AGRO 850, GEOG 850, METR 850**Prerequisites:** Junior standing or above.**Notes:** Offered spring semester of even-numbered calendar years.**Description:** Impact of climate and extreme climatic events on society and societal responses to those events. Global in scope and interdisciplinary.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**NRES 853 Hydrology****Crosslisted with:** NRES 453**Prerequisites:** MATH 102 or above**Notes:** Not available for credit for engineering students and not a substitute for CIVE 456.**Description:** Introduction to the principles of hydrology, with emphasis on the components of the hydrologic cycle: precipitation, evaporation, groundwater flow, surface runoff, infiltration, precipitation runoff relationships.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**Prerequisite for:** AGEN 957, BSEN 957, CIVE 957, GEOL 957**NRES 854 Ecological Interactions****Crosslisted with:** BIOS 454, BIOS 854, NRES 454**Prerequisites:** LIFE 121; LIFE 121L; BIOS 207 or NRES 220; Senior Standing**Description:** Nature and characteristics of populations and communities. Interactions within and between populations in community structure and dynamics. Direct and indirect interactions and ecological processes, competition, predation, parasitism, herbivory, and pollination. Structure, functioning and persistence of natural communities, foodweb dynamics, succession, and biodiversity.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**NRES 855 Soil Chemistry and Mineralogy****Crosslisted with:** PLAS 455, AGRO 855, NRES 455, SOIL 455**Prerequisites:** PLAS/SOIL 153 or GEOL 101; CHEM 109A/L and 110A/L; CHEM 221 or CHEM 221A & CHEM 221L or 251.**Description:** Chemical and mineralogical properties of soil components. Inorganic colloidal fraction. Structures of soil minerals as a means of understanding properties, such as ion exchange and equilibria; release and supply of nutrient and toxic materials; and soil acidity and alkalinity. Forms and functions of organic matter in soil.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**NRES 856 Mathematical Models in Biology****Crosslisted with:** BIOS 456, BIOS 856, NRES 456**Prerequisites:** LIFE 120; LIFE 120L; LIFE 121; LIFE 121L; MATH 107**Description:** Biological systems, from molecules to ecosystems, are analyzed using mathematical techniques. Strengths and weaknesses of mathematical approaches to biological questions. Brief review of college level math; introduction to modeling; oscillating systems in biology; randomness in biology; review of historically important and currently popular models in biology.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option

**NRES 857 Green Space and Urban Forestry Management****Crosslisted with:** NRES 457, PLAS 457**Prerequisites:** Junior or senior standing, Graduate student or permission**Description:** A focus on the management of trees, parks, and green infrastructure in rural and urban communities. Perspectives from community planning, landscape architecture, urban forestry, natural resources, horticulture, and environmental policy. Development and implementation of green space and forest management plans encompassing societal needs and biological limitations in rural and urban communities.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**NRES 858 Soil Physical Determinations****Crosslisted with:** PLAS 458, AGRO 858, NRES 458, SOIL 458**Prerequisites:** SOIL/PLAS/GEOL/WATS 361; PHYS 141 or equivalent; MATH 102 or 103.**Description:** Survey of measurement techniques and principles used in characterizing the physical properties of soils. Includes analysis of experimental design and sources of experimental error. Techniques include: particle size analysis, soil water content, pore size analysis, field sampling techniques, soil strength, and saturated hydraulic conductivity.**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Grade Pass/No Pass Option**NRES 859 Limnology****Crosslisted with:** BIOS 459, BIOS 859, NRES 459, WATS 459**Prerequisites:** BIOS 207 or NRES 220; CHEM 106A & CHEM 106L or CHEM 110A & CHEM 110L**Description:** Physical, chemical, and biological processes that occur in fresh water. Organisms occurring in fresh water and their ecology; biological productivity of water and its causative factors; eutrophication and its effects.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**Prerequisite for:** BIOS 866, NRES 866**Course and Laboratory Fee:** \$25**NRES 860 Soil Microbial Ecology****Crosslisted with:** PLAS 460, BIOS 460, NRES 460, SOIL 460, AGRO 860, BIOS 860**Prerequisites:** Senior standing.**Notes:** Recommend having a strong science background, including courses from the agronomic, environmental, microbiology, engineering or medicine disciplines.**Description:** Soil from a microbe's perspective-growth, activity and survival strategies; principles governing methods to study microorganisms and biochemical processes in soil; mechanisms controlling organic matter cycling and stabilization with reference to C, N, S, and P; microbial interactions with plants and animals; and agronomic and environmental applications of soil microorganisms.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING**NRES 861 Soil Physics****Crosslisted with:** PLAS 461, GEOL 461, NRES 461, SOIL 461, WATS 461, AGRO 861, GEOL 861**Prerequisites:** PLAS/SOIL 153; PHYS 141 or equivalent, one semester of calculus.**Description:** Principles of soil physics. Movement of water, air, heat, and solutes in soils. Water retention and movement, including infiltration and field water regime. Movement of chemicals in soils.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Prerequisite for:** AGEN 955, AGRO 955, CIVE 955, GEOL 985**NRES 862 Conservation Biology****Crosslisted with:** NRES 462**Prerequisites:** 12 hours of biological sciences, including NRES 220 and NRES 222 or equivalent.**Description:** Current issues in conservation biology. Theoretical principles from the areas of ecology and genetics to effectively preserve and manage biological diversity and small populations.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 863 Fisheries Science****Crosslisted with:** NRES 463**Description:** Fisheries biology emphasizing the determination and evaluation of vital statistics for the management of fish populations. Basis of specific management techniques. May also be offered at Cedar Point Biological Station.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option



**NRES 863L Fisheries Science Lab****Crosslisted with:** NRES 463L**Description:** Field and laboratory skills needed for fisheries biology emphasizing the determination and evaluation of vital statistics for the management of fish populations. Applied data collection and fish sampling techniques will be used. May also be offered at Cedar Point Biological Station.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Grade Pass/No Pass Option**Course and Laboratory Fee:** Total Seats Needed: 150**NRES 864 Fisheries Biology****Crosslisted with:** BIOS 464, BIOS 864, NRES 464**Prerequisites:** BIOS/NRES 489/889 or equivalent.**Description:** Biology of fishes. Factors that affect fishes in the natural environment. Techniques used in the analysis and management of fish populations.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 865 Soil Geomorphology and Paleopedology****Crosslisted with:** GEOL 465, GEOL 865, NRES 465**Prerequisites:** GEOL 450/850 and NRES 477/877**Description:** Soils and paleosols as evidence in reconstruction landscape evolution and paleoenvironments. Role of paleosols in stratigraphy.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 866 Advanced Limnology****Crosslisted with:** BIOS 866**Prerequisites:** NRES 859 or equivalent**Description:** In-depth consideration of selected areas of limnology including stream limnology, primary production, secondary production, nutrient cycling, and eutrophication.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 867 Global Climate Change****Crosslisted with:** METR 483, METR 883, NRES 467**Prerequisites:** Junior standing; and METR 475/875.**Notes:** Offered fall semester of even-numbered calendar years.**Description:** Elements of climate systems, El Nino/LaNina cycle and monsoons, natural variability of climate on interannual and interdecadal scales. Paleoclimate, and future climate, developed climate change scenarios and climate change impacts on natural resources and the environment.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 868 Wetlands****Crosslisted with:** BIOS 458, NRES 468, WATS 468, BSEN 468, BSEN 868**Prerequisites:** CHEM 109A and 109L and CHEM 110A and 110L, or CHEM 105A and 105L and CHEM 106A and 106L; Junior or Senior Standing.**Notes:** Offered even-numbered calendar years.**Description:** Physical, chemical and biological processes that occur in wetlands; the hydrology and soils of wetland systems; organisms occurring in wetlands and their ecology wetland creation, delineation, management and ecotoxicology.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Grade Pass/No Pass Option**Course and Laboratory Fee:** \$40**NRES 869 Bio-Atmospheric Instrumentation****Crosslisted with:** GEOG 469, PLAS 407, METR 469, MSYM 469, NRES 469, AGRO 869, GEOG 869, HORT 807, METR 869, MSYM 869**Prerequisites:** Junior standing; MATH 106; 4 hrs physics; physical or biological science major.**Description:** Discussion and practical application of principles and practices of measuring meteorological and related variables near the earth's surface including temperature, humidity, precipitation, pressure, radiation and wind. Performance characteristics of sensors and modern data collection methods are discussed and evaluated.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 870 Lake and Reservoir Restoration****Prerequisites:** 12 hrs NRES or related fields**Description:** Theory, processes, and mechanisms underlying lake and reservoir water quality degradation and/or pollution. Remediation of eutrophication and its effects. Current techniques used to restore and protect degraded lakes.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 871 Quantitative Fishery Assessment****Notes:** Offered spring semester of even numbered calendar years.**Description:** Advanced quantitative techniques of fishery science required to support management practices targeted at populations (recruitment, growth and mortality), communities (e.g., predator-prey interactions) and ecosystems (e.g., bio-stressors).**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** SPRING

**NRES 872 Applied Soil Physics****Crosslisted with:** PLAS 472, AGRO 872, NRES 472, SOIL 472, WATS 472**Prerequisites:** PLAS/SOIL 153; MATH 102 or MATH 104 or MATH 106.**Description:** Emphasis on applied soil physics. Discussion of theoretical principles followed by field and laboratory exercises and applications. Fluxes of water, solutes, air, and heat through the soil. Emphasis on water infiltration, water retention, other soil hydraulic properties. Components of soil water balance. Management of soil water.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Offered:** FALL**NRES 873 Ecological Anthropology****Crosslisted with:** ANTH 473, ANTH 873**Description:** Human adaptive systems and their ecological contexts. The dynamic inter-relationships between subsistence, technology, social behavior, human demography, and ecological variability.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Groups:** CAS Diversity in the US**NRES 874 Herpetology****Crosslisted with:** BIOS 474, BIOS 874, NRES 474**Prerequisites:** BIOS/NRES 386 and permission.**Notes:** BIOS 388 recommended.**Description:** Fossil and living amphibians and reptiles. Anatomy, classification, ecology and evolution.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Grade Pass/No Pass Option**Course and Laboratory Fee:** \$90**NRES 875 Water Quality Strategy****Crosslisted with:** NRES 475, SOCI 475, SOCI 875, SOIL 475, WATS 475, PLAS 475, AGRO 875, CIVE 475, CIVE 875, CRPL 475, CRPL 875, GEOL 475, GEOL 875, MSYM 475, MSYM 875, POLS 475, POLS 875**Prerequisites:** Senior standing.**Notes:** Capstone course.**Description:** Holistic approach to the selection and analysis of planning strategies for protecting water quality from nonpoint sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems; for selecting strategies; and for evaluating present strategies.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 876 Mammalogy****Crosslisted with:** BIOS 476, BIOS 876, NRES 476**Prerequisites:** 8 hrs BIOS; BIOS/NRES 386 or NRES 311.**Notes:** May also be offered at Cedar Point Biological Station. Field trips are required and may occur outside of scheduled class time. Lab and field time emphasize diversity of mammalian families and species identification of Nebraska mammals.**Description:** Evolution, natural history, ecology, and functional morphology of planetary mammals and mammals of the Northern Great Plains.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Grade Pass/No Pass Option**Course and Laboratory Fee:** \$25**NRES 877 Great Plains Field Pedology****Crosslisted with:** PLAS 477, GEOG 467, NRES 477, SOIL 477, GEOG 867**Prerequisites:** PLAS/SOIL 153.**Description:** Spatial relationship of soil properties on various parts of landscape typical of the Plains, causal factors, and predictions of such relationships on other landscapes. Grouping these properties into classes, naming the classes, and the taxonomy that results from this grouping. Application of a taxonomy to a real situation through making a field soil survey in a region representative of the Plains border, predicting land use response of various mapped units as it affects the ecosystem, and evaluating the effectiveness of the taxonomic system used in the region surveyed.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Grade Pass/No Pass Option**NRES 878 Regional Climatology****Crosslisted with:** METR 478, METR 878, NRES 478**Prerequisites:** NRES/METR 370.**Description:** Regional differentiation of the climates of the earth on both a descriptive and dynamic basis. The chief systems of climatic classification.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**NRES 879 Hydroclimatology****Crosslisted with:** NRES 479, METR 479, WATS 479, BSEN 479, METR 879, BSEN 879**Prerequisites:** NRES 208 or METR 100 or METR/NRES 370.**Notes:** Offered spring semester of even-numbered calendar years.**Description:** Interaction between earth's climate and the hydrologic cycle. Energy and water fluxes at the land-atmosphere interface. Atmospheric moisture transport, precipitation, evaporation, snowmelt, and runoff. Impacts of climate variability and change on the hydrologic cycle.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option

**NRES 880 Vertebrate Population Analysis**

**Notes:** NRES 880 is offered spring semester of even years.

**Description:** Introduction to the estimation of demographic parameters from surveys and mark-recapture data. Emphasizes analytical skills used to estimate population vital rates, such as abundance, density, population size, survival rates, home range size, and movement rates. Reinforces use of multiple hypotheses in scientific investigations, as well as model selection processes.

**Credit Hours:** 4

**Max credits per semester:** 4

**Max credits per degree:** 4

**Grading Option:** Grade Pass/No Pass Option

**Offered:** SPRING

**NRES 881 Environmental Conflict Management**

**Description:** This two-day short-course is designed to aid students development of theoretically grounded practical approaches to facilitate and manage environmental conflict. The course will provide students with skills to perform well in conflict situations and help students manage conflict in diverse environmental contexts. The program blends presentations, group discussions, conflict analysis, and strategy design exercises and simulations into a highly engaging learning environment. Participants learn from each other and develop personalized tools that can be applied immediately. wo-day short-course taught fall semester of even numbered years.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Grading Option:** Graded

**NRES 882 Ecophysiology of Wildlife**

**Crosslisted with:** NRES 482

**Prerequisites:** NRES 220 or BIOS 207; PLAS 215/BIOS 206; BIOS 386

**Description:** Evaluation of the conserved physiological principles that are broadly used across animal groups, as well as the many unique adaptations used by specific taxa. Focuses on all major vertebrate groups, including fish, birds, mammals, reptiles and amphibians, and links the physiological mechanisms that allow them to survive to the environments in which they live. Highlights methods scientists use to gather physiological information, and the ways in this information can be used by scientists in a variety of different fields.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded

**Offered:** FALL

**NRES 883 Ecological Economics**

**Crosslisted with:** AECN 883, CDEV 883

**Prerequisites:** AECN 141 or ECON 212 or equivalent

**Description:** A synthesis across the notion of "utility" as represented in traditional environmental and natural resource economics, "ecology" in ecological economics, and "community" in behavioral economics. Ideas from thermodynamics with a focus on renewable resources. Development, organization, and enhancement of eco-business, eco-industry, eco-government and eco-communities.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**NRES 884 Water Resources Seminar**

**Crosslisted with:** PLAS 484, GEOG 484, GEOL 484, NRES 484, WATS 484, AGRO 884, GEOG 884, GEOL 884, WATS 884

**Prerequisites:** Junior or above standing

**Description:** Seminar on current water resources research and issues in Nebraska and the region.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Grading Option:** Grade Pass/No Pass Option

**NRES 885 Natural Resources Seminar**

**Crosslisted with:** NRES 485

**Description:** Active listening and critical thinking activities related to seminars on current natural resources research and issues in Nebraska, the Great Plains, and throughout the world.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Grading Option:** Graded

**Offered:** FALL

**NRES 886A Professional Certifications: Certified Interpretive Guide**

**Crosslisted with:** NRES 486A

**Description:** Professional certification from the National Association of Interpretation. Practical skills for developing quality interpretive programs for museum, nature center, zoo and park visitors. Theoretical foundations of interpretation.

**Credit Hours:** 2

**Max credits per semester:** 2

**Max credits per degree:** 2

**Grading Option:** Graded

**NRES 886B Professional Certifications: Certified Interpretive Host**

**Crosslisted with:** NRES 486B

**Description:** Receive professional certification from the National Association of Interpretation. Practical skills for staff and volunteers of museums, nature centers, zoos and parks to provide quality customer service.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Grading Option:** Graded

**NRES 887 Hydrogeology**

**Crosslisted with:** GEOL 889

**Prerequisites:** GEOL 888/NRES 488 and MATH 208

**Description:** Principles of flow through porous media with emphasis on basic classical solutions, flow-net analysis, and elementary modern numerical solutions that aid in the analysis and development of groundwater supplies.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**Prerequisite for:** GEOL 988; NRES 918

**Course and Laboratory Fee:** \$15

**NRES 888 Groundwater Geology****Crosslisted with:** GEOL 488, GEOL 888, NRES 488**Prerequisites:** GEOL 100-level course; MATH 106 or equivalent.**Description:** Occurrence, movement, and development of water in the geologic environment.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Grade Pass/No Pass Option**Prerequisite for:** AGEN 955, AGRO 955, CIVE 955, GEOL 985; GEOL 470, GEOL 870; GEOL 889, NRES 887; GEOL 986; NRES 918**Course and Laboratory Fee:** \$10**NRES 889 Ichthyology****Crosslisted with:** BIOS 489, BIOS 889, NRES 489**Prerequisites:** LIFE 120 and LIFE 121**Notes:** May also be offered at Cedar Point Biological Station.**Description:** Fishes, their taxonomy, physiology, behavior, and ecology. Dynamics of fish stocks and factors regulating their production.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Grade Pass/No Pass Option**Prerequisite for:** BIOS 464, BIOS 864, NRES 464, NRES 864**Course and Laboratory Fee:** \$20**NRES 891 Seminar in Natural Resource Sciences****Description:** Presentations of special non-thesis topics, and/or research plans, and/or thesis research results.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Pass No-Pass**NRES 891A Seminar. Writing in Science****Notes:** The goal of this class is to make you a better writer through discussion and critique of published scientific papers.**Description:** Writing is the core of how we communicate our scientific findings; fostering good writing skills now will help you throughout your career regardless of if you remain in academia. This class is suitable for all graduate students working on a proposal or a manuscript, or who want to focus on improving their academic reading and writing skills.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Pass No-Pass**NRES 891B Readings in Aquatic Ecology****Prerequisites:** Admission to the Graduate Program in the School of Natural Resources**Description:** Read classic (highly cited, generally 25-75 years old) papers and more recent follow-up (<10 years) papers on topics relevant to many areas of aquatic ecology. The goal is to read the basis of the concepts taught in modern Limnology courses and to see how these concepts are currently evolving in the literature. Students will be responsible for choosing a topic and classic paper from a list (see below) and finding (with help) a modern follow up to the issue, and then will lead the group discussion on that topic.**Credit Hours:** 1-3**Min credits per semester:** 1**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Pass No-Pass**NRES 892 International Study Tours in Natural Resource Management****Crosslisted with:** NRES 492**Prerequisites:** Permission.**Notes:** Off-campus travel may be required. Choice of subject matter and coordination of on- and off-campus study is at the discretion of the instructor.**Description:** Group educational tours to sites that illustrate the diversity of approaches to natural resources management found around the world.**Credit Hours:** 1-3**Min credits per semester:** 1**Max credits per semester:** 3**Max credits per degree:** 6**Grading Option:** Grade Pass/No Pass Option**NRES 893 Experiences in Natural Resources****Crosslisted with:** NRES 493**Prerequisites:** Permission of instructor**Description:** Immersive learning experiences in natural resources.**Credit Hours:** 0-3**Min credits per semester:****Max credits per semester:** 3**Max credits per degree:** 12**Grading Option:** Grade Pass/No Pass Option**NRES 896 Independent Study****Prerequisites:** 12 hrs natural resource sciences or closely-related fields; permission**Description:** Individual or group projects in research, literature review or extension of course work under supervision and evaluation of a departmental faculty member.**Credit Hours:** 1-5**Min credits per semester:** 1**Max credits per semester:** 5**Max credits per degree:** 5**Grading Option:** Grade Pass/No Pass Option**NRES 897 Master of Applied Science Project****Crosslisted with:** AGRI 897, AGRO 897, HORT 897, ASCI 897**Prerequisites:** Admission to Master of Applied Science degree program**Notes:** Project activity for the Master of Applied Science degree.**Description:** Design, develop and complete a project that requires synthesis of the course topics covered in the primary area of emphasis.**Credit Hours:** 1-6**Min credits per semester:** 1**Max credits per semester:** 6**Max credits per degree:** 6**Grading Option:** Grade Pass/No Pass Option**NRES 898 Special Topics in Natural Resources****Crosslisted with:** NRES 498**Prerequisites:** 6 hrs NRES or equivalent.**Description:** Current issues in natural resource sciences.**Credit Hours:** 1-6**Min credits per semester:** 1**Max credits per semester:** 6**Max credits per degree:** 12**Grading Option:** Grade Pass/No Pass Option

**NRES 899 Masters Thesis**

**Prerequisites:** Admission to masters degree program and permission of major adviser

**Credit Hours:** 1-10

**Min credits per semester:** 1

**Max credits per semester:** 10

**Max credits per degree:** 99

**Grading Option:** Pass No-Pass

**NRES 902 Foundations of Ecological Resilience**

**Crosslisted with:** AGRO 902

**Prerequisites:** Graduate standing

**Description:** Concept of resilience, especially ecological resilience, and resilience theory. Both theoretical and applied aspects of ecological resilience, and the development of resilience theory. Prominent issues in resilience science and applications to practical problems in natural resource management.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded

**Offered:** FALL

**Groups:** Biology, Psychology, & Politics American Government & Public Pol

**NRES 906 Crop Growth and Yield Modeling**

**Crosslisted with:** AGRO 906

**Prerequisites:** AGRO 325/HORT 325 Introductory Plant Physiology or equivalent

**Notes:** Recommended: AGRO 406/806 NRES 406/806 HORT 406/806 Plant Ecophysiology or equivalent.

**Description:** Understanding and use of crop simulation models and ability to build crop models. Studying principles and quantitative descriptions of crop production ecology. Offered fall semester of odd-numbered calendar years.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**NRES 916 Environmental Law and Water Resource Management Seminar**

**Crosslisted with:** CIVE 916

**Prerequisites:** Permission

**Description:** An interdisciplinary seminar with the Department of Civil Engineering. Contemporary environmental issues and water resource management.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**NRES 917 Environmental Isotope Hydrology**

**Crosslisted with:** GEOL 917

**Prerequisites:** NRES 819 or equivalent

**Description:** Theory and use of stable, radiogenic and radioactive isotopes in hydrologic studies. Abundance and variation of the stable isotopes of oxygen, hydrogen, carbon, sulphur, chlorine, nitrogen, and strontium. Application of the isotopes to determine water origin, movement, geochemical history, recharge age and residence time, and to delineate contaminant sources and solute migration.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**NRES 918 Applied Groundwater Modeling**

**Prerequisites:** GEOL/NRES 488/888 or 889, MATH 208/208H, or equivalent

**Notes:** Offered fall semester of odd-numbered calendar years.

**Description:** Forward and backward numerical analysis of groundwater flow systems and their interactions with other hydro-logic components. Groundwater model development and parameter estimation using MODFLOW, PEST, and other widely used modeling packages.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**Course and Laboratory Fee:** \$20

**NRES 920 Xenobiotics in the Environment**

**Crosslisted with:** AGRO 920, ENTO 920, EOHT 920, HORT 920

**Prerequisites:** Recommend one course each in organic chemistry, soil science, biochemistry, plant physiology, microbiology and ecology

**Description:** Fate and ecotoxicological impacts of biologically foreign compounds in soil-water-plant environments; uptake, mechanisms of toxicity and metabolism in plants and other biota. Herbicides and other pesticides.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**NRES 922 Seminar in Geographic Information Systems (GIS)**

**Crosslisted with:** GEOG 922

**Prerequisites:** GEOG/NRES 812 and 822; or equivalent

**Description:** Study of current research and trends in geographic information systems (GIS), GIScience, and GeoComputation. Advanced spatial analytical techniques and geospatial modeling emphasizing GIS applications in natural resources assessment, environmental analyses, agriculture, and land management.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**NRES 935 Seminar in Historical Geography**

**Crosslisted with:** GEOG 935

**Description:** Discussion of current literature and research on selected aspects of historical geography. Specific theme of course varies according to instructor.

**Credit Hours:** 1-3

**Min credits per semester:** 1

**Max credits per semester:** 3

**Max credits per degree:** 6

**Grading Option:** Grade Pass/No Pass Option

**NRES 954 Turbulent Transfer in the Atmospheric Surface Layer**

**Crosslisted with:** BSEN 954

**Prerequisites:** MATH 821; MECH 310 or NRES 808 or BIOS 857; or equivalent

**Notes:** Offered spring semester of odd-numbered calendar years.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option



**NRES 965 Managed Aquatic Systems**

**Description:** Theoretical aspects of structure and function in aquatic systems managed for human needs, ecological processes, river-reservoir interface, energy flow (including fate and transport), population dynamics, and multiple-use systems.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Grade Pass/No Pass Option

**NRES 985 Soil Carbon and Nitrogen Dynamics**

**Crosslisted with:** AGRO 985, SOIL 985

**Notes:** Basic knowledge about soil biogeochemical characteristics and processes are required to take full advantage of the content delivered. Recommended courses: AGRO/SOIL 153 or AGRO 804, AGRO/SOIL 455/855, GEOL 417/817.

**Description:** Understand carbon and nitrogen cycling in the soil ecosystem including feedbacks and implications for soil management, environment, and climate.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded

**Offered:** FALL/SPR

**NRES 992 General Seminar**

**Crosslisted with:** AGRO 992, HORT 992

**Notes:** Agronomy and Horticulture PhD students should enroll in this course twice.

**Description:** Expected of all Agronomy and Horticulture graduate students. Presentation of thesis/dissertation or non-thesis topics in agronomy, horticulture or related subjects. Agronomy and Horticulture PhD students should enroll in this course twice.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 5

**Grading Option:** Pass No-Pass

**NRES 996 Research Other Than Thesis**

**Prerequisites:** Permission

**Credit Hours:** 1-6

**Min credits per semester:** 1

**Max credits per semester:** 6

**Max credits per degree:** 6

**Grading Option:** Grade Pass/No Pass Option

**NRES 996A Research in Soils**

**Crosslisted with:** AGRO 996A

**Prerequisites:** 12 hrs AGRO or closely related sciences, and permission

**Credit Hours:** 2-5

**Min credits per semester:** 2

**Max credits per semester:** 5

**Max credits per degree:** 5

**Grading Option:** Grade Pass/No Pass Option

**NRES 999 Doctoral Dissertation**

**Prerequisites:** Admission to doctoral degree program and permission of supervisory committee chair

**Credit Hours:** 1-24

**Min credits per semester:** 1

**Max credits per semester:** 24

**Max credits per degree:** 99

**Grading Option:** Pass No-Pass