

HISTORY OF THE DEPARTMENT OF FORESTRY AND ENVIRONMENTAL  
RESOURCES AT NORTH CAROLINA STATE UNIVERSITY, 1979-2008

V. UNDERGRADUATE CURRICULUM

When reviewing the history of the Department's undergraduate curricula and program one wonders if "there is nothing new in the world" and that "history does indeed repeat itself" for these statements seem true about the Forestry curriculum at NC State. Although there is a certain circularity in the curriculum changes between 1979 and 2008, the overall trend has been toward leaner, more focused programs with fewer opportunities for free study (electives) and greater incorporation of new technology and changing social values. There also is no doubt that the undergraduate program in its entirety has improved in many ways and that it is richer in opportunities, by any measure, in 2008 than it was in 1979.

**Majors**

In 1979-80 the Department had two undergraduate majors, Forestry and Conservation. The Forestry curriculum had, of course, existed literally since the beginning of the School in 1929, whereas the Conservation curriculum, which was jointly administered with the School of Agriculture and Life Sciences, was created in the late 1960s to serve students whose interests lay more in the area of natural resources and the environment. By the 1980s enrollment in the Conservation curriculum had declined and it was perceived by faculty and students alike as a weak program with insufficient depth in any area of study. After a number of years of committee study and intra-College discussion, the Conservation curriculum was replaced in the mid-1990s by a Natural Resources curriculum, jointly administered by the Colleges of Forest Resources and Agriculture and Life Sciences, and the Department of Marine, Earth, and Atmospheric Sciences. The Natural Resources major administered by Forestry had two concentrations: Ecosystem Assessment and Policy and Administration.

Between the mid-1990s and 2008 the Department added three additional curricula, Environmental Science: Watershed Hydrology, Environmental Technology, and by transfer from the Department of Zoology, the Fisheries and Wildlife Science Program. Whereas the Natural Resources concentrations, Hydrology, and the forestry-related parts of the Fisheries and Wildlife Program were taught by existing members of the Department of Forestry, the Environmental Technology Program was an entirely new venture requiring the addition of several faculty with the expertise required to teach the specialty courses, particularly the laboratories, required in the new program.

**Enrollment**

The story of enrollment in the Department of Forestry's undergraduate programs between 1979-80 and today very clearly parallels the

changes in public attitudes toward forestry and natural resources during the same period, reflecting the decline in respect for the forestry profession and rise in interest in "environmental" education. In 1979-80 undergraduate enrollment in all Departmental programs was 281, having declined sharply from a peak of 464 in 1975-76, with about 90% of the students in Forestry and the remainder in Conservation. That decline in enrollment continued uninterrupted, reaching a low between 160-170 by the late 1980s. At the same time the percentage of students majoring in Conservation rose to roughly 25% in the early 1990s and then to 40% when the Natural Resources curriculum became available in 1993. The number of Forestry majors rose slightly to between 150-180 during the 1990s and then declined markedly to 83 by fall 2007. While this decline in Forestry enrollees was occurring, enrollment in Natural Resources also declined slightly from about 100 in the early 1990s to 34 in fall 2007. Enrollment in the Environmental Science: Watershed Hydrology option also declined from over 20 to 6 over the same period. However, enrollment in the new Environmental Technology curriculum (88 students in fall 2007) together with the more than 100 Fisheries and Wildlife Sciences students now included in the Department's student head count, produced an increase in total undergraduate enrollment to slightly over 345 by fall 2007.

Although total undergraduate enrollment in the Department remains above 300 with two programs growing in size, the enrollment situation in the Forestry program has to be a major concern to the Department and should be a major concern to the forestry community in North Carolina. The number of young people studying forestry at NC State has declined from over 400 in the mid-1970s to under 100 in the mid-2000s. Thus, although the Department's total number of enrolled students is relatively robust, forestry in the classical sense is no longer the discipline that drives what the Department teaches. The Department's recent change in name from Forestry to Forestry and Environmental Resources clearly updates its name to describe its current undergraduate student population and what it sees as its future educational clientele. As opportunities arise in the future to replace faculty who leave or retire, it may become difficult to justify maintaining a full range of expertise in forestry disciplines when making new hires. Then again, the Department's graduate student and research programs may rescue its undergraduate teaching program as they have in the past.

It is worth noting that this situation is not unique to NC State; enrollment in forestry is declining in virtually all US and Canadian forestry schools. This enrollment decline is clearly associated with declining job opportunities in both public and private forestry. Although persons will still be hired to manage the nation's forest lands, it appears that the training required of these hires will be different from that offered in "traditional" forestry programs. The Department has been wise to broaden its educational programs and thus position itself to continue as a prime source of forest land managers although the educational background of those land managers will be much different than in the past.

## Recruiting

As a result of declining enrollment in the early 1980s, and in an effort to attract more minority students to the Department, a program of student recruiting was begun. This program started in the fall of 1983 when Jerry L. Bettis, the Department's first black faculty member, was hired to develop and carry out a student recruiting program. Half of Bettis' salary was paid by Weyerhaeuser Company for several years after his move to the Department. Furthermore, the unwritten expectation was that Bettis would complete a Master's and perhaps Doctor's degrees and assume a larger role in the academic life of the Department. Bettis' recruiting efforts over the remainder of the 1980s met with middling success at best. Although student enrollment did begin to increase, the number of black students attracted to the program remained small and hardly representative of the effort Bettis put into his work. In the fall of 1990 responsibility for all College recruiting programs moved to the office of the Associate Dean for Academic Affairs. A full-time employee was hired and College and Department recruiting efforts were coordinated there until the summer of 2007 when Shannon Shinault was hired to manage recruiting efforts as well as to deal with retention, outcomes assessment, and placement.

As a part of efforts to increase enrollment of black undergraduates in 1985-86 the Department began discussions about broadening the base of schools from which students transferred to NC State. In a direct effort to increase minority enrollment, a transfer program with North Carolina A. & T. State University was discussed. These discussions initially concentrated on a traditional transfer program with students obtaining their general course background at A. & T. and then moving to the Department to complete their forestry study. Their degree would be awarded by NC State. This concept never was acceptable to A. & T. because it would result in a net loss of graduates for them. After extended discussion the proposal was altered to a 3 + 2 program, with the student completing 3 years at A. & T. and 2 at NC State with Bachelor's degrees awarded from both institutions. An agreement on such a program was signed during the 1989-90 school year and the U. S. Forest Service assigned an employee, Dr. Lincoln Moore, to the A. & T. campus to teach the necessary introductory courses. Although the necessary courses were actually taught at A. & T., no student ever transferred to NC State to complete the program.

In 1988-89 Jim Gregory and Gary Blank traveled to the Haskell Indian School in Kansas in an effort to develop a transfer program for Native American students. In addition, visits were made to Cherokee, NC, and to the Intertribal Council Timber Management meeting. Nothing came of any of these overtures.

The availability of scholarship money is obviously an important element of a successful student recruiting program. In 1980-81 the Department's undergraduate scholarship budget was \$6,750 provided by 5

endowed accounts. These funds, which came largely from timber harvests on the Goodwin Forest, supported 8 students; the largest award was \$1,000. As monies from various sources, including scholarship endowment gifts and funds derived from management not only of the Goodwin Forest but also the Hofmann and Bull Neck Swamp Forests, increased the number and diversity of scholarships the Department could offer increased dramatically. In 2007-2008 the undergraduate scholarship budget was \$261,500. Roughly one-third of these funds come from endowed accounts and the remainder from management of the various forests. The funds support 68 undergraduates. Although the largest award is \$11,800, most are about \$4,500. It is impressive to note the number and variety of scholarships and recipients recognized during the academic awards banquet now hosted by the Forestry Foundation each spring. In this regard, the Department has come a long, long way since 1980.<sup>1</sup>

## **The Curricula**

### Forestry

The Forestry curriculum underwent almost continuous revision between 1980 and the present. Analysis of these revisions reveals the faculty's efforts to provide an education that reflected the evolving needs of forestry professionals, that incorporated emerging technological changes in the field, and that met changing University requirements.

The curriculum in effect in 1979 had not been significantly revised in a number of years. It underwent a thorough revision in 1980-81 as a result of studies conducted during the University's required 10-year review of curricula. Changes made represented adjustments due to retirement of several key faculty and to the influx of new faculty, both occurring in the late 1970s. The changes responded to the views of faculty and employers that graduates at that time were weak in communication skills, needed computer and remote sensing skills, took junior-senior courses that needed more emphasis on silviculture (particularly of hardwoods) and did not have sufficient quantitative skills. The course of study approved beginning in the fall of 1981 called for completion of 141 semester hours with 9 of these in a required summer camp program of 9 weeks. Features of the curriculum were:

- two semesters of freshman English taken consecutively with a grade of C or better
- mathematics through calculus
- 25 hours in the basic physical, biological, and soil sciences

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<sup>1</sup> Information on the undergraduate scholarship program was provided by Richard Braham who has been a member of the Scholarship Committee from its inception in 1980. He has chaired the committee ever since Don Steensen's death in 1989.

- 60 hours of forestry courses including a junior-senior sequence of silvics, silviculture, land management, and planning
- 15 hours of forestry concentration electives in one of 14 identified areas of forestry
- 21 hours of humanities/social science and free electives
- summer camp with 2-hour courses in silviculture, forest biology, and forest protection and a 3-hour course in mapping and mensuration

This 1981 curriculum serves as a base-line against which to measure both subsequent changes in the forestry program and efforts to include new technological advances in land management while at the same time meeting more restrictive University requirements.

One of the most important systemic changes in the curriculum was a writing-across-the-curriculum requirement. Recognition of the fact that forestry students (in reality all NCSU students at that time) lacked skill in written communication led the Department to hire Gary B. Blank, a Department of English lecturer, quarter-time in 1979. In 1981 Blank was appointed as a Lecturer in the Department of Forestry with half of support coming from the College of Engineering for work in its Writing Assistance Program. This arrangement lasted until 1988. Blank's responsibilities were to provide individualized assistance to forestry students with writing problems and to assist the faculty to develop a writing-across-the-curriculum requirement. As a result of Blank's efforts, and with the cooperation of the faculty, writing requirements in many courses were strengthened. Strong writing requirements remain a cornerstone of the Forestry curriculum even today.

The intensive curriculum review that resulted in the 1981 curriculum also led to a number of other changes, at least three of which are reflected in 2006. The first of these was the extension of the University C-wall rule so that it applied to eight required courses in the Forestry curriculum and to the required course in statistics. In addition, a grade point average of 2.0 or better was required for entry into summer camp. These changes, which the University allowed departments to make applicable to their curricula, were a result of what both the faculty and employers of graduates generally believed was an insufficient University requirement for graduation then in force. From 1974 to 1982 there was no University grade point average required for graduation. By 1980-81 this permissive rule had been altered to allow departments to count only 12 hours of D toward graduation. Departments were also permitted to designate courses in which a D grade could not count toward graduation. Nonetheless, a number of employers of forestry graduates still were pointedly enquiring as to what assurance they had that a student graduating under these University requirements was a competently-trained forester. The faculty sought to provide this assurance by requiring that a grade of C or better be earned in 8 "core" forestry courses (those at the junior-senior level)

and one statistics course. That requirement remained in force until the curriculum revision of 1997 when it was replaced by a Major Grade Point Average of 2.0 or better in all major courses.

The need to maintain more systematic and continuing oversight of the Department's undergraduate academic programs became apparent during the work leading to the 1981 revision of the Forestry curriculum. Consequently, a Departmental Courses and Curriculum Committee was established and charged with maintaining the required oversight. Tom Gemmer chaired this committee until his death in 1983. Others who have chaired it are Jim Gregory 1989-1994, Dick Lancia 1994-1997, Awatif Hassan 1997-2003, Joe Roise, 2003-2007, and Gary Blank 2007 to present. In addition, an Advising and Scholarship Committee was also established and chaired by Don Steensen until his death in 1989; Richard R. Braham has chaired it since 1989. It was charged with administering the Department's undergraduate advising program and awarding the scholarships that the Department was able to offer. Both of these committees became Departmental standing committees and exist today. As the number of scholarships the Department could offer increased dramatically, and as an oversight role for the College advising program was developed by the Associate Dean for Academic Affairs, the purview of the Advising and Scholarship Committee was reduced to oversight of the scholarship program only.

One thing that became clear as a result of the work leading to the 1981 curriculum was the central role that computer technology would play in education of foresters in the future. Because this fact also became evident to the other departments in the School and because the costs involved would far outstrip any funds available to a single Department, the School established its first computer laboratory in the fall of 1982. This lab, now located in 3006 Biltmore, was then affectionately referred to as "The Apple Orchard" because it consisted of 25 Apple II computers. This lab has grown over the years until it is now well-stocked with state-of-the-art computers with the appropriate software required for instruction in the College's course offerings.

The process involved in the 1980-81 curriculum review showed the importance of, and need for, a continuing process of course and curriculum evaluation. Accordingly, the new Courses and Curriculum Committee developed a process for evaluating courses beyond that required by the University at the end of each semester. It involved mid-semester student evaluations and a peer review process. This system was effective for several years but gradually went out of use as other evaluative activities were developed.

Material submitted to the University with the 1981 curriculum included a statement of the objectives of the curriculum, one of which dealt with ethics. The importance of this objective was driven home by a court case in which one of our graduates had become involved. Thomas O. Perry, who had taught the young man involved, was called as a character witness. After his testimony, the judge pointedly asked

Perry if we "taught our students anything about ethics" while they were with us. This episode, coupled with another similar case involving one of our graduates, jolted the faculty into a greater concern with ethics and professionalism, which was reflected by dealing with these subjects at numerous places throughout the undergraduate program and particularly in summer camp.

Several problems emerged early on in implementation of the new curriculum. Integration of transfer students into the forestry program had always been difficult, particularly in a way that would not obligate them to take 5 years to finish. The new curriculum did nothing to ease this difficulty. The transition most transfers had to make directly from their sophomore year at their first institution into summer camp at NC State had proven particularly difficult. In an effort to deal with this problem, a short-lived, ill-fated experiment with an intensive one-week course teaching dendrology and elementary mensuration was offered after the end of the regular semester and before summer camp. The experiment did not work. To deal with the wide variation in mathematics skills of entering freshmen, 3 "tracks" were developed based on math ability as predicted by math admissions scores. The dendrology course was eliminated.

The occasion of a 10-year Society of American Foresters Accreditation review in 1984 led to an intensive review of the 1981 curriculum by faculty, alumni, and persons who hired our students. The conclusions reached were that the curriculum was basically sound and that a broad science/forestry background was better than specializations that necessarily would be limited in scope. As a result of weaknesses identified by the Department's preparation for the Accreditation review, the following significant changes were made:

- The introductory course (FOR 110) was strengthened and its forestry content broadened.
- A policy course (FOR 472) was added as a requirement.
- Changes were made to meet the new University Humanities/Social Sciences requirements.
- The concentration requirements were eliminated.

Steps were taken to broaden the base of undergraduate advisers by using a larger number of faculty as advisers. A number of research faculty readily agreed to handle a limited load of undergraduates, thus enriching the available pool of advisers. The review also revealed that a course in wood procurement should be available. This problem was met by offering a "mini" course in procurement during spring break in 1986; this later evolved into a regular course.

During the fall semester 1984 freshman orientation was shifted from June to August before the beginning of classes. Cooper felt that the June orientation occurred at a time when students were barely removed from high school and not yet ready to think about college. As he put it, "their bodies might have been at State for orientation, but

their minds were at the beach." He felt that an orientation in the days immediately before classes would allow the Department to orient "both their minds and bodies" to the academic experience on which they were about to embark. The orientation began with a picnic for new students and their families at the Schenck Forest and continued with one day at the Hill Forest and another on campus. Although the program accomplished the objectives that Cooper set out for it, the logistics were difficult (one year a bus broke down stranding a number of students, not a good first impression!) and the program was never especially popular with the faculty. It was eventually abandoned with incoming freshmen participating in the early summer orientation with all other new students. However, the picnic in late August for incoming students and their families remains a Department tradition.

In order to fine-tune the curricular changes that had just been made, the faculty fully reviewed the program during the 1985-86 academic year. As a result:

- Two new curricula, Forest Management and Forest Science were developed.
- A new course in management science (FOR 434) was developed to be taught both for Forestry and Wood Science majors by Joseph P. Roise.
- The Physics requirement was strengthened from one 5-hour course to a full year sequence in Physics.
- General Ecology was added as a requirement.

Required hours remained at 141. This new program was submitted to the University and approved in spring 1987.

Curriculum changes over the next few years were limited. Discussions continued concerning more effective sequencing of the junior-senior courses, and summer camp hours were increased from 9 to 10, the Science Concentration was dropped in 1992 due to low enrollment, and the curriculum was renamed Bachelor of Forest Management. Perhaps the most important development was that of a new College-wide computer course, CFR 134, to be taken in the first semester of the freshman year. In the Forestry program this course was integrated with the first course in forestry (FOR 110), with the requirement that all writing assignments must be done with a word processor. These changes were incorporated into a curriculum revision approved in 1989, again with 141 total hours. At the same time these changes were being developed, there was discussion concerning a possible Forest Engineering Concentration to be added to the Management and Science Concentrations. Although these discussions continued off and on for several years, nothing ever came of them.

The Department also participated in an experiment proposed by the English Department that its students enter directly into the second freshman English course (ENG 112) with the intensive writing experience in FOR 110 taking the place of the first freshman composition

course. Although Forestry students did seem to do better in ENG 112 this experiment was abandoned after several years. The increases in emphasis on quantitative methods and computer skills in the several junior-senior courses created problems for instructors and students for several years; the problems eventually decreased as the more intensive quantitative requirements of the first two years began to have a positive effect in the junior-senior courses. One of the most important curricular changes took place in the early 1990s when several new instructors were integrated into the junior-senior courses on a rotating basis. This had the effect of diversifying the faculty to whom upper level Forestry students were exposed, thus meeting a criticism that had been raised for several years that juniors and seniors were effectively taught by a small number of faculty.

During the early 1990s considerable public debate arose when it became known that the majority of students in the UNC system were taking about 5 or more years to graduate. A number of factors were suggested as being the causes of this phenomenon, among them being the fact that many curricula required more, and sometimes many more, than the traditional 120 hours for graduation. With its 141 hours for graduation, the Forestry curriculum was particularly susceptible to this criticism. During the 1992-93 academic year the UNC Board of Governors instituted a requirement that any curriculum with hours-to-graduation greater than 128 must be submitted to the UNC Board of Governors for approval, and any curriculum exceeding 135 hours must be advertised as a 5-year program. Although it could be legitimately argued that the Forestry curriculum was really four academic years requiring 131 hours with 10 of its hours in a required summer program, it became clear early on that University authorities were unlikely to accept this argument and that, even if they did, the process for reviewing a curriculum in excess of 128 hours would be lengthy at best. It was generally accepted that advertisement as a 5-year curriculum would negatively impact enrollment and therefore was not an option. Thus, the Forestry faculty was faced with the task of cutting at least 13 hours out of a curriculum that it already perceived as having little room for major change. To further complicate the matter, after many years of discussion, the University approved its first substantive change in general education requirements in 1992.

Fortunately, the necessity to integrate these significant new requirements in the Forestry program coincided with the work necessary for the curriculum's 10-year SAF accreditation review scheduled for 1994. The faculty also had available the results of two full years of implementation of its outcomes assessment program. Extensive discussions led to a consensus for change in a number of areas:

- Increased emphasis on ecosystem processes and non-timber values
- Increased mensuration field practice and reinforcement of mensuration skills in upper level classes
- Instruction in forestry operations
- Additional emphasis on wood products

- Updating forestry core courses to stay abreast of changes in the profession
- More attention to ethics and leadership skills

The major changes in the curriculum were:

- Reduction of required hours from 141 to 126 including summer camp by dropping all advised and free electives with a consequent loss of virtually all flexibility in the program
- Incorporation of the University General Education requirements
- Addition of a course in Wildlife Management
- Dropping of several non-forestry courses and re-sequencing a number of forestry courses to accomplish a better integration of the courses in the junior and senior years
- A major revision of FOR 434 (Management Science) into a course with focus on forest operations and analytical decision-making tools

This curriculum became effective in the summer and fall of 1994 and was the academic basis for reaccreditation of the forestry program by SAF. In its response to the accreditation visit the SAF review team identified a lack of public speaking requirements in the 1994 curriculum. Under new Department Head Fred Cabbage this deficiency was addressed in a memo to SAF about treatment of oral communications in the forestry program and the program was subsequently fully accredited.

The faculty was never happy with the 1994 curriculum's severe limitations on flexibility. Consequently, faculty analysis of each element was begun shortly after its approval and a revised Forest Management program requiring 128 hours and allowing 9 hours of advised and technical electives was approved in 1996-97. The ten hours of new requirements were realized by:

- Increasing the total required hours from 126 to 128
- A reduction by the Department of Mathematics in credit hours for a required calculus course from 4 to 3
- Elimination of a second course in Physics (this change had been debated for the last several revisions and had always been rejected by the faculty as weakening too much the physical science requirements of the curriculum. The need for elective hours had finally trumped the perceived importance of physics!)
- Ecology was used to meet the University requirement for a Science/Technology/Society elective

This curriculum became effective in June of 1997 and was the basis on which the Forestry program's SAF accreditation was extended in 1999.

As a part of its ongoing process of curriculum review in August 2002 the Department again convened a meeting of faculty, alumni, and

employers. This review differed from previous curriculum reviews in that it was conducted by a facilitator and a series of specific recommendations based on results of the discussions emerged. These were:

- More flexibility in course selection should be provided
- The program should be broadened in scope
- More emphasis should be placed on personal skills development, especially in communications, critical thinking, and leadership

To meet the recommendations for greater flexibility and breadth in course selection the curriculum was revised to include 6 concentration areas: Business, Biology, International Forestry, Management, and Related Areas (the latter designed to allow students to branch out into other disciplines related to forestry) in the original revision and Urban Forestry was added in 2006. Writing and speaking communication skills were taught, as they had been for the last 25 years, both on an across-the-curriculum basis and in a special 1-hour sophomore-level course. This curriculum, approved in 2003, was the basis of the 2005 SAF accreditation of the Department's forestry academic program.

Examination of the specific changes made to create the 2003 curriculum and comparison with previous curricula reveals some major changes in philosophy and requirements. These changes, it appears, were necessitated in order to accommodate general University curriculum requirements and to incorporate the faculty's view that the education of forestry professionals demanded a broader and different set of knowledge and skills than in the past. The most important changes in course requirements were:

- Reduction in the breadth of science requirements by replacing General Biology with Plant Life, by requiring either a second course in Chemistry or a course in Physics rather than both, and by replacing General Ecology with a new course in Forest Ecology
- No course in computer use was required as it had become apparent that virtually all students brought the requisite skills with them from high school. Application of computer technology to forestry was taught on an across-the-curriculum basis

A number of important changes were made in Forestry course requirements, including:

- A course in forest insects or forest pathology, not both
- A new mensuration sequence, running from the sophomore year through summer camp and the junior year (FOR 172, 273, 374), was created
- A new sequence of four one-hour professional development courses (FOR 150, 250, 350, 450) was created to cover criti-

cal thinking, communications, professional ethics, and leadership

- A return to a minimum grade requirement (C-) in all core forestry courses for graduation.

Comparison of the Forestry curriculum of 1980 with that of 2005 reveals both significant consistencies and major changes in the philosophy underlying the program. Throughout the 25-year period a set of forestry courses, from an introduction through dendrology, several configurations of mensuration courses, silvics, silviculture, economics, management, and planning remained the core of the curriculum. Courses in remote sensing and policy added in 1981 remained as requirements throughout the period. There has also been a consistent belief in the importance of writing and speaking skills as illustrated by the continuing writing-across-the-curriculum commitment embodied in all curricula and the special communication course in the newest program. Likewise, there has always been a commitment to advanced mathematical skills as embodied by a requirement for courses in calculus and statistics. The need for computer skills was first recognized in the 1981 curriculum and a course, as well as integration of computer technology into most forestry courses, were the vehicles to achieve this objective. When it became clear in the early 2000s that a basic course in computer use was not needed, computing skills across-the-curriculum were retained as an educational objective.

Despite these consistencies there have been some major changes that have significantly altered the curriculum. The most important of these has been the reduction in total hours from 141 to 128 essentially mandated by the UNC system's decision limiting 4-year curricula to no more than 128 hours. As a consequence of this requirement, the total number of basic science hours has been reduced from 25 in 1981 to 16 in 2005. In addition, the number of hours of humanities and social science electives has been reduced from 21 to 12, with no purely free electives as there were in 1981. This seems ironic in that the new General Education requirements of the University that went into effect at the same time as the 128 hour limit were designed to provide greater breadth to what was perceived as the unreasonably narrow requirements of specialized curricula such as forestry.

The faculty's view of the need for, and nature of, concentration areas changed several times over the period from 1980 to 2005. The curriculum in force in 1981 had 14 concentrations which were eliminated in the 1984 revision. Shortly thereafter, two concentrations, Management and Science, were created with Science soon being eliminated due to a lack of student interest. The 2003 curriculum returned to the multiple concentration philosophy, establishing 5 concentrations. However, it appears that the concentrations of 2003 are different from those of 1981 in that they are designed not so much to promote depth in an area of forestry as to allow the student to branch out and explore forestry's interfaces with emerging areas that will influence the profession in the coming years.

## Conservation, later Natural Resources

The Conservation curriculum, a joint venture of the Schools of Forestry and Agriculture and Life Sciences, was approved in the late 1960s in response to the need for an academic program meeting the needs of students with interests in the "environment" as opposed to forestry. It underwent no major changes from the time it was created until it was replaced by Natural Resources in the 1991-92 academic year. As pointed out earlier, enrollment in Conservation ballooned in the mid-1970s but declined dramatically thereafter.

The professed strength of the Conservation curriculum, its breadth, was also its greatest weakness. The program had the same broad base in basic science as the forestry program and required basic courses in resource management areas including forestry, geology, soils, marine science, recreation, economics, watershed management and either wildlife or fisheries. However, no second level courses in these areas were required, so to build the requisite depth in knowledge appropriate to a trained resource manager the student had to use electives. Some students did so, but many did not. Furthermore, there were no integrative courses that tied together the intricacies of management of one resource with management of others. There was one concentration area, Natural Resource Management and Administration, in the Forestry Conservation curriculum and 4 others, Environmental Technology, Communications, Environmental Education, and Soil Conservation, in the Agriculture and Life Sciences Conservation curriculum.

Although the Agriculture and Life Sciences experience with its Conservation program was generally good, Forestry's was not. After its period of heavy enrollment in the 1970s, enrollment declined and a progressively greater number of weak students enrolled in the program. In addition, the faculty viewed the curriculum as fundamentally flawed because of its lack of depth in any area of resource management. As a result there was little enthusiasm for the program in the Department.

However, by the late 1980s it became obvious to the Department that a Forestry curriculum alone would not satisfy the needs of students expressing interest in natural resource management and that at least one viable alternative was needed. Consequently, in 1987-88 work was begun on revising the Conservation curriculum and converting it into a Natural Resources curriculum. Whereas this effort was viewed as absolutely essential to the Department's future, the College of Agriculture and Life Sciences was initially cool to the proposed change, largely because it viewed the Conservation curriculum it administered as meeting the needs of its student clientele. Because of this very different view of a shared curriculum it took until 1991-92 for a new Natural Resources curriculum to be approved by the University. The major changes made were elimination of unused concentration areas and a strengthening of the course structure of the program. The strong breadth in basic and natural resource science was maintained but to this was added a series of new Natural Resource courses, all to

be taught by Forestry faculty, designed to tie together resource management courses and to present concepts that were common to all areas of natural resources planning and management. Two concentration areas were proposed in Forestry, Ecosystem Assessment and Policy and Administration. Although the curriculum had not yet been approved, it was agreed that a section entitled Natural Resources listing all related courses would appear when the University catalog next appeared in 1992.

Because basic agreement had been reached on the structure of a Natural Resources curriculum, and because the Department of Forestry needed the up-to-date program to attract badly-needed new student enrollment, the Department advertised the opportunity to study natural resources that the new curriculum offered by enrolling students into Conservation with the understanding they would be transferred to Natural Resources once that curriculum was approved. This resulted in a rapid increase in enrollment in Conservation in 1990 and 1991 and an enrollment of 115 when the Natural Resources curriculum became effective in the Fall of 1992. The curriculum has maintained a healthy enrollment ever since.

Limited changes in course content and total hours were made in Forestry's Natural Resources curriculum effective in the summer of 1994. Further, more substantive course changes were made effective in the summer of 2003. In addition, two more important changes were made. One involved structuring the technical electives into two categories, Biological Sciences and Management Sciences. Students in the Ecosystem Assessment curriculum were required to take 18 hours of Biological and 6 hours of Management courses with majors in the Policy and Administration program required to take 18 hours of Management and 6 hours of Biology courses. The other important change involved addition of a summer practicum requirement between the junior and senior years. Students prepared for this with a one-hour course in the fall of the junior year and reported on their experiences in a one-hour course in the fall of the senior year. These changes remain in effect today. Enrollment currently is about 50 students (~15% of departmental undergraduate enrollment).

#### Environmental Sciences, Watershed Hydrology

During the 1990s the Colleges of Agriculture and Life Sciences, Physical and Mathematical Sciences, and Natural Resources cooperatively developed a number of Environmental Sciences curricula. Forestry participated in this program through development of a special degree program in watershed hydrology (Environmental Sciences, Watershed Hydrology). Jim Gregory was the driving force behind development of this program, and he served as advisor for students in the program since it became effective in January 1995 until his retirement.

As might be expected the curriculum, although strong in all the basic sciences, places emphasis on the physical sciences, particularly those with direct relevance to water management. In addition it requires students to take courses in Civil and Biological and Agricul-

tural Engineering and the courses that are common to all the Environmental Sciences programs. The curriculum underwent a minor revision that was approved in August of 2003. Enrollment during the first 7 years of the program averaged nearly 20 students; now, however, it is below 10.

### Environmental Technology

The Department's newest curriculum, Environmental Technology, became effective in August, 2003. Planning for this program goes back a number of years into the late 1990's during the closing years of Larry Tombaugh's tenure as Dean. Tombaugh sensed that the College needed a new academic program to fill a void in an important area of resource management at NC State and to compete with environmental programs developing on other campuses in the State. The program he envisioned was one that combined an understanding of environmental processes and systems with monitoring and assessment of those systems and that focused on hands-on experience in analysis of ecosystems and their condition. The curriculum would fit in the void between the purely engineering approach to environmental management and the other resource-based curricula offered at the University. Ted Shear was asked to lead planning for this program. Shear undertook this responsibility with an enthusiasm that belied the fact that the better part of his salary at that time he himself earned through research grants in environmental restoration.

After several years of effort a curriculum was developed and approved that mixed basic biological and physical science courses and university general education requirements with a four-year sequence of 13 new courses (plus one cross-listing with MEAS) in Environmental Technology. These courses include instruction in field and laboratory monitoring of the properties of water, air, soils, plants, and ecosystems, spatial information technology, assessment of and response to hazardous materials, laboratory safety, environmental regulation and assessment, forensics, and preparation for professional certification. The program also requires a summer practicum between the junior and senior years. Although Shear continues as a faculty advisor for this curriculum, 3 new faculty were required to teach the new ET course sequence. During its early years the program undoubtedly was hampered by a lack of adequate lab facilities. This problem has been remedied by the addition to Jordan Hall occupied in the summer of 2007. Despite the fact that the curriculum was not approved until 2003, 7 graduates completed the program in that same year and there were 15 graduates in 2005-2006. Total enrollment exceeded 60 in the fall of 2006. Given the importance of environmental monitoring, assessment, and the need to determine the state of natural and man-made systems at a point in time and on a continuing basis, the outlook for the Environmental Technology program and its graduates is robust.

## Fisheries and Wildlife

The Fisheries and Wildlife Program originated in the Department of Zoology prior to World War II. In its early days the program was headed by Ross Stephens and later Frederick S. Barkalow. Both of these men were influential in establishment in 1947 of the North Carolina Wildlife Resources Commission as an independent State agency. The program flourished in Zoology, especially during Barkalow's tenure as head, regularly had a strong enrollment, and graduated large numbers of students many of whom went on to successful and influential careers in the fisheries or wildlife professions.

In the mid-1970s a legislative appropriation of funds to NCSU, in addition to providing support for the Department of Zoology, earmarked funds for an additional position in wildlife management in the School of Forestry. Dick Lancia was hired into this position in 1978. With Lancia teaching the newly-established and essential fisheries and wildlife summer camp, the program became a joint offering of the departments of Zoology and Forestry. This dual role was further emphasized when Jay D. Hair was hired in 1977, using funds from both departments, to coordinate the program. Hair left in 1981 to a distinguished career with the National Wildlife Federation and an unfortunate early death in 2002. Following Hair's departure, several individuals (Gary San Julian, Bill Lewis, Phil Doerr) led the program on an interim basis until 1986 when Rich Noble was hired as coordinator. Noble strengthened the dual leadership role and, with the help of Dean Elwood, moved the headquarters of fisheries and wildlife to Turner House on the corner of Brooks Avenue and Hillsborough Street. Dr. Noble retired in 2001, and Pete Bromley assumed the role of coordinator until his retirement in 2003. Bromley's retirement, coupled with a change in programmatic emphasis in Zoology, prompted transfer of the administrative responsibility for the fisheries and wildlife undergraduates to the Department in the Fall of 2003. The faculty for the program remains partly in Zoology and partly in Forestry and Environmental Resources. Dick Lancia served as Program Coordinator until his retirement in 2008 when Chris Moorman took over the position. In 2006 Lancia became Director of Graduate Programs for fisheries and wildlife, and a PhD in Fisheries and Wildlife was approved in January 2007.

It would not be appropriate to trace the entire history of the Fisheries and Wildlife undergraduate curriculum here. For the more than half-century prior to its shift into the Department, the College of Agriculture and Life Sciences managed the program. As it is now constituted, the Fisheries and Wildlife Science major has two curricula, one in Fisheries and one in Wildlife. Both are built around a core of specialty courses, require at least one course in the basic sciences and math through calculus, and demand competence in communication and computer skills. The Fisheries and Wildlife curricula provide more opportunity for elective courses than does the Forestry curriculum, albeit a number of the electives are constrained. Both Fore-

stry and Fisheries and Wildlife require a summer educational experience taught at the College's Hill Demonstration Forest.

### **Forestry and Wildlife Summer Camp and Summer Practicums**

Almost from the first days of the forestry curriculum there has been a strong emphasis on practical, hands-on experience as a part of the education offered in the Department. The requirement for this experience is reflected in the summer programs required in the Forestry, Fisheries and Wildlife, Natural Resources, and Environmental Technology curricula. The concept of a summer learning experience emphasizing learning in the environment the student is being educated to manage and the practical application of concepts learned in the classroom is so deeply rooted in the Department's educational philosophy that it is difficult to imagine a curriculum without it being approved by the Department.

The summer forestry program has been taught at the Hill Demonstration Forest north of Durham since 1936. Rustic, but more than adequate living and teaching facilities built with materials and/or funds derived from the lands of the Forest itself allow an excellent on-site instructional program. Instruction in forestry has continued uninterrupted since 1936, and since 1979 a summer program in fisheries and wildlife management has been offered. The Forestry summer camp was a 9-week (9 credit hour) program in 1980 but increased to 10 weeks (10 credit hours) in the mid-1980s and remains at that level today. The Fisheries and Wildlife summer program has always been a 6-week (6 credit hour) program. Don Steensen served as Director of the forestry Summer Camp program from 1972 until his death during the camp season in 1989. From then until the present Summer Camp has had dual management. The College Forest manager (Jervis until 2001 and then Cox) is responsible for physical facilities, logistics, and onsite administration. The Director of Undergraduate Programs in the Department is responsible for academic aspects of the program. Dick Lancia was Fisheries and Wildlife Camp Director from its inception in 1979 until 2004, and for a brief period after Jervis' retirement directed both the Wildlife and Forestry programs. Chris DiPerno has directed the Fisheries and Wildlife summer program since 2005.

Summer, or in some cases spring, field courses were, at one time, features of almost every US forestry curriculum. For various reasons too complicated to explain here, such programs have largely disappeared and the summer program at NC State is today virtually unique<sup>2</sup>. For that matter few, if any, wildlife curricula incorporate summer programs. As indicated, the Department has persisted in offering summer programs in both disciplines. Undoubtedly, one of the major reasons these programs remain feasible is the excellent teaching and living environment offered at the Hill Forest. Another important reason is that employers have long regarded the fact that NCSU students "know

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<sup>2</sup> Purdue has a 5-week summer camp program.

field forestry (or wildlife)" as an important plus in their hiring decisions.

The titles of the forestry courses offered at summer camp have remained little changed since 1980. There has always been a course in silviculture (prior to the mid-1980s this was the only formal course in this important subject) and another in mapping and mensuration. The content of mapping and mensuration, however, is much different now with up-to-date geospatial and remote sensing techniques replacing plain table map, compass, and aerial photographs. What was forest biology in 1980 is now forest communities, then as now a course in the composition and dynamics of the major forest ecosystems of North Carolina with trips taken both to the Coastal Plain and Mountains. In 1980 two hours were devoted to forest protection, a course including fire protection, entomology, and pathology. Today, entomology and pathology are no longer taught at summer camp. Instead, there is a 1-hour course in fire management and a unique, 1-hour course in forest wildlife where the students in the forestry and fisheries and wildlife programs study together. In the 1990s evening programs were begun that dealt with various issues related to the student's professional development such as ethics, race and gender issues, international forestry, and the role of politics in natural resource management.

It would not be an exaggeration to say that the summer camp program is as rigorous and exhausting today as it was in 1979. The program is offered from mid-May to mid-July during some of the hottest days of a North Carolina summer. Days begin early and end late, with numerous assignments requiring effort far beyond attendance during class periods. The food has always been plain, plentiful, nourishing, and a source of frequent vexation to the students. A brief story, however, shows that the food has been good. Dean Ellwood for years tried to entice then Chancellor John T. Caldwell to visit the forest when classes were in session. When Caldwell finally consented to visit it so happened that the cook had turned out a lunch with, among other things, fried chicken and homemade biscuits. The rumor is that every spring thereafter Caldwell would call Ellwood and ask when they could visit "his summer camp." The only condition Caldwell put on the visit was a promise from Ellwood that fried chicken and biscuits would be served!

The physically- and intellectually-taxing conditions of the camp—there was, and is, no air conditioning in the student cabins—often led students to feel as if they hated the whole camp experience. However, the faculty has always observed that classes were "made" at summer camp and the bonding that occurred there was an essential part of the forestry curriculum. Indeed, the dissatisfaction with summer camp seems to decay logarithmically once it was over and at graduation most seniors looked back on it as an almost idyllic experience. Well, perhaps not idyllic but certainly as one of the most important of their many educational experiences at NC State. A reading of the section in the Pinetum dealing with summer camp will confirm this generalization.

The Fisheries and Wildlife summer program has always been 6 weeks in length, running from mid-May until late June. In its early days all course work was rolled into one course involving extensive field work dealing with species identification, habitat associations, and management practices. Trips were taken both to the North Carolina mountains and the eastern shore of Virginia. Today, the same subjects are covered but they are included in three separate courses, one 4-hour course in wildlife management and two 1-hour courses, one in fisheries management and one in management practices in the North Carolina mountains.

A practicum was made a requirement in the Environmental Technology Program in 2005. This course is offered not only in the first session of summer school but also in the fall and spring semesters. It emphasizes professional practice as an environmental technologist, covering such subjects as resume writing, interviewing skills, and search techniques and resources.

### **General Education Courses**

Historically, the Department offered courses that were designed to teach students in its own curricula. Of course occasional students from other programs would take forestry courses but no serious effort was made to offer courses that would provide education in forestry for students from other programs. One exception was the course in Conservation of Natural Resources, begun by Keith Argow in the late 1960s, which led to creation of the Conservation curriculum. Another was FOR 252 which was also begun in the 1960s in order to offer a single course in forest management to students in the two-year Agricultural Institute program (organized in 1959) in the College of Agriculture and Life Sciences. Although the Ag Institute dropped FOR 252 as a required course in the early 1980s, the Department continued to offer it as a course in basic forestry for non-forestry majors. The course was also required in curricula such as Conservation and (later) Natural Resources and its largest enrollment now comes from those areas. For years Larry Jervis and Rich Braham alternated as instructors, and recently Dan Robison has taught the course.

As enrollment in Forestry curricula declined and pressure from the University to increase student contact hours grew, the Department considered the desirability of offering other courses in forestry for non-majors. Two courses, FOR 248 Forest History, Technology, and Society developed by Gary Blank and FOR 330 North Carolina Forests initiated by Doug Frederick. Enrollment in both courses was low in the beginning but has risen to the point where both courses are now well-received and have robust enrollments. FOR 248 is an elective taken by students in the College Humanities and Social Sciences and the College of Design to meet the University Science, Technology, and Society requirement and Agricultural Education and Extension students make up about one-third of the enrollment.

One other course, FOR 221 Conservation of Natural Resources, needs mention here. This course existed for years as Z0 221 and then FW 221 and was a required course in the Conservation and Natural Resource curricula. When the Wildlife Program transferred to Forestry it was renamed FOR 221 and cross-listed with Fisheries and Wildlife and Zoology. Enrollment in this course has always been high, and it is the only course offered by the Department during both the academic year and in summer school. It has always been available to other programs and regularly has a significant enrollment of students from other majors.

### **Involvement with Western Carolina University Forestry program**

In addition to the futile negotiations with North Carolina A & T State University over development of a transfer forestry program, the Department was involved in much more intensive discussions with Western Carolina University concerning its efforts to develop an undergraduate forestry program as part of a natural resources management program. For years students from WCU who wished to study forestry took advantage of a 2 + 2 transfer program by transferring to NCSU after two years at Western.

All that changed when H. F. "Cotton" Robinson became Chancellor at WCU. Ironically, Robinson had been head of the Department of Genetics and of the Institute of Biological Sciences at NCSU and in that capacity had worked closely with all the people who were administering the forestry program at NCSU at the time. Consistent with a number of their other initiatives designed to make WCU better serve the needs of the people of western North Carolina, Robinson determined in the early 1980s that an undergraduate program with emphasis on forestry would fill a demand and be a service to their student body. WCU began to work toward this objective despite the fact that in 1974 Robinson had told Deans Ellwood and Saylor that he was not interested in establishing another forestry program but only sought more cooperation from NCSU.

Needless to say, when Dean Ellwood got wind of this venture, he immediately sensed that a forestry program at Western would not only siphon off students for which there was more than adequate room at NC State but also might become a viable competitor for the precious McIntire-Stennis research funds that were so critical to the finances of NCSU's forestry research program. The situation was made more complicated by the fact that one of NCSU's strong forestry supporters who was then a member of The University system Board of Governors was quoted in the Asheville paper as having proposed a forestry program at WCU, a statement which he later recanted with some embarrassment. In January of 1982 Robinson and his Dean of Arts and Sciences John McCrone invited Ellwood, Saylor, and Cooper to Cullowhee to discuss the matter. The meeting began with Robinson informing Ellwood that he did not "give a damn what we thought, that he had his mandate (based on Jordan's remark), that we (WCU) are going to get it (the forestry program) and you can cooperate or not, and we will get it immediate-

ly." Ellwood responded that NCSU would be happy to assist Western in developing its natural resources program but that forestry should be taught at NCSU. After extended, basically cordial, talks neither side had changed its position at all and Saylor and Cooper were instructed to work with McCrone to see what could be worked out.

Events, as they say, transpired, and WCU obtained permission to plan a natural resources program from The University System office. During the spring and summer of 1982 WCU developed proposals for the program, all of which contained "forest resources" as one of three concentrations. Several discussions of this proposal yielded no significant change in it and, in February 1984 WCU submitted a request to The University System office to establish a program in natural resources with forest resources as one of three concentration areas. Cooper prepared a lengthy analysis of the proposal, concluding that there were sufficient openings in forestry programs at other nearby universities, that the supply of 4-year forestry graduates had for a number of years exceeded demand, and that the proposed program was essentially a duplicate of existing programs at NCSU, Clemson, Tennessee, and VPI.

The result of deliberations at The University System level were essentially a foregone conclusion once the permission to plan was granted. As Robinson was retiring in May of 1984, it seemed appropriate, in light of his intense interest in the program, to award the program to WCU then. However, the approval of the program was accompanied by a memorandum summarizing agreements that Ellwood and the new Chancellor at WCU had come to in meetings subsequent to the approval of the degree. The important points for NCSU in this memorandum were: 1) that WCU had no interest in establishing an accredited forestry program; 2) WCU would continue its 2 + 2 program with NCSU and would explore development of a 3 + 2 program (note: neither of these agreements led anywhere); and 3) that NCSU and WCU would develop a cooperative approach to the WCU natural resources management program. Those agreements essentially ended the debate over the matter.

Western's program now requires 25 semester hours in forestry courses taught by 2 of the 6 Natural Resources faculty, both of whom have education and backgrounds in forestry and are well-regarded professionally. All of the basic material required for a forestry degree appears to be included in these 25 hours. So far, no effort has been made to obtain accreditation for the degree from the Society of American Foresters and no effort has been made to obtain McIntire-Stennis funds. University System data do recognize WCU as having a natural resource management program and do not recognize forestry as a major. Those data also indicate that between 2001-02 and 2005-06 between 11 and 23 students graduated from WCU in Natural Resources Management and Policy; there is no indication how many were in the Forest Resources Concentration. Program enrollment data indicate trends similar to those at NCSU; total enrollment in Natural Resources declined from over 41 in 2002 to 23 in 2006 (again, there is no indication how many of these students were in the Forestry Concentration).

## **Conclusion**

It is instructive to view the 25 years of change in the curricula offered in the Department of Forestry as these changes mirror, and respond to, changing University requirements and particularly to changing views of what constitutes an appropriate education for a forestry professional. One gets a sense that, in the national perspective, forestry education defined narrowly, is in a difficult position and that some major, as yet undefined, changes are likely to occur.

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