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ABET Self-Study Report for the Forest Engineering Program at SUNY ESF

Accreditation Board for Engineering and Technology

ABET
Self-Study Report

for the

Forest Engineering Program

at

State University of New York
College of Environmental Science and Forestry

Syracuse

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CONFIDENTIAL

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A. BACKGROUND INFORMATION

A1. DEGREE TITLES

The Faculty of Environmental Resources and Forest Engineering offers the Bachelor of Science in Forest Engineering. The Faculty of Environmental Resources and Forest Engineering is responsible for the design and implementation of the Forest Engineering program.

Table A-1. Undergraduate Engineering Degree Offered by the Faculty of Environmental Resources and Forest Engineering

Degree Title	Description	Comments
Forest Engineering	Bachelor of Science	ABET Accredited since 1982

A2. PROGRAM MODE

The Faculty of Environmental Resources and Forest Engineering operates in a traditional, day mode of instruction. We have been gaining experience in offering courses in a distance learning mode, and some of our courses are offered in the late afternoon and early evening, but the great majority of our undergraduate instruction occurs during the day.

A3. ACTIONS TO CORRECT PREVIOUS DEFICIENCIES

The undergraduate degree program in Forest Engineering was last evaluated in 1994. There were no major deficiencies noted. The reviewers did note that not all the faculty teaching engineering design courses were Professional Engineers. The reviewers suggested that the program consider a more complete assessment program tied to program goals be considered. They also suggested that the faculty consider establishing a Forest Engineering Industrial Advisory Council to assist in

setting and assessing goals for the program. The reviewers also noted that the facilities were adequate, but dated.

Since the 1994 review, the program has lost three faculty members to retirement, all of whom were Professional Engineers. We have hired two Assistant Professors, one of whom is a Professional Engineer and who has responsibility for the capstone and other engineering design courses. We have formed a search committee for the third position; however, the position description has yet to be finalized.

There is now an Advisory Council in place, and the Council has assisted the faculty to review the program objectives and to suggest methods to assess program success. Our efforts in this regard are described in the text to follow.

The faculty will move into a completely rehabilitated building, construction on which began during spring 2000. Again, details will be found in the text following.

B. ACCREDITATION SUMMARY

CRITERION 1. STUDENTS

INTRODUCTION

The Faculty[1] of Environmental Resources and Forest Engineering recognizes that a continual influx of capable, motivated students is in our best interest and the interest of the College. We also recognize that undergraduate recruitment and admissions is a dynamic process, and faculty have to be involved to assure the proper number of capable students enter our Forest Engineering Program. In this section, we document of activities in the College recruitment and admissions process.

RECRUITMENT

The Faculty works closely with the Office of Undergraduate Admissions to attract high quality students to our program. We participate in all college wide open houses, and provide informational sessions for potential students and their families. At the sessions, we provide an informational package that includes:

- our statement of educational objectives,
- alumni survey data,
- a description of the current implementation of our curriculum,
- example Curriculum Plan Sheets, and
- examples of undergraduate student work illustrating the 'hands-on' and project nature of some of our courses.

We have, within the last two years, adopted a strategy to follow up with our visitors. First, each potential student gets an ESF T-shirt with a letter thanking him or her for attending our session. We mail this within one week of their visit, and include an addressed, prepaid envelope with a form to return to us if they have further questions about our program. Second, we mail all potential students and their families a copy of our Faculty newsletter. Third, we send each student from whom we receive a deposit a copy of Henry Petroski's book ***Invention By Design: How Engineers Get from Thought to Thing*** (Harvard University Press, 1996), again with a personal letter. These mailings are generated from our Faculty office, from

[1] The State University of New York College of Environmental Science and Forestry (SUNY-ESF) does not have academic departments. Therefore, Faculty refers to an individual academic unit, while faculty refers to the entire body of academic employees. In the context of this report Faculty will refer to the Faculty of Environmental Resources and Forest Engineering.

our Faculty budget, and are in addition to any mailings the potential students receive from the admissions or any other office. We instituted this strategy in its entirety for the first time in the recruiting year 1999-2000; our total student deposits increased from 7 in the summer of 1999 to 20 in the summer of 2000.

Our Faculty unit has also committed resources to developing a PowerPoint slide presentation describing our program. The most recent version is on our Faculty web page[2].

Our Faculty unit also feels a responsibility to increase the diversity of our student body. We do this in conjunction with the Office of Undergraduate Admissions whenever possible, especially Dr. Carmen McCoy Harrison, Director of Multicultural Outreach. Here are two recent examples of our efforts in this regard. First, Dr. Paul Hopkins presented a lesson of Global Positioning Systems and Geographical Information Systems to three classes of eighth graders from a Syracuse City school. Dr. Harrison arranged the visit. Second, Dr. Hassett will be a mentor to a freshman engineering student identified as a United States Department of Agriculture scholar. This will entail participation in a mentoring workshop, facilitated by Ms. Harrison, during July 2000. USDA Scholars are funded jointly by federal and college funds.

ADMISSIONS

The College of Environmental Science and Forestry accepts undergraduate students directly from high school, and as transfer students from other institutions of higher learning. Summary statistics as to numbers of students from whom the College received deposits as a result of the 1999-2000 recruiting season are presented in Table B.1-1.

Table B.1-1. Summary Admissions Statistics (as of June 15, 2000)
College of Environmental Science and Forestry

	Paid Deposits by Entry Level			
Unit	Freshman	Transfer Freshman(*)	Sophomores	Juniors
Entire College	196	15	98	31
Three engineering units	29	3	16	7
Forest Engineering	15	1	4	0

(*) Transfer freshman refers to a student who enters with transfer credits, but who has not been a resident student at a college or university.

[2] The Faculty web page is accessible via the College web page at *www.esf.edu*.

The College operated on an upper division, transfer mode during the late 1980's. The College reverted to a freshman admission mode in 19990, and, as the data in Table B.1-1 suggest, the College is becoming both a four year and transfer institution, with a higher percentage of students entering as true freshmen.

The fact that we admit students at different entry points means we have to pay careful attention to issues of advanced placement and evaluation of transfer credits. Fortunately, our experience as an upper division school has given us considerable experience with these issues

We work closely with the Office of Undergraduate Admissions to evaluate both true freshmen and transfer students. The Office of Undergraduate Admissions implements admissions criteria developed in cooperation with each Faculty. College admissions standards and data are summarized in Volume II of this report.

Admission of freshmen applicants is based on the review of their high school transcript, results of either the SAT or ACT examination, information provided on the State University of New York application and the ESF Supplemental Application and their response to an essay question regarding their interest in the College and their intended program of study. Freshmen admission is based on selective criteria with emphasis placed on the rigor of their high school program, especially in the areas of mathematics and science. The SUNY-wide Mission Review process includes an Undergraduate Admissions Selectivity component for first time, full-time students (freshman). ESF is classified as a group 2 campus, the second most selective level in the matrix. This matrix guides our review of freshmen applications.

Transfer students may enter the College as sophomores and juniors based on the review of post-secondary transcripts, the SUNY application, and the ESF supplemental application. Transfer admission is based on a review of the student's performance in all previous post-secondary work and the compatibility of the course work with the requirements of their intended program of study at ESF. The overall performance criteria are classified as selective, with emphasis on areas most important to the foundation needed for their program of study.

Each Faculty establishes criteria for evaluation of transfer credit for freshman and transfer students. These criteria are used to guide the preparation of Transfer/Articulation Guidelines for each of the cooperative colleges with which ESF has a transfer agreement. The staff of the Office of Undergraduate Admission is responsible for interpreting the criteria in preparation of the Transfer/Articulation Guidelines and in reviewing course work from colleges with which we have no formal transfer agreement. The Faculties are consulted on individual course content equivalency as needed.

The Faculty and the Office of Undergraduate Admissions work very closely in establishing the admission criteria for freshmen and transfer applicants to the B. S. in Forest Engineering. Additionally, the Faculty Chair is consulted on individual applications as needed.

ADVISEMENT AND PROGRESS TOWARDS DEGREE COMPLETION

Once admitted, the Office of Undergraduate Admissions cooperates with the Registrar's Office to produce a SUNY-ESF Curriculum Plan Sheet. The Plan Sheet includes the 8 semesters of course work (for true freshmen) and generic underclass requirements (for transfer students). Transfer credits granted at the time of admissions, or by petition after admission, are indicated on the transfer student version of the Curriculum Plan Sheet.

The Registrar's Office updates the Curriculum Plan Sheets at the end of each semester, by indicating courses completed (with grades) and courses in progress (indicated as IP). Each student and his/her advisor gets a copy of the current Curriculum Plan Sheet each semester, immediately prior to the weeks set aside for student advisement and pre-registration for the next semester. The advisor thus has a clear picture as to how the student is progressing towards completion of degree requirements. In addition, the academic advisor can review the details of a student's admissions portfolio by accessing an electronic folder via the Registrar's page on the college web site. The portfolio is password-protected and can be accessed only by the faculty advisor and Faculty Chair.

The College's Academic Standards Committee reviews every ESF student whose cumulative Grade Point Average falls below the 2.000 required for graduation. That committee decides on whether a student is placed on academic probation or dismissed. A student dismissed for poor academic performance has the right to appeal the decision. If the student elects to appeal, an expanded version of the committee hears and decides on the appeal. In any case, the Faculty Chair and academic advisor are apprised of the decisions, and the student is required to meet with his or her academic advisor to discuss ways to improve the student's academic performance.

Copies of the two forms of the Curriculum Plan Sheet are included on the next several pages. The first two pages show a Curriculum Plan Sheet for a student admitted as a freshman, while the next three pages show a Curriculum Plan Sheet generated for a transfer student. The Curriculum Plan Sheet is updated every time the program is modified; the 2000-2001 Curriculum Plan Sheet will incorporate information about the General Education initiative, as described in the documentation for Criterion 4.

The Curriculum Plan Sheet provides a semester by semester check against which a student can gauge his or her progress towards the Bachelor of Science degree. The student and advisor can identify and rectify any issues related to progress towards the degree.

There are in addition some further checks. The Registrar has to certify that students who apply to take the Fundamentals of Engineering Examination are

within one year of completing all degree requirements. The Registrar also reviews all senior engineering students in anticipation of their graduation, and alerts the Faculty Chair of any potential discrepancies. The Faculty Chair confers with the advisor and/or student to understand and, if possible, work towards resolving the issue.

After Fall or Spring Commencement, the Faculty Chair and Registrar review the academic records of all potential graduates. A Diploma is generated if and only if both the Faculty Chair and Registrar agree that all published degree requirements have been met. The Registrar and Faculty Chair both certify the completion of all degree requirements by their signatures.

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

INTRODUCTION

Program educational objectives are defined as "what a student is expected to (or is able to) accomplish **after** graduation from the Forest Engineering program." The educational objectives of the Faculty are to produce graduates who:

- will engage in professional engineering practice while employed by government agencies, industry or private consulting that specialize in public works and the inventory, management, design, use, restoration and protection of natural and cultural resources,

- are prepared to enter advanced academic studies involved with natural resources engineering, mapping sciences and water resources, and

- will continue to develop the knowledge and skills needed to adapt to changing technological, environmental and business conditions to the benefit of society, employer and self.

The Program Objectives were developed by the Faculty with input from its constituent groups over a number of years. One of the principle influences on the development of Program Objectives is the Charter and Mission of the College of Environmental Science and Forestry.

The Charter presents the foundation on which the College's mission is constructed. The Charter is enacted into law by the New York Legislature, as required by Article 121 of the New York State Education Law. Article 121 prescribes the College shall direct its efforts towards the following:

1. Teaching in the science and practice of environmental science and forestry in its several branches, including landscape architecture; environmental design; environmental and resource engineering; environmental and resource management; wildlife studies; biology, chemistry, ecology; the manufacture and marketing of forest products; and the technologies appropriate to these branches of environmental science and forestry.

2. The conduct of research, investigation, and experimentation relating to such studies whenever appropriate, including suburban or urban areas, and in commercial or industrial facilities.

3. The conduct of experiments in forest and related development and management for public, commercial, recreational and aesthetic purposes and generally the giving of popular instruction and information concerning the elements of environmental science and forestry.

4. The operation of demonstration and public service programs with a view to acquiring, transmitting and applying knowledge concerning the scientific management and use of forest and related natural resources for human benefit.

The Mission of the State University of New York College of Environmental Science and Forestry, which is based on the Charter, is to be a world leader in instruction, research, and public service related to:

- Understanding the structure and function of the world's ecosystems;
- Developing, managing and use of renewable natural resources;
- Improving outdoor environments ranging from wilderness to managed forests to urban landscapes; and
- Maintaining and enhancing biological diversity, environmental quality and resource options.

The Program Objectives support the College's Charter and Mission in becoming a world leader in natural resources instruction. In reference to the Charter, the Program offers instruction in environmental design and environmental and resource engineering. Our graduates are prepared to work in suburban and urban areas. The development and management of natural resources is an integral part of the Forest Engineering program. Finally, the integration of mapping sciences in Forest Engineering supports the scientific management and use of natural resources for human benefit.

The Forest Engineering program is an integral part of the College's Mission related to the development, management, use and improvement of renewable resources and outdoor environments. Notably, the Program's first objective is to produce graduates that will contribute in a professional engineering environment to the maintenance and enhancement of environmental quality and resource options, as declared in the College's mission statement.

With their specialized education, graduates are expected to make a positive contribution to the sustained high quality yield of resources and multiple use benefits of goods and services from rural lands. In the decade of the 1990s, graduates

are increasingly involved with the interaction of natural and urban environments, and apply their skills and knowledge accordingly. Students receive instruction and education in the basics of: locating and quantifying forest resources; designing transportation, harvesting and conveyance systems for timber and water resources; designing structures, foundations and facilities for pollution abatement; and engineering planning. The student is prepared to enter the engineering profession ready to learn the practical techniques required by the employer, to embark upon a research career, or to pursue graduate work in a specialized area.

PROCESS BY WHICH OBJECTIVES ARE DETERMINED AND EVALUATED

The general preparation of the program objectives is a coordinating process guided by the Faculty Chair. Program modifications are made with full involvement and awareness of all members of the Faculty. The Faculty gives ABET evaluation and accreditation a high priority on a continuous basis. The Faculty developed the Program Objectives by engaging in review and evaluation of alumni surveys, employer surveys, and student exit surveys over the last three accreditation cycles. The Program Objectives continue to evolve over time as feedback from constituent groups is evaluated.

The process of setting and evaluating objectives is continuous, although the cycle may take 4 to 6 years to complete. The steps in the process include:

1. Determine Constituency Needs
2. Establish Composite Needs
3. Select Program Objectives
4. Set Program Outcomes
5. Evaluate Program Objectives
6. Improve Program Objectives

1. DETERMINE CONSTITUENCY NEEDS

The program recognizes that the following constituent groups offer significant opportunity for continuous program improvement:

- Current undergraduate students;
- Graduating students;
- ERFEG[3] Advisory Council;
- Alumni;
- Faculty of Environmental Resources and Forest Engineering;

[3] ERFEG is a locally generated acronym for Environmental Resources and Forest Engineering.

- Prospective high school students;
- Parents of prospective high school students; and
- Employers

Current students often provide informal, anecdotal feedback to faculty regarding the program. Taken individually, this is an imprecise method of evaluating program objectives. However, the Faculty uses this method to identify areas for further evaluation by other methods. The Exit Survey also provides information that we use to evaluate our Program Objectives.

Beginning with the Class of 1999, graduating students have been requested to complete an exit survey on their curriculum and College experience. While this survey is generally more appropriate to assess the program outcomes, some of the information regarding career plans is suitable for evaluating whether program objectives are consistent with the needs of this constituent group.

The ERFEG Advisory Council meets twice a year to provide advice and guidance to the Faculty. Planning for the formation of the Advisory Council started in 1997, and the Council met formally for the first time in 1998. Comprised primarily of Forest Engineering alumni, the Council provides the Faculty with insight into needs of employers and engineers in today's economy[4].

The Forest Engineering alumni are important resources to the program. Faculty members will often receive informal feedback from alumni regarding skills and knowledge that could be integrated in to the program. Alumni surveys are used about every 6 years to obtain information about alumni careers and education. The most recent surveys include those completed in 1994 and late 1999. Responses to these surveys were instrumental in making two hiring decisions in 1996 to fill vacancies that resulted from Faculty retirements.

Prospective high school students and their parents provide informal anecdotal feedback regarding their needs. Faculty host prospective and accepted students at College Open House events. These events typically occur twice each semester and provide prospective students and parents an opportunity to meet with program faculty. During these sessions, faculty will often receive feedback and questions about skills and knowledge that these students feel they need to be able to pursue their chosen fields.

Employers have always provided feedback to the Program on an ad hoc basis. Frequent contact between Faculty and the primary employers of graduates, along with review of current higher education literature and professional engineering literature, generally yielded a reasonable view of employer needs. However, in response to a need for a formalized process of evaluating the needs of employers, and in response to a suggestion from the Advisory Council, the Faculty

[4] As one example of their input, the members of the Advisory Council, in reviewing an early draft of our Objectives and Outcomes, suggested we incorporate a statement about the importance of teamwork, which we did.

conducted its first formal employer survey in 1999. A survey instrument was proposed by the Advisory Council, and modified by the Faculty of Environmental Resources and Forest Engineering. The results of the survey are discussed under Criterion 3.

2. ESTABLISH COMPOSITE NEEDS

Semi-monthly faculty meetings are used throughout the semester to discuss administrative and programmatic issues. For two years prior to this visit, ABET-related topics have been discussed regularly at these meetings. In addition, semi-annual Faculty retreats are used as a forum to discuss accreditation-related issues. The program objectives have been regularly evaluated at these Retreats.

In response to the Faculty desire to undergo accreditation using Engineering Criteria (EC) 2000, proposed enhancements to the Program objectives were presented for consideration by the Faculty at the January 1999 Faculty Retreat. These enhancements were further modified as a result of Faculty comments during the May 1999 and January 2000 Faculty Retreats and feedback from the ERFEG Advisory Council. The current program objectives were finalized and agreed upon by the Faculty at the June 2000 Faculty Retreat following review of alumni and employer survey results.

At our Faculty Retreat in January 2000, we were facilitated in discussing objectives and outcomes, as well as assessment and evaluation. Facilitators included Dr. Gary M. Scott, Paper Science and Engineering, who had recently attended the ABET workshop on EC2000, and Dr. Charles Spuches. Dr. Spuches is Director of Instructional Development, Evaluation and Services, and is an expert in assessment and evaluation issues.

3. SELECT PROGRAM OBJECTIVES

The Program Objectives are selected based on review of constituent needs by the Faculty, as facilitated by the Faculty Chair.

4. SET PROGRAM OUTCOMES

The Faculty actually began its review of program objectives and outcomes in 1990 at its first Faculty Retreat. This retreat formed the basis for the stated program outcomes by identifying desirable attributes of the Forest Engineering graduate. These attributes, which pre-dated publication of the ABET EC2000, were used as the

basis for the Faculty to determine the program outcomes[5]. Further detail on program outcomes is provided under Criterion 3.

5. EVALUATE PROGRAM OBJECTIVES

The analysis of alumni surveys is the most important source of information regarding how graduates are performing in the workplace. Alumni surveys are performed every six years. Comments from alumni regarding the program, skills and training they received are important sources for Faculty to determine areas for improvement. Survey analysis includes a determination of career specialty, employer, and career position with regard to time since graduation. Generally, the analysis by the Faculty look for trends in professional registration, advanced degrees and career specialty to indicate whether program objectives are being met.

Alumni surveys are also useful to identify future needs for graduates. Recent (1994) career surveys indicated areas such as water resources and waste management were increasingly in demand among employers. Consequently, when the Faculty had the opportunity to replace two faculty positions in 1996, engineers with special expertise in these areas were hired.

6. IMPROVE PROGRAM OBJECTIVES

The greatest source of information has traditionally been the alumni survey conducted every six years. The constituent needs evolve gradually over time. The Program Objectives have been sufficiently broad, yet specific enough to the program, that significant revision to the objectives has not been needed since the last accreditation visit. Most of the effort in establishing the current objectives has been to clearly state the three objectives of the program and to publish these consistently worded objectives in course catalogs, on the College Web site and in other program literature.

FACULTY TRAINING - ABET ACCREDITATION

In order to stay abreast of the EAC/ABET process, and how this process strengthens the program, several faculty have participated in EAC/ABET training sessions over the past 5-1/2 years. For example, Professor Douglas Daley attended a two-day short course sponsored by ABET Regional Engineering Workshop on

[5] Our original statements, as generated at the 1990 retreat, were cast in the form of Mission, Goals, and Objectives. We have had a continuing, and often lively, internal discussion as to the relationship between that format, and the ABET description of Program Objectives and Outcomes.

EC2000 February 2000 in New Orleans, LA. Dr. Hassett attended a workshop in Binghamton, NY in April 1999 where the EC2000 criteria were presented and discussed. Dr. Brock, while he was Faculty Chair, was particularly active in ABET issues. In particular, Dr. Brock:

- participated in two ABET sessions given at the ASAE International Summer meeting on June 20, 1994 a Kansas City, Missouri. The first session was an ABET training session for ABET American Society of Agricultural Engineers reviewers and the second session was a workshop on ABET criteria.
- served as a Forest Engineering Evaluator, EAC/ABET review team for the University of Washington, November 1995.
- participated in Outcomes-based Engineering Education Workshop, ASAE Meeting, Minneapolis, MN, August 10, 1997.
- participated in Engineering Criteria 2000 Training Session, ASAE Meeting, Minneapolis, MN, August 12, 1997.
- participated in ABET Training Criteria 2000, ASAE, Orlando, FL. July 13,1998.
- participated in ABET Visitation Training, ASAE, Orlando, FL, July 13,1998.

ROLE OF THE ADVISORY COUNCIL

The Environmental Resources and Forest Engineering (ERFEG) Advisory Council serves in an advisory capacity to the Faculty regarding such issues as student enrollment, faculty needs, curriculum, scholarships, research programs, equipment and facility needs, and ABET reaccredidation. The Advisory Council works within three committees:

A *Resource Committee* to ensure that the Faculty remains on the technological cutting-edge in matters pertaining to environmental resources and forest engineering.

An *Education and Research Committee* to ensure that the Faculty's educational programs continue to meet all necessary accreditation requirements while ensuring that its engineering students receive an education that prepares them for productive roles in society.

A *Development and Public Service Committee* to develop communications, promotions, and fund-raising activities for the Faculty in cooperation with the College.

The Advisory Council has been helpful in reviewing Program Objectives and Outcomes, and suggesting means by which Program Outcomes can be assessed.

HOW THE PROGRAM ENSURES THE OBJECTIVES ARE ACHIEVED

The Program relies primarily on alumni survey results to demonstrate that program objectives are being met. Rather than rely on specific performance measures, the Faculty uses the survey results to indicate trends over time.

SUMMARY OF 1999 ALUMNI SURVEY

The Faculty conducted a survey of Forest Engineering alumni in Fall 1999. Surveys were sent to 849 alumni, as listed by the College Alumni Association. Responses were received from 211 alumni, for a 24.7% response rate. The surveys generally covered employment status, advanced degrees, career specialty, professional registration and professional associations. Alumni were asked for voluntary comments regarding the program.

Survey responses were tabulated to aid the Faculty in assessing the success of the program in satisfying its objectives. Survey responses were grouped by decade of graduation (1990s, 1980s, and 1970s) for analysis (see Table B.2-1.).

The number of registered professional engineers increased dramatically following program accreditation in the early 1980s. Less than 50% of 1970s Forest Engineering alumni are registered as either a Professional Engineer (PE) or intern engineer (IE). Nearly 75% of 1980s alumni have PE/IE status, while 85% of 1990s alumni have PE/IE status.

Consequent to the implementation of environmental regulations in the 1980s, we see an equally dramatic increase in the number of recent alumni employed in consulting engineering firms. Likewise, specific disciplines such as waste management, environmental management and applied geographical information systems (GIS) are increasingly prevalent amongst recent graduates. Most of the program's alumni remain in the professional engineering environment. Recent graduates employed by the government appear to work for regulatory agencies, such as the New York State Department of Environmental Conservation or United States Environmental Protection Agency. Earlier graduates in 1970s and 1980s appear to work predominately in military or research capacities for non-regulatory agencies such as United States Department of Agriculture.

Table B.2-1. Summary of 1999 Alumni Survey. Data are Percent of Total Respondents			
Responses	Decade of Graduation		
	1970s	1980s	1990s
	n = 66	n = 69	n = 69
Professional/ Intern Engineer	48%	75%	85%
Master of Science (or other advanced training)	42%	55%	26%
Career Specialties	Mapping/ Surveying (19%)	Civil Engineering (19%)	Civil Engineering (15%)
	Construction Mgmt (15%)	Environmental Engineering (14%)	Waste Mgmt (13%)
	Civil Engineering (14%)	Hydrology (12%)	Environmental Engineering (10%)
			Other (12%)
Employers	Federal/State Gov't (36%)	Consulting (33%)	Consulting (50%)
	Consulting (25%)	Federal/State Gov't (17%)	Federal/State Gov't (18%)
	Commercial (20%)	Commercial (13%)	Manufacturing (10%)

Figure B.2-1 is useful as an example of the diversity of career specialties that our graduates are capable of undertaking. Forest Engineering graduates are engaged in a number of specialized engineering disciplines, from the broad category of "Civil Engineering" to the more specific "Waste Management." Figure 1 also illustrates how Forest Engineering graduates have shifted career specialties over time in response to society's needs and changing career paths. The changing face of the Forest Engineering program over the last three decades is reflected in the changes in career specialties. For example, a dramatically greater number of 1990s graduates specialize in Waste Management or Environmental Management contrasted with graduates from the 1980s or 1970s. Those who characterize their specialty area as wastewater engineering, environmental engineering or hydrology represent a significant number of program graduates. Graduates involved with civil, geotechnical or transportation engineering is relatively consistent across the three decades of graduates.

Figure B.2-2 illustrates the shift towards consulting engineering amongst the 1990s graduates. Consulting engineers represent a significant constituency of our

program, and will be instrumental in helping the Faculty to set objectives and outcomes in the next decade. In contrast to graduates from the 1980s and 1970s, government and non-manufacturing commercial businesses represent a proportionately smaller percentage of our program's constituency; these sectors remain an important constituent group, nonetheless. The survey results also indicate that 10% of the 1990s alumni are employed in manufacturing industry; this gradual shift of our graduates towards manufacturing is reflected in the survey results. The needs of manufacturing industry will need to be considered in future program objectives and curriculum development. With nearly 50% of the 1990s graduates in consulting engineering, and nearly 40% in government, commercial or manufacturing, the Faculty believes that the Forest Engineering program is satisfying the Program Objective to prepare graduates to engage in professional engineering practice.

In addition to the Faculty using the results of the alumni surveys as indicators of the program's success in accomplishing its objectives, the Faculty reports these results to a number of constituent groups. For example, prospective students and their parents receive copies of the survey results during campus visits, such as the College Open House. This enables students and parents to determine if successful completion of the Program puts them on a desirable career or research path. Sharing results such as those illustrated in Figure B.2-3 also provides a good historical perspective to students. Dominant program strengths are evident from these results; these strengths have also endured over time. Generally, our faculty will point out that Forest Engineering graduates report that they are predominately involved with environmental resources or civil engineering and specialties related to these fields, such as water resources, waste management, transportation and mapping sciences. Interestingly, 33% of responses to the 1999 survey indicated that program graduates are involved with environmental resources or civil engineering, which is a 15% increase over the previous survey. These results will provide current and prospective students confidence that the Forest Engineering program will prepare them for the engineering profession.

The Faculty uses the survey results to continually improve course offerings in response to changes in engineering professions. For example, the 1994 and 1988 surveys showed an increasing number of graduates were involved with waste management and water resources. In response, the Faculty hired two faculty members in 1996 with expertise in these areas. The 1999 survey results indicate that these two areas remain important specialties for Program graduates.

Historically, the Faculty has not formally notified alumni of the survey results. Beginning this year, the Faculty will publish the survey results in the *ESF Engineer*, our newsletter, and on the Faculty Web page. The Advisory Council members will also receive results.

RELATIONSHIP TO PROGRAM OBJECTIVES

FIRST OBJECTIVE: WILL ENGAGE IN PROFESSIONAL ENGINEERING PRACTICE . . .

Recent graduates (1990s) are employed most commonly by consulting engineering firms, a clear demonstration that they are working in a professional engineering environment. Recent graduates are in the process of pursuing Professional Engineering licensure, as demonstrated by the high percentage of respondents that have passed the Fundamentals of Engineering exam. Over 75% of the graduates in the 1980s and 1990s hold a Professional Engineer registration or are in the process of obtaining one. Nearly 90% of recent graduates are involved in engineering practice; 29% are engaged in civil practice (civil, transportation, and geotechnical engineering), while 50% are engaged in natural resources fields (hydrology, waste management, environmental management, water treatment and supply, wastewater treatment and environmental engineering).

Sixty one percent of all respondents are engaged in engineering practice. Twenty-four percent characterize their area of concentration as civil practice (including civil, transportation, and geotechnical engineering), while 32% are engaged in environmental resources engineering practice (hydrology, waste management, environmental management, water treatment and supply, wastewater treatment and environmental engineering). Two percent are engaged in forestry or agricultural engineering. The remaining 3% are engaged in air pollution or mechanical engineering.

Sixteen percent of alumni who responded are engaged in mapping sciences, including surveying, mapping, geographical information systems, photogrammetry, remote sensing, and information systems management. Many of these specialties are used in support of the engineering profession and in support of natural resources management.

Nine percent of the alumni are engaged in construction management or project management. Many of these career specialties are in a professional capacity engaged in engineering practice or in support of engineering practice.

Eleven percent of alumni are engaged in a variety of unrelated fields, including industrial operations, teaching, architecture, sales, and other fields.

Eighty three percent of recent graduates (alumni who graduated during the 1980s and 1990s) feel that the accreditation status had strengthened their career plans. In contrast, only 23% of alumni from the 1970s (prior to accreditation) felt that accreditation had helped them.

SECOND OBJECTIVE: ARE PREPARED TO ENTER ADVANCED ACADEMIC STUDIES . . .

Twenty six percent of recent graduates (1990s) have obtained a Master of Science or a Doctor of Philosophy. This is a slight decrease compared to the 1980s graduates. However, continuing economic growth in the United States since the mid-1990s has demanded engineers enter the marketplace as soon as possible. We expect that our graduates are pursuing careers rather than advanced degrees due to the improved demand (as compared to the early 1990s). Anecdotal evidence supports the contention that, in times when jobs are unavailable, enrollment in graduate programs increases. The Faculty also learned that Forest Engineering graduates who are accepted in to the Environmental and Resources Engineering (ERE) program at ESF are not listed by the Alumni Association as Forest Engineering graduates, but rather as ERE graduates. This oversight will be corrected for the next survey. Since ERE graduates do not receive the alumni survey, the survey is missing a large number of students that received both a Bachelor of Science and Master of Science from ESF.

THIRD OBJECTIVE: WILL CONTINUE TO DEVELOP THE KNOWLEDGE AND SKILLS . . .

Our graduates are demonstrating a commitment to growth and professional duty in a number of ways. Fifty four percent of recent graduates (1990s) and 62% of 1980s graduates, respectively, report belonging to a professional association. The ability to adapt to changing technology, business and environmental needs is reflected by the variety of career paths chosen by our alumni.

Twelve respondents commented that internships, or cooperative programs, were important to the success of graduates. Several recent graduates stated that an internship would provide them greater understanding of the professional environment and help them get a better job. Older alumni felt that internships made the new employee "better" than those without internships.

Technical writing and public speaking were noted as important skills to teach (10 respondents) if the Faculty of Environmental Resources and Forest Engineering had not already integrated this into the curriculum. Several individuals mentioned use of software tools and CAD as important skills.

These results were presented at a Faculty Retreat on June 15, 2000. Following discussion of these results, the program objectives were reviewed. Final draft objective statements were circulated amongst the faculty for final comment. The Program Objectives that are stated in this ABET Self-Study are the final result of this process. The Program Objectives will be published on the College Web site, in the 2000-2001 College Catalog, and in student recruiting materials used by College Admissions, and otherwise shared with our constituent groups.

CRITERION 3. PROGRAM OUTCOMES

INTRODUCTION

As described in the previous section, the Faculty developed a Mission, Goals and Objectives statement at a Faculty Retreat in May 1990. The current Program Outcomes have evolved from that original exercise. In this section, the Forest Engineering Program Outcomes are first discussed in comparison to the appropriate ABET criteria and then our Program Objectives.

The quality of instruction is a high priority, and that is discussed next. The curriculum is in one sense a collection of courses, and the quality of instruction in each course reflects on the entire curriculum. The curriculum is designed to provide appropriate educational activities, and the Faculty monitors students as they progress through the Forest Engineering program.

The Faculty assesses Program Outcomes by several methods. First, we monitor the number of students who choose to take the Fundamentals of Engineering examination as they approach graduation. The Faculty tracks performance data for the Examination, and also gathers data from commencing seniors in the form of exit interviews. The Faculty, with the close assistance of the Advisory Council, generated an Employer Survey, results of which are also discussed. Finally, results from the alumni survey are presented and discussed as they pertain to the Program Outcomes. The section concludes with a summary statement and thoughts as to the next steps in the evolution of the Faculty assessment program.

STATEMENT OF PROGRAM OUTCOMES

Current Program Outcomes for the Forest Engineering curriculum delivered by the Faculty of Environmental Resources and Forest Engineering are to produce graduates who:

- Are competent to perform in an engineering environment
- Have sufficient backgrounds/tools to function effectively
- Have the ability to conceptualize problems in terms of unifying principles
- Are capable of utilizing an engineering approach to problem solving
- Can communicate their ideas and expectations effectively
- Exhibit the following attributes of a competent engineer:
    - Knowledge - both in understanding basic principles and in creativity in problem solving
    - Skills - originality and method of problem solving
    - Attitude - professional ethics, self-disciples, and perseverance
- Can function effectively in a multidisciplinary team/environment

- Understand the need for life-long learning

RELATIONSHIP OF PROGRAM OUTCOMES TO CRITERION 3.

The Program Outcomes listed above provide good agreement with Engineering Criteria 2000: Criterion 3. Table B.3-1 maps the Forest Engineering Program Outcomes to EC2000 Criterion 3 (a) - (k). The EC2000 (a) – (k) statements are

a. an ability to apply knowledge of mathematics, science and engineering
b. an ability to design and conduct experiments, as well as to analyze and interpret data
c. an ability to design a system, component, or process to met desired needs
d. an ability to function on multi-disciplinary teams
e. an ability to identify, formulate, and solve engineering problems
f. an understanding of professional and ethical responsibility
g. an ability to communicate effectively
h. the broad education necessary to understand engineering solutions in a global and societal context.
i. a recognition of the need for, and an ability to engage in life-long learning
j. a knowledge of contemporary issues
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

It should be noted that many of our outcomes coincide with multiple EC2000 Criterion 3 statements. We believe that "utilizing an engineering approach to problem solving" includes, in a broad sense, "engineering design."

TABLE B.3-1: Mapping of Forest Engineering Program Outcomes to EC2000 Criterion 3											
Forest Engineering Program Outcome	Engineering Criterion 2000: Criterion 3										
	a	b	c	d	e	f	g	h	i	j	k
Competent Engineer	x				x			x			x
Sufficient Background	x	x			x			x		x	
Unifying Principles		x	x		x			x			
Engineering Approach		x	x		x			x			
Communication							x				
Knowledge	x				x			x		x	
Skills	x				x			x		x	
Attitude						x					
Team Worker				x							
Life-Long Learner						x			x	x	

RELATIONSHIP OF PROGRAM OUTCOMES TO PROGRAM EDUCATIONAL OBJECTIVES

The Forest Engineering Program Outcomes were designed to allow us to observe and assess our Program Educational Objectives. Each of the outcomes captures some essence of a competent, successful engineer. Table B.3-2 maps the Program Outcomes and Objectives.

Table B.3-2: Mapping of Forest Engineering Program Outcomes to Program Objectives			
Program Outcome	Forest Engineering Program Objectives		
	Professional Engineering Success	Academic Advancement	Professional Growth
Competent Engineer	x		x
Sufficient Background	x	x	
Unifying Principles	x	x	
Engineering Approach	x	x	
Communication	x	x	x
Knowledge	x	x	
Skills	x	x	
Attitude	x	x	x
Team Worker	x		x
Life-Long Learner	x	x	x

STEPS TO ENSURE PROGRAM OUTCOMES ARE ACHIEVED

EFFECTIVENESS OF INSTRUCTION

Individual Course Assessment Techniques

Many faculty elect to use informal instructional assessment techniques. These might include early course surveys, one-minute assessments, or other instruments. One example of the use of an in-class assessment technique is given in the information pertaining to FEG 489 Engineering Planning and Design provided in the discussion of Criterion 4 of this report.

Formal Evaluation Processes

The curriculum consists of a series of courses. The Forest Engineering students have a right to expect, and the Faculty has the obligation to deliver, effective instruction. The faculty of the College of Environmental Science and Forestry have adopted a common End-of-Course Student Questionnaire to provide some measure of course evaluation information to course instructors. Each

instructor is asked to administer the survey instrument near the end of the course, and the forms are collected and sent to the campus Office of Instructional Development, Evaluation and Services for statistical analysis. Each instructor receives a summary of responses, as well as the student forms with responses to three open-ended items. The Faculty Chair receives copies, of the summary statistics only, for each course offered in the Faculty. Example statistics are provided in the following table.

Table B.3-3. Summary of Selected Items from SUNY-ESF End-of-Course Student Questionnaire For Courses Taught by Faculty of Environmental Resources and Forest Engineering, Fall 1999 and Spring 2000

Courses Fall 1999	Item (Scale is 1 Strongly Disagree to 5 Strongly Agree)		
	Course and subject matter were well organized	Instructor communicated effectively	Instructor Enthusiastic about teaching
FEG 132	4.2	4.3	4.2
ERE 225	4.4	4.4	4.1
FEG 300	3.5	3.9	4.5
ERE 371	4.4	4.1	3.9
FEG 420	4.7	4.6	4.4
FEG 430	4.7	4.6	4.9
FEG 448	4.3	4.6	4.9
Overall Forest Engineering Average	4.3	4.4	4.4
Overall ESF Average	4.1	4.0	4.3
Courses Spring 2000			
FEG 340	3.8	3.8	4.9
FEG 350	3.6	2.9	3.6
ERE 351	4.0	3.6	3.4
FEG 363	4.1	3.9	3.7
FEG 437	3.8	3.8	4.4
ERE 440	4.3	4.3	4.5
FEG 454	4.0	4.4	4.1
FEG 489	3.8	3.7	4.2
Overall Forest Engineering Average	3.9	3.8	4.1
Overall ESF Average	4.0	4.0	4.3

The data in Table B.3-3 indicate that, in general, the Forest Engineering students feel they are well served by their instructors. For some reason, the student

responses were much more positive in the Fall 1999 rather than the Spring 2000 semester.

The faculty use the End-of-Course Questionnaire data for their own efforts to improve instruction. The Faculty Chair can (and does) consult with individual faculty to discuss issues raised in the data and to suggest opportunities to further improve instruction delivered by the Faculty.

MONITORING OF PROGRESS THROUGH CURRICULUM

The Faculty has a number of tools to assess the achievement of Program Outcomes. These include the curriculum itself, the Curriculum Plan Sheet, and Degree Certification. Each of these topics are discussed in other parts of this report, but are briefly mentioned below.

CURRICULUM

The curriculum provides the opportunity for the students to achieve the Program Outcomes and thus the Program Objectives. Students who maintain a minimum grade point average and pass all the degree requirements are granted a degree. The broad undergraduate engineering curriculum gives students exposure to a wide range of topics, from math and science to humanities and the social sciences to engineering and design. The curriculum also focuses attention to the strengths of our faculty, especially in the area of Mapping Sciences (Photogrammetry, Remote Sensing) and Water Resource Engineering (Hydrology, Hydraulics, Wastewater Treatment). We feel that the curriculum provides an excellent opportunity for students to achieve the Program Outcomes. An outline of our curriculum is discussed in section B.4 of this report.

CURRICULUM PLAN SHEET

The Curriculum Plan Sheet provides a printed outline of each student's undergraduate curriculum. It includes information regarding the required Forest Engineering undergraduate curriculum, including course names, numbers, and credits. It also contains a listing of all courses the student has taken to fulfill the curriculum requirements including the course number, credits, time taken, and final grade. Transfer credits are identified, as well as summaries of lower and upper division credit hours required and taken. Further discussion and examples of Curriculum Plan Sheets can be found in the discussion of Criterion 1. The Curriculum Plan Sheet provides an excellent tool to identify courses in which the student is deficient.

DEGREE CERTIFICATION

Degree Certification provides a final process to certify that all degree requirements have been fulfilled. This is process is discussed under Criterion 1.

ASSESSMENT TOOLS/PROGRAM ASSESSMENT

A variety of tools have been developed to aid in the assessment of the Forest Engineering Program Outcomes. These include monitoring the number of students who choose to take the Fundamentals of Engineering Examination, and their performance on the examination. In addition, exit surveys, employer surveys, and alumni surveys are conducted. The alumni survey is discussed in detail in Criterion 2 of this report and is not mentioned below. The exit and employer surveys are discussed below, as well as the outcome assessment from the latest surveys.

FUNDAMENTALS OF ENGINEERING EXAMINATION

The Fundamentals of Engineering Examination is used as an assessment tool in two regards. First, we encourage but do not require students to take the examination. That students do, and the extent to which they do, is an indicator of the student's recognition of the importance of the examination in demonstrating their competence to perform in an engineering environment, and demonstrating the basic skills and knowledge that characterize an engineer. The following table shows the number of students who filed the necessary forms, and were certified to take the Fundamentals of Engineering examination, as well as the number of graduating seniors.

Table B.3-4. Numbers of Students Certified to Take the Fundamentals of Engineering Examination Compared to Numbers of Graduates			
Date of Fundamentals of Engineering Examination	Number of Eligible Students	Date of Graduation	Number of Graduates
April 1997	9	May 1997	13
		August 1997	2
October 1997	10	December 1997	7
April 1998	16	May 1998	15
		August 1998	2
October 1998	3	December 1998	8
April 1999	27	May 1999	20
		August 1999	0
October 1999	5	December 1999	7
April 2000	20	May 2000	16
Totals:	90		90

The data in Table B.3-4 is somewhat confusing in that a student can elect to take the examination when they are within thirty hours of completing their degree, and it is therefore possible that some students take the examination and subsequently fail to graduate. It is also possible that students graduate without taking the examination. The totals, however, suggest that nearly 100% of the Forest Engineering students file the necessary forms to take the examination, and thus demonstrate their understanding of its importance in their chosen career path.

The performance of Forest Engineering students on the Fundamentals of Engineering examination represents another means by which the exam could serve as an assessment tool[6]. Data as to the overall pass rate for Forest Engineering students is presented in the next table.

[6] We are well aware of the discussions in the profession as to the merits of using the Fundamentals of Engineering examination as an assessment tool.

Table B.3-5. Number of Students Who Indicated ESF School Code on the Fundamentals of Engineering Examination and Pass Rate			
Date of Examination	Number of Students	Number Passed	Percent Passing
April 1993	28	18	65
April 1994	2	2	100
April 1995	9	8	89
April 1996	9	7	78
April 1997	(16)	-	-
April 1998	(19)	-	-
April 1999	14	13	93

The data in Table B.3-5 are of interest in several regards. First, in the 1997 and 1998 testing cycles, the students were apparently directed by the examination proctors to not indicate their school code. We therefore cannot track their performance for those years. Second, there is confusion on the part of the students as to how to represent their program. Some students choose to indicate their program as Other, while others elect Civil. The choice of program dictates to a small extent the content of the examination; therefore, results from students selecting one program choice may not be precisely comparable to students taking other forms of the examination. Still, the data indicate our students are well prepared and perform well on the Fundamentals of Engineering examination. The data also tell us we as a Faculty should be more proactive in describing the choices the students have to make as to the form of the examination.

EXIT SURVEY

In the last two years, an exit survey has been requested of the graduating seniors. In 1999, 13 of the 20 surveys were returned (65%), while in 2000, 12 of 20 surveys were returned (60%). These surveys provide another assessment tool for both our Program Objectives and Program Outcomes. The results are also very useful in assessing program resources, such as faculty and equipment, and identifying areas of need. The Exit Survey addresses student's short-term activities and goals as well as their impression of the instructional activities of the Faculty.

EXIT SURVEY OUTCOME ASSESSMENT: SHORT-TERM ACTIVITIES AND GOALS

Tables B.3-6a and B.3-6b contains responses to questions regarding short-term activities and goals of 1999 and 2000 graduates. Our graduates feel the program prepares them for employment, and upon graduation, 31% of the 1999 graduates

and 50% of the 2000 graduates had accepted full-time jobs. The survey results also indicate approximately half of the graduates feel prepared for graduate study. Of the graduates surveyed, 54% had taken the FE exam in 1999, while 92% took the FE exam in 2000. About half of the students expected pursue a graduate degree within the next 5 years. We used these results to assess the Program Outcome related to the importance of life-long learning. In general, graduates would highly recommend the program to someone else.

These results reflect success in obtaining our Program Objective regarding the production of successful engineers. A large percentage of the respondents felt prepared for engineering employment. The percentage of graduates who stated they felt prepared for graduate study seems low. This may reflect the strong economy in that the seniors had already received job offers. This may indicate the need for additional experience (such as employment) prior to graduate school, or the need for our Faculty to present graduate study as a plausible step in a graduate's professional career.

Table B.3-6a. Exit Survey Short-Term Activities and Goals

1999 Survey
Responses to Forced Choice Items

	Graduate Study	Employment	Military	Volunteer	Homemaking	Travel	Undecided
Program prepared me for	6	12	1	3	1	4	1
	Graduate Study	Employment	Military	Volunteer	Homemaking	Travel	Undecided
During next 12 months I will	3	5		3		2	2
	NO	YES	Engineer	Other	Consulting	Government	Industry
Have accepted full time job? What type?	9	4	3	1	2	0	2
	GRE	EIT	LSAT	GMAT	MCAT	Other	
Graduate / professional exams	4	7					
	Definitely	Probably Yes	Probably not	Definitely not			
Plan graduate school within next 5 years?	5	4	4				
	Very Highly	Highly	Slightly	No	No response		
Would you recommend ERFEG to someone else?	2	7	4				

Table B.3-6b. Exit Survey Short-Term Activities and Goals

2000 Survey
Responses to Forced Choice Items

	Graduate Study	Employment	Military	Volunteer	Homemaking	Travel	Undecided
Program prepared me for	6	12		1		1	
	Graduate Study	Employment	Military	Volunteer	Homemaking	Travel	Undecided
During next 12 months I will		12		2			
	NO	YES	Engineer	Other	Consulting	Government	Industry
Have accepted full time job? What type?	6	6	6		3	2	1
	GRE	EIT	LSAT	GMAT	MCAT	Other	
Graduate / professional exams		11					
	Definitely	Probably Yes	Probably not	Definitely not			
Plan graduate school within next 5 years?		5	7				
	Very Highly	Highly	Slightly	No	No response		
Would you recommend ERFEG to someone else?	4	8					

EXIT SURVEY OUTCOME ASSESSMENT: INSTRUCTIONAL ACTIVITIES

The exit survey also contains questions regarding instructional activities within the department. Survey results for 1999 and 2000 are included in Table B.3-7a and B.3-7b. The 1999 and 2000 results were very similar. In general, Forest Engineering faculty received very high marks for approachability, assistance and advising, while lower marks were received for course selection and time scheduling. In 1999, some students felt College resources and equipment were not easily available or accessible, while these sentiments appear to dissipate in the 2000 survey results.

Table B.3-7a. Exit Survey Instructional Activities: 1999 Survey						
	strongly disagree				strongly agree	
Instructional Activities	1	2	3	4	5	Average
Course selection was adequate		3	5	2	2	3.3
Time schedule convenient		2	4	3	3	3.6
Easy to obtain faculty assistance		1	1	4	6	4.3
Easy to obtain department assistance			1	5	6	4.4
Easy to obtain TA help		1	1	6	4	4.1
Necessary equipment available		2	3	4	3	3.7
College resources accessible		2	2	4	4	3.8
Faculty advising easily obtained		1	1	4	6	4.3
Counseling easily obtained		1	2	3	6	4.2
Faculty members easy to approach			1	1	10	4.8
TA easily found during office hours			2	5	5	4.3

Table B.3-7b. Exit Survey Instructional Activities: 2000 Survey						
	strongly disagree				strongly agree	
Instructional Activities	1	2	3	4	5	Average
Course selection was adequate			4	7	1	3.8
Time schedule convenient		1	5	6		3.4
Easy to obtain faculty assistance			1	7	4	4.3
Easy to obtain department assistance			1	7	4	4.3
Easy to obtain TA help			3	6	3	4.0
Necessary equipment available			1	9	2	4.1
College resources accessible				10	2	4.2
Faculty advising easily obtained			3	6	3	4.0
Counseling easily obtained			6	4	2	3.7
Faculty members easy to approach			1	6	5	4.3
TA easily found during office hours			3	6	3	4.0

SUGGESTED FUTURE CHANGES TO EXIT SURVEY

In its present form, the exit survey provides more of an assessment of Program Objectives and the adequacy of instructional resources. These questions do not directly address Program Outcomes, and additional questions should be included in the future. One possible scenario would have students respond to the various statement such as "I can work on a multidisciplinary team," etc.

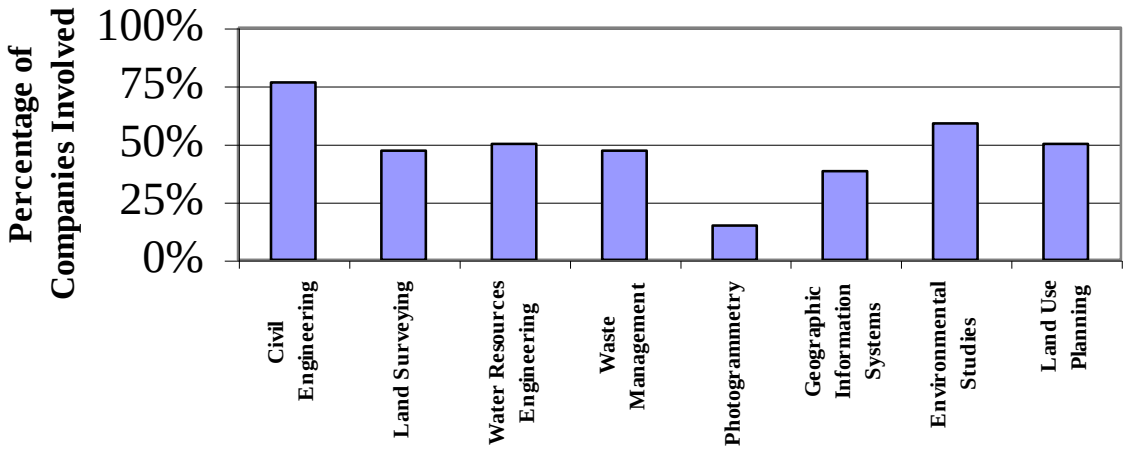
EMPLOYER SURVEY

To better ascertain the strengths and weaknesses of our graduates, an employer survey was developed. This survey was sent to 130 companies, and 34 of the surveys were returned (26%). The employer survey provides a tool to assess our desired program outcomes. This was the first employer survey the Faculty of Environmental Resources and Forest Engineering has distributed, and thus we do not have the opportunity to compare it to past surveys (unlike the alumni survey).

COMPANY DESCRIPTIONS

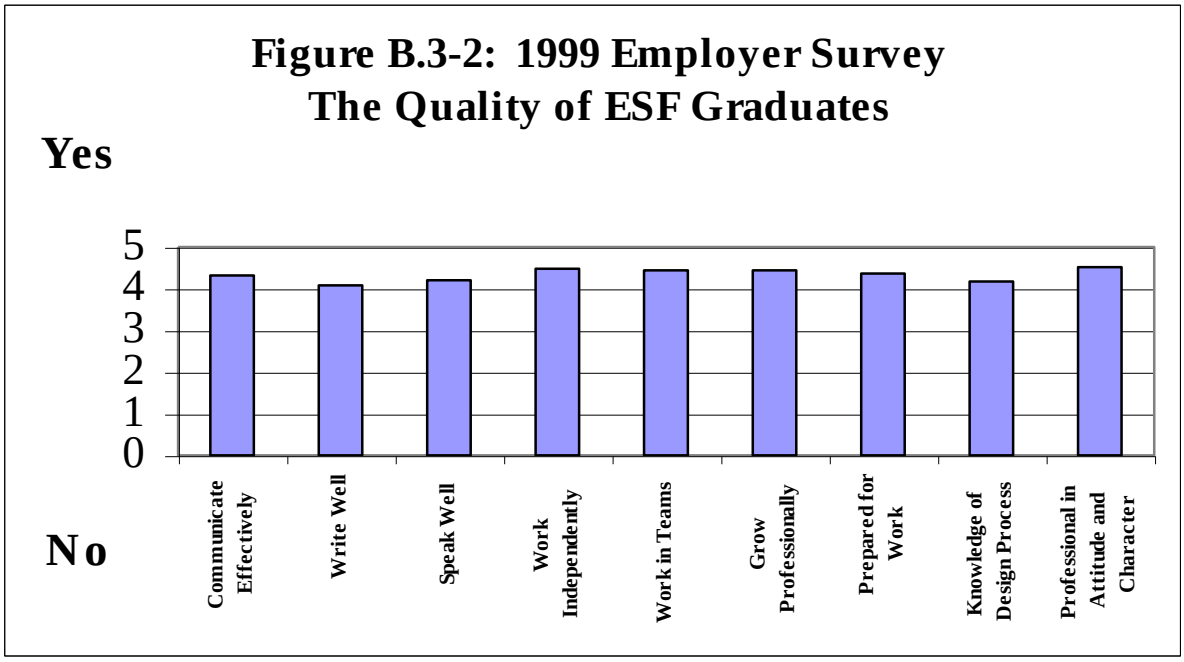
The companies that returned the survey ranged in size, with 21% having 10 or fewer employees and 44% having more than 50. Over 35% of the companies surveyed employed more than one ERFEG graduate within the past 5 years, and over 82% currently employed a Forest Engineering graduate. As shown in Figure 1, these companies participated in a range of professional activities which reflects the breadth of our undergraduate program and the ability of our graduate engineers to function in a variety of career options. In addition, 77% of the respondents indicated that registration as a Professional Engineer is important for professional advancement at their company.

Figure B.3-1: 1999 Employer Survey
Companies Professional Involvement



EMPLOYER SURVEY OUTCOME ASSESSMENT

Employers were asked to grade the performance of Forest Engineering graduates in the workplace. Questions were designed to assess topics such as communication skills and professional abilities to professional attitude and character. Grade options were 1 through 5, with 5 being the highest grade. Figure 2 displays the average results from this survey.



For all questions asked, Forest Engineering graduates received an average score above 4.0. The highest scores were for Professional in Attitude and Character (4.52), Ability to Work Independently (4.48), Work in Teams (4.44), and Grow Professionally (4.44). This result indicates two strengths of our program: the ability of our graduates to work both independently and in team settings, and the character in which our graduates approach the engineering profession. It also provides some indication that many desired program outcomes are being achieved. These include the production of graduates who:

- Are competent to perform in an engineering environment
- Have sufficient backgrounds/tools to function effectively
- Exhibit the knowledge, skills and attitude of a competent engineer
- Can function effectively in a team environment
- Understand the need for life-long learning

The lowest scores were for Writing (4.08) and Speaking (4.20) abilities, and Knowledge of the Design Process (4.17). Communication skills are a known weakness of many graduating engineers, yet are crucial tools for successful professionals. The Faculty of Environmental Resources and Forest Engineering has been working to improve these skills in our graduates. Many courses have newly employed semester projects and presentations that are designed to improve student communication skills. In addition, we are currently redesigning both of our undergraduate design courses where we will further investigate the design process. These lower scores may indicate the need to further explore ways to train engineers to achieve the program outcomes to produce graduates who:

- Have the ability to conceptualize problems in terms of unifying principles
- Are capable of utilizing an engineering approach to problem solving
- Can communicate their ideas and expectations effectively

SUGGESTED FUTURE CHANGES TO EMPLOYER SURVEY

The employer survey provides the Faculty another tool to assess our program outcomes. This was the first time an employer survey was distributed, and slight modifications to its format may improve this tool. As a Faculty, we discussed ways to improve the Employer Survey at our recent (June 2000) Faculty Retreat. Two suggestions are to:

1) Change the grading scale so that is more informative. Currently the survey asks whether Forest Engineering graduates possess a certain desirable engineering characteristic, with the answer being either Yes (5) or No (1). One problem with this is that it is difficult to understand to whom the answer is relative. It might be more informative to ask instead "Compared to other engineers at your company, Forest Engineering graduates are Above Average (5), or Below Average (1)." Under this system, (3) is an average score. This may help us better understand how our graduates perform in their professions.

2) Include a section to obtain more written feedback from respondents. This might include:
    - List the 3 biggest strengths of Forest Engineering graduates:
    - List the 3 biggest weaknesses of Forest Engineering graduates:
    - What changes would you suggest to the Forest Engineering curriculum (courses to include, useful engineering design experiences, etc.)?

- What professional areas do you see expanding in the next 3 to 5 years?

Both of these changes might give us more specific information regarding Forest Engineering graduates and ways to improve our curriculum and the quality of our program. It should be noted, though, that large changes to the present employer survey could also be counterproductive, since such actions might hinder efforts to compare surveys given in different years.

PROGRAM RESPONSE TO ASSESSMENT

There are a number of ways in which the Faculty has responded to past program assessments. Some of these are discussed below.

As a Faculty, we have realized that communication skills are often a weakness of engineering graduates. To account for this, many courses have developed new exercises to improve communication skills. For instance:

- In the senior capstone design course (FEG 489) students produce progress reports, have video-taped practice oral presentations, and produce a final design report and formal oral presentation.

- Courses including APM 395, FEG 430, FEG 437, and FEG 454, which traditionally have not had a project/report component, now include semester projects where students work on communicating technical information in a clear and concise manner.

- FEG 448, a popular senior design elective, requires students to participate in a group design project. Students prepare final written and oral presentations. In addition, students develop a poster of their final design project that is presented at the annual ESF Spotlight on Graduate and Undergraduate Research. The posters are also used in various Faculty recruiting activities.

The Faculty has also realized the importance of design experiences for engineering undergraduates. In response, we are currently improving the FE300/489 design sequence. FE489, the senior capstone design course, has been developed into a professional design experience. Students have clients to which they report, keep track of time spent on the project, and develop Gantt Charts and detailed progress reports. In addition, this course exposes students to many new professional issues and reinforces topics from other classes. These topics include:

- Resume writing and interviewing

- 1st year on the job experiences (by recent graduates)
- Engineering ethics
- Technical writing
- Professional management

A number of faculty have also participated in workshops and presentation on improving undergraduate education in engineering. These experiences have translated into improved classroom teaching, and have aided in the development of our Program Objectives and Outcomes.

SUMMARY STATEMENT AND FUTURE ASSESSMENT ACTIVITIES

The Faculty has invested considerable effort into developing an assessment program to the point we can begin to modify our teaching and curriculum on the basis of the data we collected. The assessment program is a work in progress, and we envision changes and improvements as we gain more experience with the overall process. For example, we hypothesize that the best way to convince students of the need for life-long learning is to remind them of their intellectual growth while in our program We have therefore begun to assemble student portfolios in electronic format. We provided each of last year's freshmen with a Read/Write CD. The CDs will be stored in the Faculty office, and we will archive selected class assignments onto them. We started modestly last year, with a class assignment from APM 153, Computing Methods for Engineers and Physical Scientists. We will include, for next year's freshmen, assignments from their freshman writing class as well. We will present graduating seniors with a copy of their CD, and keep one for our use.

We will also explore an enhanced use of the SUNY-ESF Student End-of-Course Questionnaire. The form provides the opportunity to ask, and receive statistical summaries of, instructor generated items in addition to the standard suite of questions. We will explore the use of selected items to assess activities specific to our program, and that speak to the Program Outcomes. For example, we might generate items pertaining to design exercises, or communication skills. Of course, as we gain experience with the assessment process, we will continue to assess and modify the Program Outcomes themselves.

CRITERION 4. PROFESSIONAL COMPONENT

INTRODUCTION

The Faculty has spent considerable time and effort in developing and articulating the Forest Engineering curriculum. Curriculum matters are discussed at every semester-end faculty retreat, and most faculty meetings. We participate in campus activities concerning teaching and learning, and coordinate our activities with the other engineering units at ESF and Syracuse University.

1999-2000 CURRICULUM

The table on page 48 describes the curriculum offered during the 1999-2000 academic year, and is described in that year's catalog. The curriculum features:

1. Math and Science (38 credit hours)
   - 15 credit hours of calculus through differential equations,
   - 3 credit hours of calculus-based probability and statistics
   - 8 credit hours of calculus-based physics, with laboratory
   - 8 credit hours of chemistry, with lab experience
   - 4 credit hours of botany, with laboratory

2. Other (17 credit hours)
   - 1 credit hour of orientation
   - 3 credit hours of writing
   - 3 credit hours of computer programming
   - 1 credit hour of engineering graphics
   - 2 credit hours of dendrology
   - 3 credit hours of forest ecology and silviculture
   - 1 credit hour of harvest systems
   - 3 credit hours of principles of management

3. Humanities and Social Sciences (18 credit hours)
   - 6 credit hours of economics
   - 3 credit hours of literature
   - 9 credit hours of electives

4. Engineering Sciences (24 credit hours)
   - 5 credit hours of statics and dynamics

- 4 credit hours of electrical sciences
- 3 credit hours of mechanics of materials
- 3 credit hours of surveying
- 4 credit hours of fluid mechanics
- 2 credit hours of remote sensing
- 3 credit hours of engineering decision analysis

5. Engineering Courses with a Design Component (30 credit hours)
   - 1 credit hour of engineering design
   - 4 credit hours of engineering hydrology
   - 3 credit hours of photogrammetry
   - 3 credit hours of mechanical design
   - 4 credit hours of structures
   - 4 credit hours of soil mechanics
   - 3 credit hours of transportation engineering
   - 2 credit hours of power systems
   - 3 credit hours of water pollution engineering
   - 3 credit hours of an approved engineering design elective

6. Capstone Course (3 credit hours)
   - 3 credit hour design course in the spring semester of the senior year.

The grouping of courses presented above is consistent with previous ABET guidance. The curriculum concentrates math and science in the first two years, with a considerable amount of engineering sciences as well. The student engages engineering design courses beginning in the junior year.

FOREST ENGINEERING
Effective 1999-2000

FALL				***SPRING***			
FRESHMAN YEAR							
MAT 295	*Calculus I*	*4*	M&S *	*MAT 296*	*Calculus II*	*4*	M&S
PHY 211	*Engr Physics I*	*3*	M&S	*FOR 206*	*Microeconomics*	*3*	H/SS
PHY 221	*Engr Phy. Lab*	*1*	M&S	*PHY 212*	*Engr. Physics II*	*3*	M&S
EFB 226	*Gen. Botany*	*4*	M&S	*PHY 222*	*Engr. Phy.II Lab*	*1*	M&S
CLL 190	*Writing & Environ*	*3*	O	*APM 153*	*Compt. Methods*	*3*	O
FEG 132	*Orientation*	*1*	O	*Elective*	*Human/Social Sci*	*3*	H/SS
		16				*17*	
SOPHOMORE YEAR							
MAT 397	*Calculus III*	*4*	M&S	*MAT 485*	*Diff.Eq/Matrix Alg.*	*3*	M&S
CHE 106	*Gen. Chem. I*	*3*	M&S	*ERE 222*	*Dynamics*	*2*	E
CHE 107	*Gen. Chem. Lab*	*1*	M& S	*ELE 231*	*Elec. Sci.*	*4*	E
ERE 221	*Statics*	*3*	E	*CHE 116*	*Gen. Chem. II*	*3*	M&S
ERE 225	*Engr. Graphics*	*1*	O	*CHE 117*	*Gen. Chem. II Lab*	*1*	M&S
FOR 205	*Macroeconomics*	*3*	H/SS	*ERE 362*	*Mech/Materials*	*3*	E
				CLL 290	*Perspectives on the Environment*	*3*	H/SS
		15				*19*	
JUNIOR YEAR							
ERE 371	*Surveying/Engr*	*3*	E	*FEG 340*	*Eng. Hydro & Flow Controls*	*4*	E-D
MAE 341	*Fluid Mech.*	*4*	E				
EFB 335	*Dendrology*	*2*	O	*FEG 350*	*Remote Sensing*	*2*	E
FOR 321	*For.Ecol/Slvctr*	*3*	O	*FEG 363*	*Photogrammetry I*	*3*	E-D
FEG 300	*Engr. Design*	*1*	E-D	*ERE 385*	*Mech. Design*	*3*	E-D
Elective	*Human/Social /Sci*	*3*	H/SS	*APM 395*	*Prob & Stat/Engrs*	*3*	M&S
				ERE 351	*Basic Eng. Thermo.*	*2*	E
		16				*17*	
SENIOR YEAR							
FEG 410	*Structures I*	*4*	*E-D*	*FEG 437*	*Transportation*	*3*	E-D
FEG 420	*Harvest Systems*	*1*	O	*FEG 454*	*Power Systems*	*2*	E-D
FEG 430	*Eng. Dec. Analysis*	*3*	E	*FEG 489*	*FEG Plan/Design*	*3*	E-D
CIE 337	*Soil Mechanics*	*4*	E-D	*ERE 440*	*Water Pol. Eng.*	*3*	E-D
FOR 360	*Res. Polcy/Mgmt*	*3*	O	*Elective*	*(Design at least 1 cr)*	*3*	E-D
Elective	*Human/Social Sci*	*3*	H/SS				
		18				*14*	

**EAC / ABET Categories*

M*ath &* **S***cience = 38*	**E***ngineering = 56*	*No. of Engineering Courses* **E** *= 20*
O*ther = 17*	**H***umanitites &* **S***ocial* **S***cience = 18*	*No. of Engin-Design Courses* **E-D** *= 11*

2000-2001 CURRICULUM

The Board of Trustees of the State University of New York required all SUNY campuses to address the issue of General Education, and to implement a General Education program of at least 30 credit hours for the freshmen entering for the 2000-2001 academic year. SUNY-ESF undertook a campus-wide effort to implement the General Education guidelines, and as a result each academic unit modified their undergraduate program to accommodate the requirements.

The SUNY Board of Trustees identified three Areas of Competency and nine Knowledge and Skill Areas. The Areas of Competency are:

1. Basic Communications
2. Critical Thinking
3. Information Management

The nine Knowledge and Skills areas are:

1. Mathematics
2. Natural Sciences
3. Social Sciences
4. American History
5. Western Civilization
6. Other World Civilizations
7. Humanities
8. The Arts
9. Foreign Language

The Faculty participated in the campus-wide discussions regarding the General Education initiative. The Faculty compared the Trustees Areas of Competency with the Forest Engineering Program Objectives and Outcomes (see discussion of Criteria 2 and 3) and decided the Areas of Competency were already addressed by our own Program Outcomes, although not in the exact same terms. Table B.4-1 maps our Program Outcomes with the Board of Trustees Areas of Competency. As discussed in the sections for Criteria 2 and 3, our Program Objectives and Outcomes are a work in progress; we may modify them to more explicitly deal with the Trustees' Areas of Competency as we gain more experience with the General Education initiative.

Table B.4-1. Comparison of SUNY Board of Trustees Areas of Competencies to Forest Engineering Program Outcomes	
SUNY Area of Competency	Forest Engineering Program Outcomes
Basic Communications	Can communicate their ideas and expectations effectively
Critical Thinking	Are capable of utilizing an engineering approach to problem solving
Information Management	Can communicate their ideas and expectations effectively Have sufficient background/tools to function effectively in an engineering environment

The Faculty modified the Forest Engineering curriculum to incorporate the nine Knowledge and Skills areas, as described in Table B.4-2 and the table on page 51. In general, the changes were minor. The following presentation summarizes the changes, and the effects on our program.

Table B.4-2. Faculty of Environmental Resources and Forest Engineering Implementation of SUNY Board of Trustees Knowledge and Skills Areas	
Knowledge and Skill Area	Implementation
Mathematics	6 credit hours of calculus
Natural Sciences	6 credit hours of physics, or chemistry, or botany
Social Sciences	3 credit hours of economics, combining both macro- and microeconomics
American History	Elective(*)
Western Civilization	Elective(*)
Other World Civilizations	Elective(*)
Humanities	3 credit hours of a literature course, emphasizing the literature of nature
The Arts	Elective(*)
Additional coverage	3 credit hour elective, at the 300 or above level
Foreign Language	SUNY-ESF asked for, and was granted a waiver for this requirement
(*) Course may cover multiple knowledge and skills areas All electives are selected by the student in conjunction with the academic advisor from a list of approved courses.	

FOREST ENGINEERING
Incorporating General Education Requirements (2000-2001)

FALL				*SPRING*			
FRESHMAN YEAR							
MAT 295[7]	*Calculus I*	*4*	M&S/GE*	*MAT 296*[1]	*Calculus II*	*4*	M&S/GE
PHY 211[2]	*Engr Physics I*	*3*	M&S/GE	*PHY 212*	*Engr. Physics II*	*3*	M&S/GE
PHY 221	*Engr Phy. Lab*	*1*	M&S	*PHY 222*	*Engr. Phy.II Lab*	*1*	M&S
EFB 226[2]	*Gen. Botany*	*4*	M&S	*APM 153*	*Compt. Methods*	*3*	O
CLL 190[3]	*Writing & Env*	*3*	O/GE	*Elective*[4]	*General Ed*	3	H-SS/GE
FEG 132	*Orientation*	1	O	*Elective*[5]	*General Ed*	3	H-SS/GE
SOPHOMORE YEAR							
MAT 397	*Calculus III*	*4*	M&S	*MAT 485*	*Diff.Eq/Matrix Alg.*	*3*	M&S
CHE 106	*Gen. Chem. I*	*3*	M&S	*ERE 222*	*Dynamics*	*2*	E
CHE 107	*Gen. Chem. Lab*	*1*	M&S	*ELE 231*	*Elec. Sci.*	*4*	E
ERE 221	*Statics*	*3*	E	*CHE 116*	*Gen. Chem. II*	*3*	M&S
ERE 225	*Engr. Graphics*	*1*	O	*CHE 117*	*Gen. Chem. II Lab*	*1*	M&S
FOR 207[6]	*Economics*	3	H-SS/GE	*ERE 362*	*Mech/Materials*	*3*	E
				CLL 290[7]	*Perspectives on the Environment*	3	H-SS/GE
JUNIOR YEAR							
ERE 371	*Surveying/Engr*	*3*	E	*FEG 340*	*Eng. Hydro & Flow Controls*	*4*	E-D
MAE 341	*Fluid Mech.*	*4*	E	*FEG 350*	*Remote Sensing*	*2*	E
EFB 335	*Dendrology*	*2*	O	*FEG 363*	*Photogrammetry I*	*3*	E-D
FOR 321	*For.Ecol/Slvctr*	*3*	O	*ERE 385*	*Mech. Design*	*3*	E-D
FEG 300	*Engr. Design*	*1*	E-D	*APM 395*	*Prob & Stat/Engrs*	*3*	M&S
Elective[8]	*General Education*	3	H-SS/GE	*ERE 351*	*Basic Eng. Thermo.*	2	E
SENIOR YEAR							
FEG 410	*Structures I*	*4*	*E-D*	*FEG 437*	*Transportation*	*3*	E-D
FEG 420	*Harvest Systems*	*1*	O	*FEG 454*	*Power Systems*	*2*	E-D
FEG 430	*Eng. Dec. Analysis*	*3*	E	*FEG 489*	*FEG Plan/Design*	*3*	E-D
CIE 337	*Soil Mechanics*	*4*	E-D	*ERE 440*	*Water Pol. Eng.*	*3*	E-D
FOR 360	*Res. Polcy/Mgmt*	*3*	O	*Elective*	*(Design at least 1 cr)*	3	E-D
Elective[9]	*Upper Level Hum/SS*	3	H-SS/GE				

* *EAC / ABET Categories*

M*ath &* **S***cience = 38*	**E***ngineering = 56*	*No. of Engineering Courses*	**E** *= 20*
O*ther = 17*	**H***umanities &* **S***ocial* **S***cience = 18*	*No. of Engin-Design Courses*	**E-D** *= 11*

[7] Fulfills Quantitative Requirement for General Education (3)
[1] Fulfills Quantitative Requirement for General Education (3)
[2] Fulfills Natural Science Requirement for General Education (3)
[2] Fulfills Natural Science Requirement for General Education (3)
[3] Fulfills Basic Communication Requirement for General Education (3)
[4] Multiple Purpose General Education Requirement (3)
[5] Multiple Purpose General Education Requirement (3)
[6] Fulfills Social Science Requirement for General Education (3)
[7] Fulfills Humanities Requirement for General Education (3)
[8] Multiple Purpose General Education Requirement (3)
[9] *Elective must be at the 300 or above level*

Note: The courses referenced as footnotes 4, 5 and 8 collectively fulfill general education requirements in American History, Western Civilization, Other World Civilizations, and The Arts. The three courses are thus designated as Multiple Purpose courses. The course referenced as footnote 9 is to provide depth of coverage in some area of interest as selected by the student.

The implementation of the SUNY Trustees' General Education requirements does not alter the distribution of courses in the EAC/ABET categories, as can be seen by the summary of the courses in Table B.4-3 and the table on page 51. However, the curriculum changes will have effects on the Forest Engineering program. First, other faculty units at ESF (notably the Faculty of Environmental Studies) will be designing courses to meet the General Education requirements. This provides our Faculty the opportunity to provide input as to course content, timing, etc. We see this as a positive, and have suggested that some of the General Education courses be designed to provide an opportunity for students from different undergraduate programs to engage in the study of environmental issues (e.g., global warming) from a broad, multidisciplinary perspective. The General Education component of the Forest Engineering program could thus be more in concert with the overall mission of ESF. Second, the Faculty will have to address the changes in terms of student advisement. The College is preparing, with input from our Faculty, new Curriculum Plan Sheets, but we still have to help our students understand their choices. Third, the General Education courses will become a part of our on-going program assessment.

CURRICULUM DESIGN AND PROGRAM OUTCOMES

The sequence of courses indicates the structure of the Forest Engineering program. However, a more meaningful analysis shows the relationship between program outcomes and instructional activities in specific courses. The following table provides this information. Please note that the information in the table is for the instructional activities in *engineering* courses only and excludes, for example, activities in the Writing and the Environment course.

Table B.4-3. Forest Engineering Program Outcomes and Illustrations of Specific Course/Instructional Activities to Achieve Outcomes	
Program Outcome	Course(s)/Instructional Activity
Can communicate their ideas and expectations effectively	ERE 225 Engineering Graphics: Preparation of engineering drawings FEG 300: Engineering Design: Oral and written report of class design project ERE 371 Surveying: Design and preparation of topographic map FEG 340 Engineering Hydrology: Oral reports of lab assignments FEG 363 Photogrammetry: Preparation of poster describing class design project ERE 385 Mechanical Design: Oral report of class design project CIE 337 Soil Mechanics: Formal, written laboratory reports FEG 489 Engineering Planning and Design: Formal oral presentation and written report of semester long design project
Can function effectively in a team environment	ERE 225 Engineering Graphics: Students work on project as a team FEG 300 Engineering Design: Students work on project as a team ERE 371 Surveying: Teams of students plan and execute a survey, and generate a topographic map based on their survey design. FEG 363 Photogrammetry: Students work on final design project as a team FEG 340 Engineering Hydrology: Students work on final design project as a team. CIE 337 Soil Mechanics: Students work on final laboratory assignments and generates reports as a team. FEG 489 Planning and Design: Students work on semester design project as a team. Guest instructor discusses group dynamics and effective strategies for teamwork.

Table B.4-3. (Continued)

Program Outcome	Course(s)/Instructional Activity
Are capable of utilizing an engineering approach to problem solving	FEG 300 Engineering Design: Students are introduced to formal engineering design process. FEG 430 Engineering Decision Analysis: Students do economic analysis of alternatives for disinfection of drinking water. ERE 440 Water Pollution Engineering: Students apply design process to two design problems FEG 489 Planning and Design: Formal design process is applied to semester long project.
Have the ability to conceptualize problems in terms of unifying principles	The curriculum includes theory-rich courses followed by applications courses that reinforce fundamental principles. Examples: MAE 341 Fluid Mechanics followed by FEG 340 Engineering Hydrology, which includes hydraulics. ERE 351 Thermodynamics followed by FEG 454 Power Systems.
Have sufficient back-ground/tools to function effectively	The Math and Science and Engineering Science courses are intended to provide technical background, while the Humanities and Social Sciences courses are intended to place technical activities in a broader social context.
Have sufficient back-ground/tools to function effectively (continued)	Some engineering courses provide tools to be used in other courses. APM 153 Computing Methods: Students design computer programs as one means of problem solving ERE 225 Engineering Graphics: Students display engineering data. ERE 371 Surveying: Mapping activities assist in visualizing topographic and spatial information. APM 395 Engineering Statistics: Students analyze data to determine significance of data. FEG 430 Engineering Decision Analysis: Methods to choose among alternative solutions to a problem.

Table B.4-3. (Continued)

Program Outcome	Course(s)/Instructional Activity
Are competent to perform in an engineering environment	FEG 132 Orientation: Discussion of differences between science and engineering FEG 300 Engineering Design: Students learn formal engineering methodology FEG 489 Planning and Design: Semester long design project with formal oral presentation, written report, and class discussions related to professional behavior and expectations.
Exhibit attributes of a competent engineer: Knowledge	Math and Science, Engineering Science, and Engineering Science and Design courses
Exhibit attributes of a competent engineer: Skills	APM 153 Computing Methods for Engineers and Physical Scientists: Students write and document several computer programs. ERE 225 Engineering Drawing: Students create engineering drawings using appropriate software. FOR 360 Principles of Management: Students discuss management styles. FEG 363 Photogrammetry: Students use MATHCAD to solve series of linear equations. ERE 371 Surveying for Engineers: Students plan and create a topographic map. FEG 430 Engineering Decision Analysis: Students analyze and interpret data for a water resources project.
Exhibit attributes of a competent engineer: Professional ethics	FEG 132 Orientation: Discussion of issues surrounding construction of Citicorp Building FEG 489 Planning and Design: Class discussion led by guest lecturer (a lawyer) on professional responsibilities and potential sanctions for misconduct.

ENGINEERING DESIGN ELECTIVES

Forest Engineering students can elect one engineering design elective to explore an area of particular interest. Currently the Faculty allows the following courses to fulfill this curriculum requirement:

- CIE 332 Structures II
- CIE 338 Soil Mechanics and Foundations II
- ERE 441 Air Pollution Engineering
- FEG 448 Advanced Topics in Hydraulics
- FEG 464 Photogrammetry II
- ERE 596 Hazardous Waste Management

Details of these courses can be found in Appendix.

CAPSTONE DESIGN EXPERIENCE

FEG 489 Engineering Planning and Design is an important professional component of the Forest Engineering program. The course objective is to provide a major design experience at the culmination of the student's curriculum. The experience is based on the knowledge and skills acquired in earlier coursework and incorporates engineering standards and realistic constraints that include some or all of the following: economic; environmental; sustainability; constructability; manufacturability; ethical; health; safety; social; regulatory; and political. The students will strengthen their problem-solving skills. Teamwork, critical thinking, evaluation and assessment form the core of the course, where students will develop skills that will assist them in becoming lifelong learners and self-growers.

At the completion of FEG 489, each student will have:

1. An ability to apply the knowledge of mathematics, science and engineering to open-ended engineering design problems.

2. An ability to use project management tools, techniques and skills, such as scheduling, resource allocation, cost estimating, time management and documentation, to effectively manage the execution of engineering design projects.

3. An ability to formulate a problem solving and design approach for a system, component or process to meet the desired needs.

4. An ability to communicate effectively with partners, supervisors, subordinates, clients, public citizens and regulatory agencies using oral and written formats such as memos, letters, technical design reports, drawings, specifications and public presentation.

5. An ability to understand the roles of each team member and to function effectively as a contributing member of an engineering design team.

6. An ability to discern the problem and define the client's needs to effectively solve the problem to the satisfaction of the client.

7. An appreciation for the professional, legal and ethical responsibility of the engineer.

8. An ability to use learning skills as part of continuing growth and development.

Students are assigned to design a solution to a broad, complex problem. Solutions are found through a rigorous problem analysis and a search for and evaluation of practical alternative solutions. Students are expected to specify a chosen alternative that meets the design criteria established by the student team for that problem. Students are expected to follow a design process, driven largely by their own initiative, that involves inquiry, deliberation, evaluation, innovation and attention to professional duty. Students are expected to:

1. Investigate problems and synthesize information
2. Propose and test alternative solutions
3. Develop designs for critical elements of the project
4. Study, evaluate and revise designs as needed
5. Prepare and make oral presentations of the work
6. Write, edit and revise reports suitable for publication and professional presentation

The course involves the structured guidance, assessment and evaluation of the students' work and their individual progress in becoming self-growers. Students receive guidance in the systematic application of engineering design and project management skills to solve complex, environmentally-related, "real world" problems.

Students are expected to record project correspondence in a logical format as part of the documentation process. While much of the assessment and evaluation is expected to be in written form, any verbal communications germane to the project completion between instructor and student are written by the student as part of the project record. This ensures a mutual understanding has been reached.

Student participation in the classes and as part of a team is essential to success in this course. Students are expected to participate in classes, labs, field trips, investigations, guest speaker presentations, report writing, and oral presentations. Students maintain project management records and personal reflecting journals in addition to the usual class notes.

EVALUATION AND ASSESSMENT TOOLS USED IN FEG 489

Student performance in FEG 489 is evaluated and assessed using a number of methods and products. The significant products produced by individual students and student teams are described in the following section. The products and assessment processes are: Final Team Oral Presentation; Final Team Engineering Design Report; Final Solution; Team Peer Evaluation; Project Management Records; Personal Reflecting Journal; Client Evaluation; and Instructor Assessment.

Final Team Oral Presentation

The presentation is one of the two principal products related to the design project. The oral presentation is made before an audience of peers, faculty and professional colleagues at the end of the semester. Evaluation criteria, focusing on the delivery and quality of the presentation, are provided in class.

Final Team Engineering Design Report

The Engineering Design Report is the second principal product related to the design project. The instructor evaluates the written report for conformance with the guidelines and specifications provided in class. The documentation of the design process, calculations and graphics form a significant portion of the evaluation.

Final Solution

The problem solution is evaluated against the criteria developed by the team. The robustness of the solution and adherence to the definition of a high quality solution is the primary focus of the evaluation.

Team Peer Evaluation

Each team member provides an evaluation of the other team members' contributions to the team's success. Guidelines are provided in class. Students are exposed to an ongoing system of performance assessment throughout the semester, and are thus prepared to assess and evaluate peer contributions.

Project Management Records

Each team is required to keep a project management notebook charting progress and decisions throughout the semester. The team is evaluated on its ability to document the project completely and accurately. The project management notebook contains, at a minimum: time records; schedule; client meeting record; team meeting records; team self-assessment; scope of work; communications; team contact information; and change orders. Bi-weekly assessment of the notebook by the instructor is used to guide the team's success.

Personal Reflecting Journal

Each individual is required to keep a journal, separate from the usual management notebook that records assignments, notes, calculations and "to do" lists. The journal is used to perform self-assessments that reflect on the individual's learning experiences throughout the semester. The students are evaluated on their ability to keep their journals current and complete.

Client Evaluation

The client or the client's representative evaluates the design project. The team and its individual members are evaluated on their understanding of the problem, their ability to develop a solution that satisfies the client's needs and the quality of their communication with the client.

Instructor Assessment

Student progress is assessed regularly throughout the semester. Key tools that are used for assessment include, but are not limited to: performance during structured activities; Project Management Notebook; weekly team reports; personal journal assessment; 30% Engineering Design Report; 75% Engineering Design Report.

Instructor assessment of student performance occurs throughout the semester. These assessments may be real-time (occurring during the execution of an activity), formative, or summative (occurring at the conclusion of an activity). Instructor assessments may focus on a number of factors, ranging from basic knowledge of science and engineering to teamwork skills to communication skills. Instructor assessments may take place for individual students or for teams. Student self-assessments are also used to identify areas of strength, areas for improvement, and shared insights in the design and learning processes.

CRITERION 5. FACULTY

INTRODUCTION

The Faculty consists of six full-time faculty members, all of whom have either the Ph. D. or M. S. with the additional credential of Professional Engineer. In addition, two faculty members split their assignments between the Faculty of Environmental Resources and Forest Engineering, and the Faculty of Forestry. Both of these individuals have Ph. D. degrees in engineering fields.

The Faculty experienced one recent retirement (a Senior Research Associate, December 1999), and the Faculty had to use an Adjunct Faculty during the Spring 2000 semester to deliver one required course in the Forest Engineering program. The Adjunct is a Professional Engineer and works for a local consulting firm. He is also a graduate of our Forest Engineering program. A search has been authorized for a new faculty member to replace the Senior Research Associate. The search committee has been formed and the search should be well underway during the Fall of 2000.

Some required engineering courses are taught by engineering faculty outside the Faculty of Environmental Resources and Forest Engineering, as summarized in Table B.5-1. Forest Engineering students take three courses from the L. C. Smith College of Engineering at Syracuse University as part of their required course work, and have the option of taking selected Syracuse University courses as engineering design electives. The engineering programs at Syracuse University are ABET-accredited, and the instructors are highly qualified.

Forest Engineering students also receive instruction in engineering courses from faculty members associated with the Faculty of Construction Management and Wood Products Engineering. Again, the instructors are qualified by virtue of their engineering degrees and extensive consulting experience.

The following table details the faculty affiliations for engineering courses taught to Forest Engineering students during the 1999-2000 academic year. It is seen that faculty members from the Faculty of Environmental Resources and Forest Engineering teach the majority of engineering courses in the Forest Engineering program.

Table B.5-1. Faculty Affiliations for Engineering and Engineering Science Courses Taught to Forest Engineering Students During the 1999-2000 Academic Year	
Engineering Courses	Faculty Affiliations
ELE 231 Electrical Science MAE 341 Fluid Mechanics CIE 337 Soil Mechanics	L. C. Smith College of Engineering, Syracuse University
ERE 221 Statics ERE 222 Dynamics ERE 362 Mechanics of Materials ERE 385 Mechanical Design FEG 410 Structures	Faculty of Construction Management and Wood Products Engineering, SUNY-ESF
FEG 300 Engineering Design ERE 371 Surveying FEG 340 Engineering Hydrology(*) FEG 350 Remote Sensing FEG 363 Photogrammetry FEG 430 Engineering Decision Analysis FEG 437 Transportation ERE 440 Water Pollution Engineering FEG 489 Planning and Design	Faculty of Environmental Resources and Forest Engineering
FEG 454 Power Systems	Adjunct Faculty
(*) Faculty member has a split appointment with Faculties of Forestry (80%) and Environmental Resources and Forest Engineering (20%).	

FACULTY COMPETENCIES

Table B.5-2 shows the competency areas for faculty in the Faculty. The curriculum vitae (Appendix I) give more detailed information to support the information in the table.

Table B.5-2. Competency Areas for Faculty of Environmental Resources and Forest Engineering Members

Faculty Member	Comments
R. Brock	Ph. D., Civil Engineering, Cornell University. Research interests in analytical photogrammetry and applications of Global Positioning Systems.
M. Duggin	Ph. D., Physics, Monash University. Research interest in atmosphere-sensor interactions.
P. Hopkins	Ph. D., Civil and Environmental Engineering, University of Wisconsin. Research interests in innovative mapping technologies.
J. Hassett	Ph. D., Civil Engineering, Syracuse University. Research interests in watershed processes and drinking water quality.
C. Kroll	Ph. D., Civil and Environmental Engineering, Cornell University. Research interests in stochastic hydrology and hydrologic modeling.
T. Endreny(*)	Ph. D., Civil Engineering and Operations Research, Princeton University. Research interests in innovative rainfall-runoff models.
D. Daley	M. S. SUNY-ESF, P. E., Research interests in waste management and environmental restoration.
C. Davis(*)	Ph. D., Forest Operations, Purdue University. Research interests in timber stand management.
(*)Faculty members have a split appointment with Faculties of Forestry and Environmental Resources and Forest Engineering.	

The faculty are clearly competent, at least by statement of credentials, to deliver instruction in the core components of the Forest Engineering program. However, like engineering faculties elsewhere, we struggle with the Professional Engineer/Doctor of Philosophy question. Our two recent hires (C. Kroll and D. Daley) represent one of each credential, and we are unsure of how the search for the newly authorized faculty member will progress. We have found it difficult to attract faculty members with both credentials.

INTERACTIONS WITH STUDENTS: GENERAL

In general, faculty members in the Faculty of Environmental Resources and Forest Engineering maintain a close working relationship with the undergraduate students. The faculty do almost all of the teaching, including laboratory sessions. Graduate Teaching Assistants are used primarily as graders and not as deliverers of instruction, except in relatively rare cases when a faculty member is unavailable. The project nature of much of the course work encourages faculty-student interactions in settings outside the formal classroom.

Evidence in support of these statements is found in the results of the Undergraduate Exit Survey, as noted in the discussion of Criterion 3. Three items in particular speak to student attitudes with respect to faculty interactions. The items (Faculty members easy to approach; Easy to obtain faculty assistance; Easy to obtain department assistance) all received a 4.3 average response (scale from 1 Poor to 5 Excellent).

INTERACTIONS WITH STUDENTS: ADVISING

Every member of the Faculty performs academic advising. The typical advising load is about 12 undergraduate students per faculty member. As noted in the discussion of Criterion 3 (Program Outcomes and Assessments), the graduating students feel the faculty is approachable and advising was readily available (scores of 4.3 and 4.0 out of 5, respectively, for the Spring 2000 exit survey).

The Registrar's Office conducted a very informal survey as to student satisfaction with advising. This was done in response to anecdotal statements made by some undergraduates (not necessarily engineering students) to the effect that their advisors were either not available or not knowledgeable about their undergraduate program. Table B.5-3 below shows the results from this informal survey.

Table B.5-3. Results of ESF Registrar's Informal Survey of Forest Engineering Student Attitudes Towards Academic Advising

Item	Average Score (1 Poor – 5 Excellent) n = 11 students; 6 faculty evaluated
Accessibility	4.2
Knowledge of curriculum	3.8
Interest in you as individual	4.1

The results displayed above are consistent with the Forest Engineering undergraduate exit survey, and indicate a generally positive attitude by Forest Engineering students as regards the faculty efforts in student advisement.

The State University of New York requires that each campus survey a randomly selected cross section of undergraduates. The Student Opinion Surveys are done every three years, most recently in the Spring of 2000. Unfortunately, in past years, the undergraduates' responses were lumped into arbitrary categories, which made it impossible for a particular program to learn the responses of the students in their program. The Spring 2000 Survey included markers for each program; therefore, the survey results should give some insight into satisfaction as to advising quality and other student-oriented issues by individual program. The summary statistics from the Student Opinion Survey will be made available to each SUNY campus during early July, and will be available to the evaluators of our program for their review. The results will also be used in our own on-going assessment activities.

SERVICE TO OTHER FACULTIES

Faculty members from the Faculty of Environmental Resources and Forest Engineering contribute in important ways to other academic programs at the College. Dr. Hopkins is currently a Study Area Coordinator in the Bachelor of Science Program in Environmental Studies managed by the Faculty of Environmental Studies. He co-ordinates the Information and Technology Study Area, and is responsible for assignment of academic advisors and curriculum development for the program. He teaches two undergraduate courses (ERE 310 Spatial Measurements and ERE 450 Introduction to Geographical Information Systems) intended mainly for students in the Study Area. Along with Dr. Hopkins, Drs. Hassett and Kroll advise undergraduate students in the Study Area. Drs. Hassett, Kroll, Hopkins and Professor Daley routinely advise graduate students in the interdisciplinary Graduate Program in Environmental Sciences.

PROFESSIONAL DEVELOPMENT

Faculty engage in a number of activities related to professional development. Table B.5-4 provides illustrative examples of these activities. The table gives information in two senses: activities to assist others in their professional development, and activities undertaken by faculty to improve their own skills.

Table B.5-4. Illustrative Recent Professional Development Activities of the Faculty of Environmental Resources and Forest Engineering

Faculty Member	Activities
J. Hassett	Provide 4 review classes for local Intern Engineers preparing for the Professional Engineers Examination (last 5 years). Planner and Presenter, Annual Workshop to Prepare Graduate Teaching Assistants, SUNY-ESF (Every fall for the past 8 years) Organized and Chaired Special Session, Spring 2000 Meeting, American Geophysical Union. Washington, DC. Member (elected by College Faculty): Search Committee for SUNY-ESF College President, Spring 1999 – April 2000.
R. Brock	Attend GEOLAB 3 Course, Toronto, Canada, January 2000. Provide assistance to ESF researchers using GPS equipment and techniques. Chairman, FE-02 Forest Engineering Executive/Advisory Committee, American Society of Agricultural Engineers
D. Daley	Faculty Advisor, ESF Student Chapter Air and Waste Management Association. ESF Chapter awarded International Student Service Award in 1999; three ESF students won AWMA scholarships in 1999. Attended Engineering Criteria 2000 Workshop, New Orleans, LA, February 2000. Presentation: *Encouraging Student Learning*, St. Lawrence Section, American Society of Engineering Education, March 2000.
M. Duggin	Co-chair, Session of Polarized Light, SPIE Annual Meeting, San Diego, CA, July 2000. Revised undergraduate courses (FEG 350, FEG 352) to take advantage of technologies in ESF 'Smart Classroom.' Taught graduate level course (ERE 796) in distance learning mode with colleagues from Rochester Institute of Technology and Cornell University.
P. Hopkins	Chair, Strategic Planning Committee, American Society for Remote Sensing and Photogrammetry. Member, A2 Working group on Photogrammetry and Remote Sensing, Society of American Foresters, Attended Workshop: A Guide to SAR Interferometry, Denver, December 1999.
C. Kroll	Organized and Chaired Special Session, Spring 2000 Meeting, American Geophysical Union. Washington, DC. Faculty Advisor, Forest Engineering Club Prepared and presented two review sessions (Economics and Statistics) for undergraduates preparing for the Fundamentals of Engineering Examination
T. Endreny	Attend NSF Engineering Teaching Scholars Workshop, Carnegie Mellon, Summer, 2000. Attend Workshop on Critical Thinking, Oswego, NY, May 2000.

RESEARCH

Research activities with the Faculty of Environmental Resources and Forest Engineering represent a wide range of activities with a number of different research sponsors, as detailed in Table B.5-5.

Table B.5-5. Illustrative Sponsored Research Activities of the Faculty of Environmental Resources and Forest Engineering

Faculty Member	Project and Sponsor
J. Hassett	An Engineering Analysis of Galley Systems (with 3 other investigators), New York City Department of Environmental Protection (NYC DEP) $1.45 million. Criteria for Selecting Management Models for Urbanizing Watersheds, NYC DEP, $75,000. Terrestrial Processes and Drinking Water Quality, NYC DEP, Principal Investigator (with many co –PIs), NYC DEP, $6 million. Management Model for New York State Canal System, PI (with C. Kroll), $65,000.
R. Brock	Center for Exploring and Developing Commercial Applications of Remote Sensing and Geo-Spatial Technologies, Co-PI, Urban Cover Classification Using High Resolution Aerial Imagery, Co-PI
D. Daley	Proposal Pending: Environmental Monitoring for the On-Farm Fertilization Recovery System, Cayuga County, $21,000. Evaluation of Best Management Practices to Reduce Nutrient Loading from Highway Runoff, Delaware County, $21,000.
M. Duggin	Proposals Pending: Polarized Light in Camouflage Detection, with PAR Corporation, to various government agencies. Polarized Light in Development of Improved Endoscopy, Colonoscopy, and Laproscopy, with colleague from SUNY Upstate Medical University.
P. Hopkins	Technology and Policy Aspects of Applying Remote Sensing to Forest Management in State Agencies, Project Director, with R. Brock and M. Duggin. Urban Cover Classification Using High Resolution Aerial Imagery, Project Director. Ecological Inventory and Land Management Alternatives of Niagara Mohawk Power Corporation Lands, Co-Principal Investigator. Center for Exploring and Developing Commercial Applications of Remote Sensing and Geo-spatial Technologies, Project Director (with R. Brock and M. Duggin). Using Satellite Radar Imagery to Improve Forest Classification in New York State, Project Director.
C. Kroll	A National Assessment of Low-Streamflow Estimation Using a Physically Based Statistical Methodology, EPA-NSF, $353,100. The Effects of Forest Harvesting on Streamflow Generation and Water Quality in a Catskill Mountain Watershed, USDA, $72,000.

The Faculty's extensive research portfolio provides direct benefits to the undergraduates in the Forest Engineering program, in that three undergraduates worked as funded research assistants during the 1999-2000 academic year. Two of the students worked with Professor Kroll, while the third worked with Professor

Hopkins. The student who worked with Professor Hopkins is entering our Master of Science program in the fall.

The research activities inform and enrich the undergraduate program in less obvious ways, such as in providing real-life examples for class room discussions and data for students to manipulate in problem sets. The research activities sometimes provide the basis for the capstone engineering planning and design class, as happened two years ago when a group of seniors examined the data needs for the New York State Canal System and designed a data management system for that agency. The undergraduates worked in close collaboration with the graduate students working on the related research project managed by Drs. Hassett and Kroll.

FACULTY SIZE

The presentation above should give the clear evidence that the Faculty of Environmental Resources and Forest Engineering is very productive in teaching, professional development, and research. As mentioned above, we are searching for a new faculty member, and that will bring the number of full-time faculty in the Faculty to 7. We have available a fraction of two other individuals: 20% of Dr. Endreny's, and 10% of Dr. Davis' time.

The number of faculty is adequate to deliver a high quality Forest Engineering program. However, if the amount of extramurally-funded research continues to increase, we can make a strong case for additional faculty resources.

CRITERION 6. FACILITIES

INTRODUCTION

The facilities available to the Faculty of Environmental Resources and Forest Engineering are adequate, as will be discussed below. However, we are excited about the rehabilitation of a campus building (Baker Lab), which is being renovated in accordance with plans developed by our faculty and the project architects. We will move into the building when all the renovations are done. The new space will do much to help us integrate our teaching, research, and public service activities.

The Faculty has dedicated classrooms and laboratories, access to laboratory facilities maintained by other engineering units at SUNY-ESF and Syracuse University, access to college-wide facilities at SUNY-ESF. In addition, faculty and students have access to University-wide facilities at Syracuse University.

FACILITIES WITHIN THE FACULTY OF ENVIRONMENTAL RESOURCES AND FOREST ENGINEERING

COMMON AREAS AND FACULTY OFFICES

The common areas in the Faculty of Environmental Resources and Forest Engineering have recently been refurbished, in part because of planned maintenance, and in part to repair water damages that occurred during lengthy roof repairs on Bray Hall. The common areas have new carpeting, wall treatments, display cases, and bulletin boards, all of which create a positive first impression for our constituents.

Faculty offices are adequate and well maintained. Graduate student offices on the 4th floor of Bray Hall were, during the summer of 1999, completely renovated. The administration provided $30,000 for new furniture for the graduate students. The furniture was installed during the Fall of 1999. Office spaces in the basement of Bray Hall have also been renovated recently.

LABORATORIES

The Faculty has excellent laboratory resources in surveying, photogrammetry and mapping sciences, and fair laboratory resources to support instruction in other engineering areas. The equipment is well maintained, and new equipment is obtained from a variety of resources. Table B.6-1 below describes the laboratories and their uses.

Table B.6-1. Laboratory Facilities within the Faculty of Environmental Resources and Forest Engineering

Physical Facility Building and Room	Purpose of Laboratory	Adequacy for Instruction	Area (sq. ft.)
Geotechnical Instrumentation 11 Bray	Instrument Repair and Maintenance Facility	Good	290
Geotechnical 12 Bray	Surveying and Mapping Science Instruction	Good	910
Geotechnical Instrumentation 12A Bray	Instrument Holding Facility	Specialized Instruction Only	230
Digital Photogrammetry, Image Analysis and GIS Lab 13 Bray	Precision Photogrammetry Measurements, Advance Image Analysis, Advanced GIS Equipment	Good for Small Groups	620
Mapping Science 14 Bray Hall	Supports Mapping Science Instruction and Research	Good for Small Groups	460
Photogrammetric Engineering 15 Bray	Houses Photogrammetric Analog Computers	Good for Small Groups	290
Photographic Labs 16, 16A, 17 Bray	Provides Darkroom, Wet and Dry Photo Processing, Support for Instruction and Research	Good for Small Groups	580
Global Positioning System 314A Bray	Houses GPS Base Station	Good for Small Groups	80
Photogrammetry and Planning Lab 315 Bray	Photo Lab Exercises, Lab Space for Senior Capstone Course	Good	890
Wet Lab in Old Greenhouse	Support Field Exercises In Water Resources Engineering	Fair	530
East Wing of Old Greenhouse	Support Field Exercises In Water	Fair	1,050

	Resources Engineering		

LABORATORY AND INSTRUCTIONAL EQUIPMENT MAINTAINED BY THE FACULTY OF ENVIRONMENTAL RESOURCES AND FOREST ENGINEERING

Table B.6-2 provides details as to some of the laboratory and instructional equipment maintained by the Faculty and routinely used by Forest Engineering students.

Table B.6-2. Examples of Instructional and Laboratory Equipment Routinely Used by Forest Engineering Students

Category	Description	Use
GPS Surveying Equipment	4 Trimble Basic Plus Units	Support instruction and research in surveying and mapping sciences
	2 Trimble Pro-XL Units	
	4 Trimble Pro-RL Units	
	2 Leica System 300 with a Leica System Base Unit	
	1 Magellan ProMark X CP Unit	
	1 Magellan Nav 5000 Pro Unit	
	3 Trimble GPS Backpacks	
Surveying Equipment	4 Zeiss Elta 50-R Total Stations	Support instruction and research in surveying and mapping sciences
	4 Reflexive Prisms with Prism Poles	
	2 Precision International, Citation Electronic Distance Meters	
	2 EDM Battery Chargers and Associated Prisms	
	5 Nikon AP-5 Autolevels	
	3 TOPCON AT-G3 Autolevels	
	1 Bausch and Lomb Laser Range Finder	
Image Interpretation Equipment	1 Richards MIM light table with a Bausch and Lomb 240 Stereoscope	Support instruction and research in photogrammetry and image analysis
	1 Old Delft Scanning Stereoscope	
	1 Bausch and Lomb Zoom Transfer Scope	
	Numerous stereoscopes	
Photogrammetric Equipment	1 David W. Mann Company Mono-Comparator	Support research and instruntion in photogrammetry
	1 Ziess PSK2 Stereocomparator	
	1 Wild B8 Optical/Mechanical Plotter	
	1 Wild A9 Optical Plotter	
	1 B+L Optical/Mechanical Plotter	
Water Resources	1 Swoffer Velocity Meter	Support instruction in engineering hydrology and hydraulics

LABORATORY FACILITIES USED BY FOREST ENGINEERING STUDENTS

Forest Engineering students have access to laboratory facilities maintained by other academic units at SUNY-ESF and Syracuse University. Table B.6-3 describes these facilities.

Table B.6-3. Laboratory Facilities Forest Engineering Students Use That Are Maintained by Other Academic Units

Facility and Location	Use	Entity Responsible for Maintenance	Comments
Environmental Engineering Laboratory, First Floor, Walters Hall	Support Instruction In Water Pollution Engineering	Faculty of Paper Science and Engineering	Wastewater treatment pilot plant. (1,200 sq. ft.)
Hydraulics Laboratory, First Floor, Walters Hall	Support Instruction in Engineering Hydrology and Hydraulics	Faculty of Paper Science and Engineering	Closed-loop hydraulic flume. (1,100 sq.ft.)
Materials Testing, Baker lab	Supports Materials Science Instruction and Research	Faculty of Construction Management and Wood Products Engineering	Currently under reconstruction as part of Baker rehab project. (650 sq. ft.)
Structural Testing, Baker Lab	Supports Instruction for Structures Course	Faculty of Construction Management and Wood Products Engineering	Currently under reconstruction as part of Baker rehab project. (700 sq. ft.)
Geotechnical Laboratory, Hinds Hall	Supports Instruction and Research in Geotechnical Engineering	L. C. Smith College of Engineering, Syracuse University	Recently renovated.

CLASS ROOM FACILITIES

The College maintains classroom facilities, and the Registrar assigns classes to rooms of appropriate size. The rooms are equipped with the standard suite of audio-visual equipment, which can be augmented by mobile carts with computers and projection equipment for, for example, PowerPoint presentations.

The College maintains one unique classroom facility. A classroom equipped for distance learning is located in 16 Illick Hall. The facility has a complete suite of audio-visual equipment, and can be used in either a local classroom or distance learning (send or receive) mode. The Faculty is a disproportionate user of that facility. Dr. Duggin co-taught a course from there with colleagues from Cornell University and the Rochester Institute of Technology. He also modified his

undergraduate FEG 350 Remote Sensing course to take advantage of the facility. His experiences led to suggestions to upgrade the computer and projection devices, and those suggestions are being implemented this summer. Drs. Hassett, Hopkins and Endreny routinely teach their courses there as well. In fact, the Faculty were the exclusive users of that College facility during the Spring 2000 semester. Our use of the so-called 'smart classroom' is especially important in that it is in a sense a test-bed for the design of instructional facilities to be installed in the renovated Baker Lab.

COMPUTER INFRASTRUCTURE

Forest Engineering students have access to Faculty computing resources, College computer clusters, and all the computing resources at Syracuse University, including computer clusters and main-frame computers. The College academic computer support personnel will install specific engineering-related software on the servers, at the request of an individual Faculty. Clusters can be scheduled for class computer exercises. Some details of these facilities are provided in Table B.6-4.

Table B.6-4. Computer Facilities to Which Forest Engineering Students Have Access	
Location	Description
Mapping Sciences	2 Solaris, 9 Dell, 2 Gateway Computers with software and accessories to support instruction in mapping sciences
ESF Computer Cluster-14 Moon Library	25 P5-60 Gateway computers equipped with networked printers and standard word processing, spread sheet, etc. software
ESF Computer Cluster-303 Baker Lab	23 P5-75 Gateway computers equipped with networked printers and standard word processing, spread sheet, etc. software
ESF Computer Cluster-323 Baker Lab	15 E-3000 200 MHz Gateway Computers, 1 Hewlett Packard 7550A Plotter, networked printers (one color) and standard word processing, spread sheet, etc. software -
ESF Computer Cluster-323A Baker Lab	8 PS-60, 7 E3200 350MHz Gateway computers, networked printers (one color), and standard word processing, spread sheet, etc. software
ESF Computer Cluster-324 Baker Lab	16 E-3000 200 MHz Gateway computers, networked printers (one color), and standard word processing, spread sheet, etc. software
Syracuse University	UNIX main frame computers, computer clusters in dormitories and Schine Student Center. Syracuse University Residence Halls are wired for internet access.

FUTURE FACILITIES

The Faculty will move into the rehabilitated and renovated Baker Laboratory. The construction activities are scheduled to occur in three phases, and the first phase started during late Spring 2000 semester. The project is scheduled to be completed I the next four or five years. The Faculty has had continuing dialogue with the project architects, and participated in every step of the Program Study for the Rehabilitation of Baker Laboratory. The following table provides a summary of the plans for the new facilities for the Faculty of Environmental Resources and Forest Engineering. The Faculty spaces will total about 10,000 sq. ft.

Table B.6-5. Planned Spaces for the Faculty of Environmental Resources and Forest Engineering in the Rehabilitated Baker Laboratory	
Program Component	Description
Department Offices	Chair's office, secretarial space, conference room, etc.
Faculty Offices	Ten faculty offices, each with space for a computer workstation
Professional Staff	Three offices, associated work space
Graduate Student Offices	Office space for 72 graduate students, office space for 8 graduate assistants
Geo-Spatial Modeling Teaching Lab	Teaching and research laboratory, preparation and storage area, specialized laboratory
Mapping Science Teaching/Research Laboratory	Teaching laboratory, surveying equipment maintenance and storage, remote sensing, image interpretation, server room
Water Resources/ Environmental Engineering	Wet chemistry laboratory, hydraulics laboratory, dedicated computer cluster
Engineering Design and Computation Laboratory	Laboratory for capstone design course, and other engineering design activities

SUMMARY

The current facilities available to the Faculty have been and are adequate. However, the fact is that the facilities are spread among three buildings (Bray and Walters Hall, and the Old Green House) and on three floors in one building (Bray Hall). The Faculty is in a very favorable position with respect to the rehabilitation of Baker Laboratory, in that we will not suffer any disruption to our current activities and programs. Current projections are that the move will occur in about 4 years, which seems reasonable given that work has started on Phase One of the three planned phases, and is proceeding according to schedule. Funds have been authorized at the state level for all three phases of the project.

The Baker Laboratory plans call for the Faculty to have facilities on three floors of that building, and ready access to state-of-the-art laboratory, classroom and computer facilities, which should allow for a better integration of Faculty activities. The plans also provide space for an increase in the number of faculty in the unit. We are looking forward to the challenges and opportunities the new space will provide us.

CRITERION 7. INSTITUTIONAL SUPPORT AND FINANCIAL RESOURCES

INTRODUCTION

The support available to the Faculty of Environmental Resources and Forest Engineering is adequate, as will be discussed below. However, we recognize the changing dynamics and sometimes precarious nature of funding for public assisted higher education. We have therefore begun to consider how we can increase the amount of discretionary funds available to our Faculty. We will discuss our efforts in this regard as well.

LEADERSHIP

The Faculty has benefited from the fact that the senior administration of the College understands the importance of the Forest Engineering program, and seems to hold the activities of the Faculty in high regard. The new President, Dr. Cornelius Murphy, began his tenure on May 15, 2000, and came to the College after having been the Chief Executive Officer of O'Brien and Gere, Ltd., a nationally known environmental engineering firm with headquarters in Syracuse, NY. Dr. Murphy understands the importance of engineering education and knows our Forest Engineering program by virtue of having hired several of our graduates. Dr. William Tully, Vice-President for Academic Affairs and Provost, was one of the original designers of the Forest Engineering program, and served as a professor and chair of the Forest Engineering Department before he became Dean of Engineering, and then Provost. Dr. Tully is a Professional Engineer registered in the State of New York.

BUDGET

Funds available to the Faculty come from state allocations, continuing education activities, research funding, and development activities. The Faculty Chair has final authority on expenditures from all accounts except research funding, for which the faculty Principal Investigator has sole authority. However, the Chair has little discretion in salary matters, given that unions that represent faculty and staff negotiate salaries on behalf of their members.

The mechanism by which the state allocation is derived is as follows. The Budget for the State of New York should be in place by April 1 of every year. The

allocation to the State University of New York is contained in the budget. The SUNY Central Administrative staff works with each SUNY campus to determine a campus budget. In recent years, the campus allocation has been determined by a model intended to reward campus performance as determined by a complex set of metrics.

The Provost, in consultation with each Faculty Chair, determines the allocation of state funds to a particular Faculty unit. The Provost has the option of funding activities such as faculty searches by special allocations above and beyond the normal allocation. Funds allocated to the Faculty have been adequate to maintain the quality of the program.

The state allocation covers salaries, wages and benefits, with the remainder of the funds being at the discretion of the Faculty Chair. The state allocation is one source of funds to the Faculty, as funds accrue to the Faculty from several other mechanisms.

Funds accrue to the Faculty from the Office of Continuing Education by virtue of faculty involvement in continuing education activities. Such activities might include participation in the design and delivery of non-credit short courses, or work during the summer on grants managed by the Office of Continuing Education.

Sponsored research generates funds to support the Faculty in several ways. Some grants are designed to support and enhance undergraduate education directly. Dr. Kroll has sought funding from the National Science Foundation to instrument a teaching and research watershed site in Heiberg Forest, in Tully, NY. The Heiberg Forest is one of the College's properties, and is located about 15 miles south of the Syracuse campus. While not yet successful, the idea is sound, and Dr. Kroll will continue to seek funds to instrument the site. Some grants include funds to support undergraduates. Three undergraduate Forest Engineering students were supported by this mechanism during the most recent academic year. Inevitably, some research equipment, computers and software purchased from research funds is used in support of the undergraduate program, thus freeing state allocated funds for other purposes. Likewise, research funding is sometimes used for travel to professional conferences, again reducing the demand on state allocated funds for this purpose.

Each Faculty unit also receives a yearly allocation from the Provost's Office via the Research Foundation more or less proportional to the amount of research overhead funds generated by the unit during the previous year. These funds accrue to the Faculty Chair, and have to be used to support opportunities to generate more research funding. Finally, the Faculty has begun to generate funds from development activities.

Table B.7-1 summarizes sources and amounts of funds available to the Faculty, and comments on expenditure guidelines.

Table B.7-1. Sources, Amounts, and Restrictions on Funds Available to the Faculty of Environmental Resources and Forest Engineering

Source	Amount	Comment
State Allocation: State Budget	Salaries and Wages: $571,550 Supplies and Materials: $49,300(*)	Faculty Chair has final authority on expenditure of state allocated funds, but little discretion in salary matters.
State Allocation: Instructional Equipment	Approximately $10,000 per academic year	Faculty Chair has final authority; must be spent in support of educational activities
Sponsored Research (as of 4/30/00)	$6,991,070 (**)	Multiple projects; Project Director has final authority
Research Foundation Sponsored Program Development	$5,370	Faculty Chair has final authority; must be spent to enhance Faculty research efforts
Continuing Education Program Development	$3,895(**)	Faculty Chair has final authority, in consultation with faculty generating the funds
Funds from Development Activities: Earl Church Fund William Johnson Fund Forest Engineering Fund	 $605(***) $1,127 $2,145	Faculty Chair (and sometimes one other faculty member) has authority; restrictions apply according to particular fund.

(*) From Faculty budget summary of 4/30/2000. The Supplies and Materials includes an allocation for furniture. The normal budget for Supplies and Materials is approximately $30,000.
(**) From Research Foundation budget summary for 4/30/2000.
(***) From Year End Summary from Development Office.

The data in the above table demonstrate success by the Faculty in attracting a substantial amount of sponsored research, and adequate support from other sources. Many of the larger research projects are multi-year efforts, and so the funds are or will be expended over two or three years. As will be demonstrated below, the funding has created opportunities to hire a substantial number of research-funded

employees and graduate research assistants, all of whom contribute to the academic success of the Faculty.

There is at least one other noteworthy item in the above table. The Faculty, and the College in general, like other public supported institutions, has not had a great deal of experience with development efforts. However, we now recognize, thanks in part to the assistance of the Environmental Resources and Forest Engineering Advisory Council, that funds raised through development efforts can help us achieve the aspirations for our program.

Therefore, we as a Faculty have begun to pay attention to development issues. We produced, in co-operation with the ESF Office of News and Publications, the first issue of our Faculty newsletter, entitled ESF Engineer, and mailed it to over 1100 alumni and friends of the Faculty. The issue was published during the Spring 2000 semester. The newsletter included an article by Brenda Greenfield, Assistant to the ESF President for Development, on Giving to ESF and ERFEG, as well as an article submitted by John Thonet, Chair of the ERFEG Advisory Council. The first issue was well received, and we plan to produce one issue each semester. For the second issue, we will have an article provided by John View, ESF Director of Financial Aid, who will write about the average indebtedness of Forest Engineering students when they graduate.

The Faculty, in conjunction with the Advisory Council, sponsored a reception for alumni in the Washington, D. C. area, in May 2000. The reception was held in conjunction with the annual meeting of the American Society for Photogrammetry and Remote Sensing, an organization in which many of our faculty and alumni are active.

PERSONNEL

PERMANENT EMPLOYEES

The Faculty employs several individuals in instructional support roles. These positions are detailed in Table B.7-2.

Table B.7-2. Instructional Support Personnel Associated with the Faculty of Environmental Resources and Forest Engineering

Position	Duties	Years With Faculty
Secretary	Administrative assistance (budget, personnel, student queries, etc.)	5
Instructional Support Specialist	Maintain instructional and research equipment, assist in instruction as needed	22
Instructional Support Specialist	Maintain instructional and research equipment, assist in instruction as needed	1

TEMPORARY EMPLOYEES

Graduate Assistants

The Faculty has funds for Graduate Assistants allocated, and can select graduate students to assist in the delivery of the undergraduate program. The Faculty had 9.5 Graduate Assistants during the 1999-2000 academic year, a number that has stayed constant over the last several years. The Graduate Assistants are unionized and their performance is formally evaluated in accordance with contractual requirements. The Graduate Assistants are used primarily as graders and laboratory assistants and are rarely responsible for delivery of formal instruction.

Personnel Supported by Research and Other Funding Mechanisms

As discussed previously, the Faculty has been successful in attaining funding from several research sponsors. The Faculty thus has direct supervisory responsibility for a number of individuals supported by research funding, as described in Table B.7-3.

Table B.7-3. Personnel Supported by Research Within the Faculty of Environmental Resources and Forest Engineering

Title	Numbers
Post-Doctoral Associate	2
Research Project Assistant (Graduate students)	20
Research Aide (both graduate and undergraduate students)	5

Research Support Specialist	8
Project Staff Assistant	1
Project Aide	1

FACULTY DEVELOPMENT

The Faculty recognizes the importance of faculty development, and routinely commits Faculty resources to that end. In addition, the College commits resources to this important endeavor.

Development begins with recruiting faculty and professional staff. The Provost provides funding in addition to the normal state allocation for this important activity. The College has been successful in recruiting and attracting highly qualified faculty in recent years, including the two recent hires in the Faculty. Table B.7-3 shows examples of other faculty development activities at the Faculty and College level.

Table B.7-3. Examples of Faculty Development Activities at the Faculty and College Level

Activity	Purpose	Comment
Mentoring	Provide untenured faculty formal interaction with senior faculty	Faculty Chairs responsible for assigning mentors and oversight as necessary.
Mentoring Conference	College activity for untenured faculty and their mentors to discuss scholarship issues in an informal atmosphere	Provost's Office funds and organizes the event; senior faculty and invited guests lead discussion
Annual Teaching and Learning Conference	Forum to discuss teaching and learning issues at the College. Keynote speakers and discussion leaders from other institutions.	Provost's Office funds event, organized by Office of Instruction, Evaluation and Service.
Annual Workshop for Graduate Assistants	Provide orientation for newly appointed Graduate Teaching Assistants. Newly appointed faculty are invited to attend some sessions.	Provost's Office funds event, organized by Office of Instruction, Evaluation and Service.

In addition to the College-wide activities described in Table B.7-3, the Provost often provides funding to individual faculty for specific activities. The Faculty Chair can also elect to support a particular activity from the funding available to the

Faculty unit. Table B.7-4 provides some recent examples of activities supported by these means.

Table B.7-4. Examples of Faculty Development Activities for Individual Faculty Members in the Faculty of Environmental Resources and Forest Engineering

Faculty	Activity	Comments
D. Daley	Attend ABET Workshop in New Orleans, February 2000.	Funded by Provost
T. Endreny	Selected to attend National Science Foundation Workshop for Engineering Educators, Carnegie-Mellon, July 2000.	Travel from Faculty funds, NSF grant supports other costs.
J. Hassett	Attend Catchment Modeling Shortcourse, Geological Survey National Training Center, Denver, July 2000	Funded from research grant
R. Brock	Attend GEOLAB-3 Short Course, Toronto, January 2000	Funded by Faculty Chair
P. Hopkins	Attend Workshop on SAR Interferometry, Denver, December 1999.	Funded from research grant

SUMMARY

The Faculty has adequate support from the Administration and the support comes in a variety of forms. The Faculty is also active in securing funding from sponsored research activities and has begun, with the assistance of the Advisory Council and College Development Office, to consider ways to attract more discretionary funds to the Faculty.

CRITERION 8 PROGRAM CRITERIA

INTRODUCTION

This section discusses how our program satisfies the applicable Program Criteria for the Forest Engineering option in Agricultural Engineering. This is broken into two areas: curricular topics and faculty qualifications.

CURRICULAR TOPICS

We have developed a broad curriculum that spans a wide range of engineering topics. Below in Table B.8-1 we have mapped the Program Criteria for the Forest Engineering option in Agricultural Engineering with specific courses within our curriculum. Note that only a subset of the ERFEG undergraduate curriculum was used to match the Program Criteria. As one can see, our curriculum program an excellent match to the Program Criteria for Forest Engineering. The curriculum is discussed in more detail under Criterion 4 of this report.

Table B.8-1. Mapping of Program Criteria to Forest Engineering Curriculum	
Program Criteria for Forest Engineering and Other Named Programs	Forest Engineering Curriculum Satisfying Criteria
Mathematics through Differential Equations	15 credit hours of calculus through differential equations 3 credit hours of calculus-based probability and statistics
Engineering Sciences	4 credit hours of electrical sciences 3 credit hours of mechanics of materials 3 credit hours of surveying 4 credit hours of fluid mechanics 2 credit hours of thermodynamics 2 credit hours of power systems
Computer Systems	3 credit hours of computer programming
Information Systems	3 credit hours of engineering decision analysis
Ecological and silviculture systems	3 credit hours of forest ecology and silviculture
Harvest systems	1 credit hour of harvest systems
Hydrology	4 credit hours of engineering hydrology
Natural Resources	2 credit hours of dendrology 4 credit hours of botany
Transportation Systems	3 credit hours of transportation engineering
Water Resources	3 credit hours of water pollution engineering
Processing Systems	2 credit hours of remote sensing 3 credit hours of photogrammetry

FACULTY QUALIFICATIONS

The faculty are well qualified to teach courses which are primarily design in content. Qualifications include advanced educational degrees, professional experience, and professional licensure. Below in Table B.8-2 we have mapped engineering courses with a design component to the qualifications of the faculty involved with those courses. A discussion of faculty qualifications can be found under Criterion 5 of this document. Included in the Appendix are the summary curriculum vitae for each faculty member.

Table B.8-2.: Mapping of Faculty Qualifications to Design Courses in the Forest Engineering Curriculum	
Design Course	Faculty Qualification
1 credit hour of engineering design (FEG 300)	Professional Licensure, over 30 years of professional experience.
4 credit hours of engineering hydrology (FEG 340)	Ph. D. in Civil Engineering, three degrees in engineering. Certification as Professional Hydrologist in Training.
3 credit hours of photogrammetry (FEG 363))	Ph. D. in Civil Engineering. Over 20 years of experience with photogrammetry. Professional certification as Certified Photogrammetrist.
3 credit hours of mechanical design (ERE 385)	Ph. D. in Mechanical Engineering, consulting experience including structural failure analysis.
4 credit hours of structures (FEG 410)	Ph. D. in Structural Engineering, registered as Professional Engineer in Province of Quebec.
4 credit hours of soil mechanics (CIE 337)	Ph. D. in Civil Engineering, extensive research experience with geotextile applications.
3 credit hours of transportation systems (FEG 437)	Professional Licensure, 16 years of professional experience
2 credit hours of power systems (FEG 454)	Professional Licensure, 10 years of professional experience
3 credit hours of water pollution engineering (ERE 440)	Ph. D. in Civil Engineering, research experience in water quality/wastewater treatment.
3 credit hour capstone design course (FEG 489)	Professional Licensure, 16 years of professional experience

SUMMARY

The Forest Engineering program offers coursework in several areas as required in the Program Criteria for the Forest Engineering option. The Faculty feels the combination of the strong core of engineering coursework and the natural resources training provided by the courses listed in Table B.8-1 provide our students the opportunity for a unique undergraduate education. The Program Assessment and Outcomes Evaluation discussed earlier in this report suggest that the Forest Engineering program does in fact prepare the graduates for a wide range of careers in the engineering profession.

APPENDIX I

A. TABLE 1A. BASIC-LEVEL CURRICULUM

Forest Engineering (2000-2001 Curriculum)

Year and Semester	Course	Category				
		Math & Basic Science	Engineering Topics (X) if Design	General Education	Forest Engineering Program Criteria	Other
Fall Freshman	(*) MAT 295 Calculus I	4		3	4	
	(*) PHY 211 Engineering Physics	3		3		
	(*) PHY 221 Engineering Physics Laboratory	1				
	EFB 226 General Botany	4		3	4	
	CLL 190 Writing and the Environment			(**)3		3
	FEG 132 Orientation					1
Spring Freshman	(*) MAT 296 Calculus II	4		3	4	
	(*) PHY 212 Engineering Physics II	3				
	(*) PHY 222 Engineering Physics II Laboratory	1				
	APM 153 Computing Methods			(**)3	3	3
	Elective			3		
	Elective			3		

(*) Course taught at Syracuse University

(**) General Education Area of Competency

Other General Education Courses represent Knowledge and Skills Areas

Table 1A (Continued)

Year and Semester	Course	Category				
		Math & Basic Science	Engineering Topics (X) if Design	General Education	Forest Engineering Program Criteria	Other
Fall Sophomore	(*) MAT 397 Calculus III	4			4	
	(*) CHE 106 General Chemistry I	3				
	(*) CHE 107 General Chemistry I Laboratory	1				
	ERE 221 Statics		3			
	ERE 225 Engineering Graphics					1
	FOR 207 Economics			3		
Spring Sophomore	(*) MAT 485 Differential Equations and Matrix Algebra	3			3	
	ERE 222 Dynamics		2			
	ERE 362 Mechanics of Materials		3		3	
	(*) ELE 231 Electrical Science		4		4	
	(*) CHE 116 General Chemistry II	3				
	CHE 117 General Chemistry II Laboratory	1				
	CLL 290 Perspectives on the Environment			3		

(*) Course taught at Syracuse University

Table 1A (Continued)

Year and Semester	Course	Category				
		Math & Basic Science	Engineering Topics (X) if Design	General Education	Forest Engineering Program Criteria	Other
Fall Junior	ERE 371 Surveying for Engineers		3		3	
	(*) MAE 341 Fluid Mechanics		4		4	
	EFB 335 Dendrology				2	2
	FOR 321 Forest Ecology and Silviculture				3	3
	FEG 300 Engineering Design		1 (X)			
	Elective			3		
Spring Junior	FEG 340 Engineering Hydrology and Flow Controls		4(X)		4	
	FEG 350 Remote Sensing		2		2	
	FEG 363 Photogrammetry		3 (X)		3	
	ERE 385 Elements of Mechanical Design		3 (X)			
	APM 395 Probability and Statistics for Engineers	3			3	
	ERE 351 Basic Engineering Thermodynamics		2		2	

(*) Course taught at Syracuse University

Table 1A (Continued)

Year and Semester	Course	Category				
		Math & Basic Science	Engineering Topics (X) if Design	General Education	Forest Engineering Program Criteria	Other
Fall Senior	FEG 410 Structures I		4 (X)			
	FEG 420 Harvest Systems				1	1
	FEG 430 Engineering Decision Analysis		3		3	
	(*) CIE 337 Soil Mechanics		4 (X)			
	FOR 360 Principles of Management					3
	Elective			3		
Spring Senior	FEG 437 Transportation		3 (X)		3	
	FEG 454 Power Systems		2 (X)		2	
	FEG 489 Engineering Planning and Design		3 (X)			
	ERE 440 Water Pollution Engineering		3 (X)		3	
	Elective		3 (X)			
CURRICULUM TOTALS		38	56	36	67	17

(*) Course taught at Syracuse University

TABLE 2. COURSE AND SECTION SIZE SUMMARY

Required Courses in Forest Engineering Program as Taught During 1999-2000 Academic Year

Course No.	Title	No. Of Sections Offered in Current Year	Average Section Enrollment	Type of class (1)			
				Lecture	Laboratory	Recitation	Other
EFB 226	General Botany	8	20	x	x		
APM 153	Computing Methods	1	17	x			
ERE 221	Engineering Mechanics - Statics	1	28	x			
ERE 225	Engineering Graphics	1	13	x	x		
FOR 205	Macroeconomics	1	37	x			
ERE 222	Engineering Mechanics - Dynamics	1	13	x			
ELE 231	EE Fundamentals	1	6	x			
FOR 206	Microeconomics	1	100	x			
ERE 362	Mechanics of Materials	1	27	x			
ERE 371	Surveying for Engineers	2	10	x	x		
FOR 321	Forest Ecology and Silviculture	2	10	x	x		
MAE 341	Fluid Mechanics	1	16	x			
EFB 335	Dendrology	1	18		x		
FEG 340	Hydrology & Flow Controls	2	12	x	x		
FEG350	Remote Sensing	1	15	x			
FEG 363	Photogrammetry	2	9	x	x		
APM 395	Statistics for Engineers	1		x			

ERE 351	Thermodynamics	1	17	x			

Table 2. Course and Section Size Summary (continued)

Course No.	Title	No. Of Sections Offered in Current Year	Average Section Enrollment	Type of class (1)			
				Lecture	Laboratory	Recitation	Other
FEG 410	Structures	1	33	x	x		
FEG 420	Harvest Systems	1	19	x	x		
FEG 430	Engineering Decision Analysis	1	22	x			
CIE 337	Soil Mechanics and Foundations	1	28	x	x		
FOR 360	Principles of Management	4	10	x		x	
FEG 454	Power Systems	1	20	x			
FEG 437	Transportation	1	19	x	x		
ERE 440	Water Pollution Engineering	2	14	x			
FEG 489	Planning and Design	1	19	x	x	x	

TABLE 3A. FACULTY WORKLOAD SUMMARY – FALL 1999 SEMESTER

Faculty of Environmental Resources and Forest Engineering

Faculty Member Name	FT or PT	Classes Taught (Enrollment / Credit Hours.) Fall 1999	Total Activity Distribution		
			Teaching	Research	Other
Robert H. Brock	FT	ERE 566 (7/2) ERE 664 (8/3)			
Douglas J. Daley	FT	ERE 225 (13/1) ERE 596 (9/3)			
Michael J. Duggin	FT	ERE 790 (6/3)			
James M. Hassett	FT	FEG 132 (8/1) EST 435 (16/3) ERE 596 (3/3)			
Paul F. Hopkins	FT	ERE 371 (20/3)ERE 450 (30/3) ERE 550 (23/3)			
Charles N. Kroll	FT	ERE 596 (9/3) FEG 430 (22/3)			
Theodore A. Endreny	FT				
Craig A. Davis	FT	FEG 420 (19/1)			
William P. Tully	FT				

TABLE 3B. FACULTY WORKLOAD SUMMARY – SPRING 2000

Faculty of Environmental Resources and Forest Engineering

Faculty Member Name	FT or PT	Classes Taught (Course No./ Credit Hours.) Spring 2000	Total Activity Distribution		
			Teaching	Research	Other
Robert H. Brock	FT	ERE 563 (1/3) ERE 596 (4/3) FEG 363 (19/3)			
Douglas J. Daley	FT	ERE 225 (9/3) FEG 437 (19/3) FEG 489 (19/3)			
Michael J. Duggin	FT	ERE 351 (17/3) FEG 350 (15/2) FEG 498 (1/3) ERE 552 (4/3)			
James M. Hassett	FT	ERE 440 (18/3) ERE 643 (4/3) EST 496 (4/3)			
Paul F. Hopkins	FT	ERE 310 (10/3) ERE 580 (7/3)			
Charles N. Kroll	FT	APM 395 (19/3) ERE 596 (11/3)			
Theodore A. Endreny	FT	FEG 340 (25/4) ERE 596 (3/3)			
Craig A. Davis	FT				
William P. Tully	FT				

TABLE 4. FACULTY ANALYSIS

Faculty of Environmental Resources and Forest Engineering

Name	Age	Rank	F T o r P t	Highest Degree	Institution from which Highest Degree Earned and Year	Years of Experience			Professional Registration (Indicate State)	Level of Activity (High,Med. Low, none) in:		
						Govt./ Industry Practice	Total Faculty	This Institution		Professional Society (Indicate Society)	Research	Consulting/ Summer Work in Industry
Robert H. Brock	67	Professor	F T	Ph.D	Cornell 1971	4	37	26		H-ASAE L-ASPRS	L	M
Douglas J. Daley	39	Assistant Professor	F T	M.S.	SUNY ESF 1984	12	4	4	NY	H-ASEE M-AWMA	M	M
Michael J. Duggin	62	Professor	F T	Ph.D	Monash 1965	16	25	19	(*)		M	H
James M. Hassett	54	Professor and Chair	F T	Ph.D	Syracuse 1988	2	22	19		M – AGU M-Sigma Xi	H	L
Paul F. Hopkins	45	Professor	F T	Ph.D	Wisconsin 1993	1	20	21		H-ASPRS	H	L
Charles N. Kroll	34	Assistant Professor	F T	Ph.D	Cornell 1996	2	4	4		M - AGU	H	L
Theodore A. Endreny(**)		Assistant Professor	F T	Ph.D.	Princeton, 1999	4	1	1		M - AGU	H	L
Craig A. Davis(**)		Associate Professor	F T	Ph.D.	Purdue, 1987	2	19	14		H - SAF	M	L
William P. Tully	59	Professor	F T	Ph.D	Syracuse 1978	4	34	34	NY	M-ASEE M-ASCE	L	L

(*) Dr. Duggin is a Chartered Engineer, as recognized by the Engineering Council, London, U. K.
(**) Drs. Endreny and Davis have appointments split between the Faculty of Forestry and the Faculty of Environmental Resources and Forest Engineering.

TABLE 5. SUPPORT EXPENDITURES

Forest Engineering

	Fiscal year			
Expenditure Category	1997-1998	1998-1999	1999-2000	2000-2001
Operations	$15,007.95	13,813.05	38,907.72	-
Travel	$7,062.51	$6,075.98	$4,687.48	-
Equipment: Institutional Funds	$8,028.41	$30,036.65	$9,700	-
Equipment: Grants and Gifts	-	-	-	-
Graduate Teaching Assistants	$56,000	$62,250.00	$81,700	-
Part Time Assistance	$19,239.56	$114,093.96	$139,859.76	-
TOTALS	$105,338.43	$114,093.96	$139,859.76	

B. COURSE SYLLABI

The course syllabi are arranged alphabetically and then by course number.

C. CURRICULUM VITAE

The curriculum vitae begin with the Faculty of Environmental Resources and Forest Engineering, followed by faculty at SUNY-ESF who teach courses for Forest Engineering students. Finally, the curriculum vitae for faculty at Syracuse University who teach courses for Forest Engineering students are included. The curriculum vitae are arranged alphabetically within each grouping.