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NATURAL RESOURCE MANAGEMENT - THE CREATION OF A NEW INTERDISCIPLINARY MAJOR AT THE UNIVERSITY OF DELAWARE

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ABSTRACT: The College of Agricultural Sciences at the University of Delaware has an excellent faculty and physical facility well positioned to educate students for managing the world's natural resources (air, land, water, plants, animals, etc.) into the next century. The college offers a variety of traditional, discipline specific undergraduate majors in five academic departments. A faculty committee worked for more than two years to formulate a new major with an interdisciplinary approach. The result is a new major, Natural Resource Management, which began admitting freshmen students in the Fall of 1997. This paper will discuss the creation of the Natural Resource Management major.

INTRODUCTION

The College of Agricultural Sciences at the University of Delaware has an excellent faculty and physical facility well positioned to educate students for managing the world's natural resources (air, land, water, plants, animals, etc.) into the next century. The college offers a variety of traditional, discipline specific undergraduate majors in five academic departments. A faculty committee worked for more than two years to formulate a new major with an interdisciplinary approach. The result is a new disciplinary major, Natural Resource Management, which began admitting freshmen students in the Fall of 1997.

This paper will discuss the creation of the Natural Resource Management major. Topics include: the College of Agricultural Sciences, the faculty committee that formulated the major, the desired goal and nature of the curriculum, the major concerns in the approval process, faculty and student reactions to the major, and a description of the curriculum. The paper will also include a discussion of methods used to promote the major and an overview of the first set of students transferring or admitted to the major.

DESCRIPTION OF THE COLLEGE

The College of Agricultural Sciences at the University of Delaware consists of five academic departments: Animal and Food Sciences, Bioresources Engineering, Entomology and Applied Ecology, Food and Resource Economics, and Plant and Soil Sciences. With approximately 65 faculty, these departments collectively offer 16 undergraduate majors with 10 concentrations. The majors are traditional agricultural majors and are typically discipline specific. Examples include: Engineering Technology, Preveterinary Medicine, Food Science, General

Entomology, Food and Agribusiness Management, and Plant Science. Undergraduate enrollment in the college is approximately 600, with 100 new freshmen and 50 transfers admitted each year.

The College of Agricultural Sciences has excellent facilities accessible to students. The College's 350-acre, on-campus site includes a working farm, a wood lot, a habitat trail, a greenhouse laboratory and expansive gardens. Townsend and Worriow Halls contain offices, classrooms and laboratories, as well as an agriculture library and a modern computing site.

NEED FOR THE NEW MAJOR

The need for a new major in Natural Resource Management arose from two sources. First, there was a need to coordinate existing course offerings in the college into an interdisciplinary major. Second, the college had many requests from prospective students for a major focused on natural resources and the environment.

The college has historically offered several traditional majors oriented toward the use of natural resources and the environment. Examples include: Wildlife Conservation, Environmental Soils Science and Agricultural Economics. However, these majors are very discipline specific with little overlap with other academic departments.

Since 1990, visits to high schools in Delaware and the surrounding region have revealed a popular interest in "the environment." The source of the interest appears to be the increasing incorporation of environmental topics into high school biology, chemistry and agriculture curricula, as well as intensifying local and global issues focusing on the environment.

Despite their interest, many students were unable to articulate an exact definition of "environment" as it related to a college major or a career choice. While the University of Delaware offered a major in Environmental Science, that title covered a limited aspect of the popular field. Similarly, other programs in our college did not completely address the interests of many prospective students. Natural Resource Management (NRM) was designed to fill the void for students who sought to have a solid training in the physical sciences but also have an understanding of economics, ethics and public policy.

THE PROCESS OF CREATING THE MAJOR

The initiation of a new undergraduate major at the University of Delaware is a complex and involved process. It involves the formulation of a detailed proposal, which is then reviewed and approved by numerous administrators and department, college and university-level faculty committees. It culminates with the approval by the University's Faculty Senate. The process can take a year or more.

The Faculty Committee

In September 1994, the Dean appointed a faculty committee to evaluate and develop a more comprehensive framework for the college's natural resource programs. Our Associate Dean had done some preliminary work and provided a outline of the issues and concerns to be addressed. The committee consisted of faculty from Entomology and Applied Ecology, Plant and Soils Sciences, Food and Resource Economics and Animal and Food Sciences. The Associate Dean for Research and Associate Dean for Resident Instruction also attended committee meetings.

The committee met frequently over the next months and struggled with issues such as:

- how could the desired interdisciplinary nature of the major be achieved;
- what would be the purpose of the new major;
- what would be the desired characteristics of a program graduate;
- how would the major be different than existing majors;
- would it draw students away from existing majors;
- were resources (faculty, labs, etc.) currently available to implement a new major; and
- what would be the career opportunities for program graduates.

The Approval Process

After endless discussion and numerous compromises among committee members, a first draft of the Natural Resource Management major was sent to the Dean in April 1995. With his concurrence, the committee began the approval process for the new major.

Per University requirements for a new major, the process began by soliciting the approval of 11 departments outside the college to include courses offered by the departments in the Natural Resource Management major. With some minor ex-

ceptions, all agreed. Next, the committee met with the Department Chairs and then the entire college faculty to solicit comments and suggestions. The input of current undergraduates was solicited and considered. The first draft was then revised to reflect many of the suggestions. Next, the major was approved with minor revisions by the faculty in each of the three participating departments. The last step within the college was the Courses and Curriculum Committee. This committee, with representatives from each of the academic departments, undergraduate students and graduate students, approved the major unanimously.

Outside the College, the proposed major was forwarded to the Faculty Senate's Undergraduate Studies Committee. This committee had several minor questions regarding prerequisites, number of credits, etc. Approval of this committee required that a university wide "open hearing" be held to hear comments and suggestions from the university community at large. With that done, the major was forwarded to the Faculty Senate's Coordinating Committee on Education for review and approval. A major concern of this committee is the need for resources (faculty, laboratories, etc.) to support a new undergraduate major. Because this major asked for no new resources, it was approved and sent to the full Faculty Senate and approved at their March 1996 meeting.

Goal and Nature of Curriculum

As articulated by the faculty committee that formulated the major, the purpose of the curriculum is to produce graduates with: 1) an understanding of the social, physical, economic, legal and political problems of managing the use and perpetuation of natural resources in the 21st century and 2) the skills and capabilities to address those problems in both public or private forums.

The curriculum was designed to insure that characteristics of graduates would include:

- the skills required to solve "real world" problems;
- the ability to write and speak effectively;
- a solid understanding of natural sciences, mathematics, statistics, economics and public policy;
- a sound knowledge of the world's biodiversity;
- a competence in using computers to manage information and solve problems;
- a broad interdisciplinary education in the arts, humanities and social sciences; and
- an awareness of the ethical issues in natural resource use and management.

The curriculum relies heavily on courses already offered by the sponsoring Departments within the College, Entomology and Applied Ecology, Food and Resource Economics and Plant and Soil Sciences, together with courses offered in other colleges across the University. A full list of the requirements is attached.

Major Concerns

Various forms of the curriculum were presented and discussed at three college-wide faculty meetings and at an open hearing within the college. In that process, several important questions arose. Those questions with their answers are detailed below.

Who is administratively responsible for the curriculum? The major is administered by a three member faculty steering committee formed with chair-appointed representatives from Entomology and Applied Ecology, Food and Resource Economics and Plant and Soil Sciences. Appointments are for six years with reappointment allowed. Initial appointments are staggered by lot to establish a rotation. The chair of this committee rotates through the Departments represented every two years. Secretarial support is provided by the Associate Dean's office.

Who receives credit for majors? The number of majors is evenly distributed among the three departments sponsoring the program: Entomology and Applied Ecology, Food and Resource Economics and Plant and Soil Sciences. These majors are reported on all college reports regarding undergraduate enrollment.

Who decides on curriculum revisions? The steering committee is responsible for soliciting input from students and faculty, formulating revisions and submitting them through the normal college and University channels (Courses and Curriculum Committee, etc.).

Who advises students? Initially, the steering committee will advise students. If the number of majors increases significantly, other interested faculty will be recruited.

How will this curriculum be promoted relative to current Department curricula? The steering committee and other interested faculty will meet with the Associate and Assistant Deans to formulate a plan to promote this program.

Do careers opportunities exist for majors in this program? The first graduates of this program will not enter the job market until the year 2000. It is therefore difficult to know definitively what career opportunities will exist. However, outside evaluation of the program by individuals in state government and private industry provided positive support for the program including possible employment and internship opportunities. Overall, it is clear that the effective use and management of natural resources will remain important and is likely to increase in importance to the public, businesses and government agencies. It is only by starting now that we can provide students who are well-trained to address these issues in the next century.

Why are 130 credit hours required? This interdisciplinary curriculum depends heavily on courses from the three supporting departments to provide majors a broad training in natural sciences as well as economics and public policy. This breadth in addition to necessary courses in mathematics, statistics, computer training, communications and ethics necessitate 130 credit hours. Several majors in the College currently require 130 credit hours. Thus, this major is consistent with others in the College.

PROMOTION OF THE MAJOR

Several methods have been used to promote the new Natural Resource Management major. The Assistant Dean for Student Services presents the major to prospective students on routine visits to local high schools. A color recruitment brochure and curriculum guide were prepared and have been widely distributed to more than 900 high-school personnel in our region, to the campus Visitors Center and Admissions Office, to County Extension Offices, and to hundreds of prospective students and their parents who visit during college open houses. A Natural Resource Management World Wide Web site (<http://bluehen.ags.udel.edu/homepage/nrm/nrm.html>) is in place and has been used by many students.

TRANSFERS AND ADMITS

The Natural Resource Management major first appeared in the Undergraduate Catalog in the Fall of 1996, at which time five current university students changed their majors to Natural Resource Management. The 1996-97 Admissions Prospectus was the first issue to carry the Natural Resource Management major on the admissions application. As of July 25, 1997, fourteen students had applied and were offered admission to the Natural Resource Management major; five accepted their admission for a 36% yield rate (the college's yield rate is 41%). The average verbal SAT score for Natural Resource Management applicants was 606; for enrollees, the average score was 638 (the college's average was 567). The average math SAT score for Natural Resource Management applicants was 616; for enrollees, the average score was 620 (the college's average was 561). Thus, students enrolling in the major so far are above the average academically when compared to the college as a whole.

SUMMARY

The College of Agricultural Sciences anticipates the enrollment in Natural Resource Management will continue to increase. Information requests from high-school students demonstrate a continuing interest in the interdisciplinary facet of natural resource and environmental studies, as the Natural Resource Management major provides.

NATURAL RESOURCE MANAGEMENT REQUIREMENTS

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE
 MAJOR: NATURAL RESOURCE MANAGEMENT

CURRICULUM **CREDITS**

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing 3
 Three credits in an approved course or courses stressing multicultural, ethnic, and or gender-related content 3

COLLEGE REQUIREMENTS

Mathematics and Computer Science

Mathematics course 3
 Computer Science course 3

Agricultural and Biological Sciences 9-12

Minimum of one course in three of the following areas:
 Food and Resource Economics, Agricultural Engineering, Animal and Food Science, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology.

Literature and Arts 6

Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theater, or Foreign Language.

Social Sciences and Humanities 9

Minimum of one course in three of the following areas:
 Anthropology, Black American Studies, Criminal Justice, Economics, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies.

Physical Sciences 8

Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology or Physical Science.

MAJOR REQUIREMENTS

Courses taken to satisfy Major Requirements may also be used to satisfy University and College Requirements.

External to and within the College

AGRI 165 Mastering the Freshman Year (or any equivalent Department freshmen seminar) 1
 BISC 207 Introductory Biology I and 4
 BISC 208 Introductory Biology II or 4
 PLSC 101 Botany I 4
 CHEM 101 General Chemistry 4
 or
 CHEM 103 General Chemistry 4
 CHEM 102 General Chemistry 4
 or

CHEM 104 General Chemistry 4
 ECON 151 Introduction to Microeconomics 3
 ECON 152 Introduction to Macroeconomics 3
 ENTO 201 Wildlife Conservation and Ecology 3
 MATH 221 Calculus I 3
 MATH 222 Calculus II 3
 FREC 135 Introduction to Data Analysis 3
 FREC 150 Economics of Agriculture and Natural Resources 3
 FREC 424 Resource Economics: Theory and Policy 3
 FREC 444 Economics of Environmental Management 3
 FREC 480 Geographic Information Systems in Natural Resource Management 4
 PLSC 201 Botany II 4
 PLSC 204 Introduction to Soil Science 4

Group I - Communications: 6 credits from the following (including a minimum of three credits in oral communications):

Any course satisfying the College of Arts and Science second writing course requirement. Recommended courses are: ENGL 301- Expository Writing, ENGL 312 - Written Communications in Business, ENGL 410 - Technical Writing, ENGL 415 - Writing in the Professions. 3
 AGRI 212 Oral Communication in Agriculture and Natural Resources 3
 FREC 345 Strategic Selling and Buyer Communication 3
 UNIV 401/402 Senior Thesis (Any student successfully completing a Senior Thesis may count three credits toward the writing course requirement of this group.) 3

Group II - Chemistry / Physics: 8 credits from the following:

CHEM 213 Elementary Organic Chemistry 4
 CHEM 214 Elementary Biochemistry
 CHEM 216 Elementary Biochemistry Laboratory 1
 CHEM 321 Organic Chemistry 4
 CHEM 322 Organic Chemistry 4
 CHEM 220 Quantitative Analysis 3
 CHEM 221 Quantitative Analysis Laboratory 1
 PHYS 201 Introductory Physics I 4
 PHYS 202 Introductory Physics II 4

Group III - Statistics: 6 credits from the following:

FREC 408 Research Methods 3
 and
 FREC 409 Research Methods II 3
 or
 STAT 201 Introduction to Statistics I 3
 and
 STAT 202 Introduction to Statistics II 3

Group IV - Ecosystems: 6 credits from the following:

BISC 302	General Ecology	3
ENTO 325	Wildlife Management	3
ENTO/PLSC 440	Integrated Disease and Pest Management	3
GEOG 235	Conservation of Natural Resources	3
or		
GEOG 236	Conservation: Global Issues	3
or		
GEOG 230	Humans and Earth Ecosystem	3
PLSC 304	Environmental Soil Management	4

Group V - Plants and Animals: 6 credits from the following:

BISC 371	Introduction to Microbiology	4
ENTO 205	Elements of Entomology	3
ENTO 305	Entomology Laboratory	2
ENTO 406	Insect Identification - Taxonomy	3
ENTO 318	Taxonomy of Birds	2
ENTO 418	Avian Biology	2
ENTO 425	Mammalogy	3
ENTO 426	Aquatic Insects	3
PLSC 212	Woody Landscape Plants	4
PLSC 303	Introductory Plant Pathology	4
PLSC 402	Plant Taxonomy	3

Group VI - Land and Water Management: 6 credits from the following:

EGTE 103	Land and Water Management	3
EGTE 113	Land Surveying	2
EGTE 328	Waste Management Systems	3
GEOL 107	General Geology	4
GEOG 101	Physical Geography	3
GEOG 206	Physical Geography: Topography-Soils	3
GEOG 220	Meteorology	3
GEOG 320	Water and Society	3

Group VII - Natural Resource / Environmental Policy: 12 credits from the following (including a minimum of six credits in Food and Resource Economics):

ECON 306	Public Choice	3
ECON 332	Public Finance and Fiscal Policy	3
ECON 360	Government and Business	3
EGTE 416	Project Economic Analysis	3
FREC 406	Agriculture and Natural Resource Policy	3
FREC 429	Community Economic Development	3
FREC 450	Environmental Law and Policy	3
POSC 220	Introduction to Public Policy	3
POSC 350	Politics and the Environment	3

Group VIII - Ethics: 3 credits from the following:

PHIL 200	Business Ethics	3
PHIL 202	Contemporary Moral Problems	3
PHIL 203	Ethics	3
PHIL 340	Cross Cultural Environmental Economics	3
PHIL 448	Environmental Ethics	3

ELECTIVES

After required courses are completed, sufficient elective credits must be taken to meet the minimum credit requirement for the degree. Elective credits may include Military Science, Music or Physical Education (only four credits of activity-type Physical Education and/or four credits of performing Music organization credit may be counted toward the degree).

Credits to total a minimum of 130