The program in Natural Resources and Environmental Science is designed to provide students with the knowledge and skills needed for a career in the rapidly growing fields of environmental science and policy. As the world population grows, and as nations are drawn closer together through technology and trade, the conservation and management of natural resources will become increasingly important to the sustained well-being of all societies. The curriculum provides students with exposure to a broad array of key disciplines involved with natural resources. As a result, graduates have the capacity to integrate different perspectives and diverse bodies of knowledge in dealing with real resource management problems.

All students in the program share a common core of major requirements. This core is designed to provide the student with broad exposure to the technical and socioeconomic dimensions of natural resources and their management. Important components of this core are required three-week summer camp after the sophomore or junior year and a required internship or research experience. In addition to this core, all students must develop a Concentration Area consisting of at least 18 hours of course work. This Concentration Area allows the student to focus the degree on an area of interest in the technical or policy oriented aspects of natural resource management. These courses must be chosen in consultation with the academic advisor and must be approved by the advisor and the NRES Steering Committee as part of the plan of study for the student.

Graduates of the Natural Resources and Environmental Science degree program are employed as professionals in both the public and private sectors. Industries which have an impact upon the environment maintain a staff of environmental scientists and technicians to ensure compliance with the standards of our society. Government agencies employ broadly trained natural resource scientists to serve in regulatory or management functions for the resources in their jurisdiction. Additional employment opportunities exist in environmental journalism and education, and with the many nonprofit organizations which have environmental concerns. In addition, students in either option are well prepared for graduate programs dealing with resource and environmental issues and in traditional academic disciplines.

**Graduation Requirements**

To earn a Bachelor of Science in Natural Resources and Environmental Science, the student must complete at least 120 semester hours with at least a 2.0 grade-point standing. A minimum of 45 credit hours must be from upper division courses (300 and above). Remedial courses may not be counted toward the total hours required for the degree. In addition to the UK Core requirements, the student must complete college, premajor, major and concentration requirements, including an internship or research experience. The student will construct their concentration area with the approval of a faculty advisor in the area of interest.

**UK Core Requirements**

See the UK Core section of the 2021-2022 Undergraduate Bulletin for the complete UK Core requirements. The courses listed below are (a) recommended by the college, or (b) required courses that also fulfill UK Core areas. Students should work closely with their advisor to complete the UK Core requirements.

I. Intellectual Inquiry in Arts and Creativity

Choose one course from approved list

-- CONTINUED --
Natural Resources and Environmental Science • 2

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GEO 431 Political Ecology
GEO 316 Environment and Development
FOR 320 Forest Valuation and Economics
ECO 473G Economic Development
AEC/NRE 545 Resource and Environmental Economics
AEC 532 Agricultural and Food Policy
and U.S. Trade in Agricultural Products

The area will provide students with the theoretical and analytical tools necessary to evaluate the quality of water, soil, and ecosystem resources. This analytical skill development area is geared towards students pursuing careers as environmental science and protection scientists/technicians and forest and conservation scientists/technicians.

Students will learn the theory and application of sample data collection and techniques, field and laboratory analysis, statistical analysis, and data interpretation required to evaluate the quality of water, soil, and ecosystem resources. This analytical skill development area is geared towards students pursuing careers as environmental science and protection scientists/technicians and forest and conservation scientists/technicians.

Students will learn the theory and application required to address a variety of environmental conditions. This analytical skill development area is geared towards students wishing to pursue careers that depend on extensively applying geospatial technologies to natural resources and environmental science issues or advanced study in geospatial science.

FOR 200 Basics of Geospatial Technology
FOR 570 Landscape Ecology for Natural Resources
GEO 305 Elements of Cartography
GEO 409 Advanced GIS
GEO 415 Map Interpretation
GEO 419 Introduction to Remote Sensing
GEO 509 Workshop in Geospatial Technologies
LA/NRE 556 Contemporary Geospatial Applications for Land Analysis

3. Geospatial Analysis
Geospatial technologies are often used in conjunction with traditional natural resource and environmental scientist job requirements. This development area will provide students with enhanced skills beyond the major requirements in the use of geospatial software, approaches, and products. Students will learn the theory and application required to address a variety of environmental conditions. This analytical skill development area is geared towards students wishing to pursue careers that depend on extensively applying geospatial technologies to natural resources and environmental science issues or advanced study in geospatial science.

FOR 200 Basics of Geospatial Technology
FOR 570 Landscape Ecology for Natural Resources
GEO 305 Elements of Cartography
GEO 409 Advanced GIS
GEO 415 Map Interpretation
GEO 419 Introduction to Remote Sensing
GEO 509 Workshop in Geospatial Technologies
LA/NRE 556 Contemporary Geospatial Applications for Land Analysis

4. Environmental Education and Communication
The environmental education and communication area will introduce you to the concepts of Environmental Education (in NRE 365) and then provide you with the background necessary to apply your environmental systems knowledge in an educational (formal and non-formal) setting or through other avenues of communication.

AED/FCS 583 Designing Curriculum and Assessment in Career and Technical Education
CLD 230 Intrapersonal Leadership
CLD/SOC 360 Environmental Sociology
CLD/EDL 402 Principles of Leadership
CLD/EDL 403 Leadership and Communication
COM 281 Communication in Small Groups
COM 287 Persuasive Speaking
COM 315 Understanding Workplace Communication in a Diverse U.S. Society
ECO 499 Seminar in Economics (Subtitle required)
EDP 202 Human Development and Learning
ENG 425 Environmental Writing
NRE 360 Environmental Communication
NRE 365 Environmental Education

5. Individualized Analytical Skill Development
With advisor approval, a student may submit a request for an individualized ASD. The written proposal must include a memo explaining the rationale, a list of proposed courses for the ASD, an explanation of how those courses meet the intent of the ASD, and a copy of the student’s Plan of Study which includes the proposed course work. The written proposal must be submitted to the DUS for Steering Committee approval.

— CONTINUED —
Environmental System Emphasis Areas

1. Conservation Biology
The conservation biology emphasis area will provide students with knowledge of the ecological underpinnings and organismal biology of conservation biology. Depending on the courses chosen, students will: (1) gain a solid foundation in field botany by learning tree identification and by developing a taxonomic framework for plant identification; (2) become familiar with the mammals, birds, reptiles and amphibians of Kentucky and surrounding states; (3) gain an introduction to the vegetation, flora and forests of Kentucky and surrounding states; and (4) develop an understanding of ecosystem pattern and process. Students who choose courses in this environmental systems emphasis area may be qualified to pursue careers with organizations dedicated to the preservation, conservation, and management of habitat, and related rare species preservation. Other opportunities include nature preserve manager, natural resource educator, naturalist, biological inventories and assessment, and environmental consulting. This emphasis area also prepares students for graduate studies in ecology, evolutionary biology, zoology, or botany.

ABT/BIO/ENT/FOR 461G Introduction to Population Genetics................................. 3
BIO/PLS 210 The Life Processes of Plants ............................................................ 3
BIO 303 Introduction to Evolution ................................................................. 4
BIO 325 Ecology ............................................................................................ 4
BIO 375 Behavioral Ecology and Sociobiology .............................................. 3
BIO/NRE 420G Taxonomy of Vascular Plants .................................................... 4
BIO/GE 530 Biogeography and Conservation .................................................. 3
FOR 219 Dendrology .......................................................................................... 3
FOR 370 Wildlife Biology and Management ...................................................... 4
FOR 510 Herpetology .......................................................................................... 4
FOR 520 Mammals of the Eastern United States .............................................. 3
FOR 530 Freshwater Ecology ............................................................................ 3
FOR 540 Urban Ecology ..................................................................................... 3
FOR/GEO 570 Landscape Ecology for Natural Resources ....................... 3

2. Forestry
The forestry emphasis area provides students with knowledge in dendrology (the study of trees) and silviculture (the cultivation, growing, and management of trees). In dendrology students will learn basic concepts of botany of woody species, and their use, along with basic soil and site characteristics used in the identification of trees and forest vegetation. In silviculture students will learn the basics of ecologically-based management of forest ecosystems to achieve a desired objective. Students who choose this emphasis area may be qualified to pursue careers in natural resource management with an emphasis on forest systems. [Note: Students with a B.S. in Forestry from a Society of American Foresters (SAF) accredited forestry program may be more competitive for certain forestry jobs. The NRES program is not an SAF accredited program.]

FOR 200 Basics of Geospatial Technology ....................................................... 3
*FOR 219 Dendrology .......................................................................................... 4
*FOR 221 Winter Dendrology .......................................................................... 4
*FOR 255 Forest Fire ............................................................................................ 1
*FOR 260 Forest Products and Wood Science .................................................... 4
*FOR 320 Forest Vegetation and Economics ...................................................... 4
*FOR 350 Silviculture .......................................................................................... 4
FOR 400 Human Dimensions of Forestry and Natural Resources ............... 3
FOR 425 Forest Management ........................................................................... 4
ENT/FOR 502 Forest Entomology ...................................................................... 4
*Students are strongly encouraged to take these key courses.

3. Human Dimensions and Natural Resource Planning
The human dimensions and natural resource planning emphasis area will provide students with an understanding of the interaction between society and natural systems and provide students with the skills and knowledge for tomorrow’s effective conservation leaders. This emphasis area does this by building upon the core NRES curriculum with course work and internship experience focused on land planning, legal aspects of land and water, landscape ecology, biogeography, and geospatial technologies. Private foundations and government entities are funding land conservation efforts, and increasingly, real estate developers and their consultants are incorporating land conservation into their development projects. There is a professional community working in a variety of capacities for conservation organizations globally and there is the opportunity for advanced study in a variety of graduate programs.

BIO/GE 530 Biogeography and Conservation .................................................. 3
CLD/SOC 340 Community Interaction .............................................................. 3
CLD/SOC 360 Environmental Sociology ............................................................ 3

4. Soil Science
Students choosing this emphasis area will learn about the dynamic and interrelated processes taking place within the thin skin of the Earth (i.e., Critical Zone) and the services provided by these processes to ensure adequate and sustainable feed, fuel and fiber production, clean air and water, and healthy habitats. Topics covered include bioremediation, phytoengineering, soil fertility, microbiology, soil chemistry, biogeochemistry, etc. Students completing this emphasis area will be equipped to evaluate soils for a range of management options, and be eligible for positions with public and private agencies (e.g., the Natural Resource Conservation Service, Environmental Protection Agency, U.S. Department of Agriculture, Environmental Consulting Firms, etc.)

PLS 396 Soil Judging .......................................................................................... 3
PLS 406 Advanced Soil Judging ....................................................................... 3
PLS 468 Soil Use and Management .................................................................. 3
PLS/NRE 470G Soil Nutrient Management ..................................................... 3
PLS 566 Soil Microbiology ............................................................................... 3
PLS 573 Soil Morphology and Classification .................................................. 3
PLS 575 Soil Physics ......................................................................................... 3
GEO 351 Physical Landscapes ......................................................................... 3
EES 530 Low Temperature Geochemistry ..................................................... 3

5. Water Resources
The water resources emphasis area will provide students with a fundamental understanding of the hydrologic cycle so that students understand how climate, soils, vegetation, and land-use affect the amount, timing and quality of water. Use of this information is important in natural resource management so that one may determine where water resource management objectives are compatible and where they conflict with other resource management objectives. Ultimately, students will gain an understanding of the role of watershed management and multiple use in planning and implementing natural resource programs while becoming familiar with current issues in watershed management and water resources.

AEN 461G Biometeorology ............................................................................... 3
BAE 532/CE 542 Introduction to Stream Restoration ..................................... 3
BAE 536 GIS Applications for Water Resources ............................................ 3
BAE/CE 547 Watershed Sedimentation ............................................................ 3
BIO/GE 530 Biogeography and Conservation .................................................. 3
CHE 565 Environmental Chemistry .............................................................. 3
EES 530 Low Temperature Geochemistry ..................................................... 3
EES 585 Hydrogeology ..................................................................................... 3
FOR 530 Freshwater Ecology ........................................................................... 3
GEO 230 Severe Storms and Extreme Weather ............................................ 3
GEO 451G Fluvial Forms and Processes .......................................................... 3
LA 531 Watershed Modeling and Management ............................................. 3
NRE/LA 556 Contemporary Geospatial Applications for Land Analysis ........ 3
PLS/NRE 455G Wetland Delineation .............................................................. 3
PLS 573 Soil Morphology and Classification .................................................. 3
PLS 575 Soil Physics ........................................................................................ 3

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6. Wildlife Ecology and Management
This emphasis area will provide opportunities for students to gain knowledge and experience, understand fundamental concepts, and develop basic skills in the area of wildlife ecology and management. The curriculum provides students with the option to meet certification requirements to become a registered Associate Wildlife Biologist with The Wildlife Society. To do this, students will need to complete additional course work. For more information visit: http://wildlife.org/learn/professionaldevelopment/certification/certificationprograms/

ASC 325 Animal Physiology ................................................................. 3
BIO/ENT 300 General Entomology ................................................... 3
BIO 303 Introduction to Evolution .................................................... 3
BIO 304 Principles of Genetics .......................................................... 3
BIO 325 Ecology .............................................................................. 3
BIO 350 Animal Physiology ............................................................. 3
BIO 375 Behavioral Ecology and Sociobiology ............................... 3
BIO 559 Ornithology ....................................................................... 3
BIO/ENT 568 Insect Behavior .......................................................... 3
FOR 370 Wildlife Biology and Management .................................... 3
FOR/ENT 502 Forest Entomology ...................................................... 3
FOR 510 Herpetology .................................................................... 4
FOR 520 Mammals of the Eastern United States ............................. 4
FOR 530 Freshwater Ecology ............................................................ 3
FOR 540 Urban Ecology ................................................................. 3
FOR 550 U.S. Biodiversity Hotspots ................................................. 3
FOR/GEO 570 Landscape Ecology for Natural Resources ............. 3

7. Global Sustainable Food Systems
Students who choose this area will be exposed to basic principles in sustainable agriculture, issues in global food systems (e.g., food security) and the ecology of agricultural systems, emphasizing the overlap and complementarities between systems emphasized through NRES major requirements and food production systems. Some students choosing this ESEA may want to obtain the minor in Sustainable Agriculture, which requires the selection of SAG 210 (not listed below because all 9 credits must be 200 or above), in addition to SAG 310 and 386.

AEC 309 International Agriculture, World Food Needs and U.S. Trade in Agricultural Products .......................................................... 3
AEC 352 Agricultural and Food Policy ............................................. 3
CLD/SOC 360 Environmental Sociology ............................................ 3
DHN 318 Hunger, Food Behavior, and the Environment ................ 3
ENT/BIO 300 General Entomology .................................................. 3
ENT 310 Insect Pests of Field Crops ............................................... 3
PLS 404 Integrated Weed Management ........................................ 4
SAG 310 Cultural Perspectives on Sustainability ............................ 3
SAG/PLS 386 Plant Production Systems ......................................... 4
SAG 390 Agroecology ................................................................... 3

8. Earth System Sciences
The Earth Systems Science emphasis area will provide context for understanding the processes that operate within and at the interface between Earth’s lithosphere, biosphere, hydrosphere, and atmosphere, i.e., the environments in which bedrock, soil, organisms, water, and air interact. Students pursuing this area of emphasis may choose to pursue the minor in Geological Sciences, which can be partly satisfied with NRES required courses EES 220 and PLS 366, plus EES 230 and 235, and an additional 5 credits at the 300 level or higher in Earth and Environmental Sciences (EES) or a related field. All courses listed below at the 300+ level would count toward the minor. Students who take EES 385 among their NRES major requirements may also count this course toward the minor.

EES 230 Fundamentals of Geology I ................................................ 3
EES 235 Fundamentals of Geology II .............................................. 3
EES 323 Field Work in Regional Geology ........................................ 6
EES 345 Paleoclimatology: The Science ...................................... 3
EES 360 Mineralogy .................................................................. 4
EES 450G Sedimentary Geology .................................................... 4
EES 530 Low Temperature Geochemistry ..................................... 3
EES 550 Fundamental Geophysics ................................................. 3
EES 585 Hydrogeology ................................................................ 3
GEO 331 Global Environmental Change ..................................... 3
GEO 351 Physical Landscapes ...................................................... 3
PLS 450G Biogeochemistry ........................................................... 3

9. Individualized System Emphasis Area
With advisor approval, a student may submit a request for an individualized ESEA. The written proposal must include a memo explaining the rationale, a list of proposed courses for the ESEA, an explanation of how those courses meet the intent of the ESEA, and a copy of the student’s Plan of Study which includes the proposed course work. The written proposal must be submitted to the DUS for Steering Committee approval.

Subtotal: Analytical Skill Development and Environmental System Emphasis Areas ........................................ 18

Electives
Free elective courses should be selected by the student to lead to the minimum total of 120 hours required for graduation.

Subtotal: Electives ........................................................................ 7-9

TOTAL HOURS: ........................................................................ 120