Keene State College
Environmental Studies Program
Self-Study Report 2002

Program Coordinator:
Timothy T. Allen, Professor of Geology & Environmental Studies

Approved degree programs:
Bachelor of Science in Environmental Studies
Option in Environmental Policy
with Specialization in: Economics, Geography, Political Science,
or Individualized Specialization
Option in Environmental Science
with Specialization in: Biology, Chemistry, Geology,
or Individualized Specialization
Minor in Environmental Studies

Starting date of program: 1976

Previous reviews: 1995-1996

Person responsible for preparation of this report:
Timothy T. Allen, Professor of Geology & Environmental Studies

Timothy T. Allen, Program Coordinator

Gordon J. Leversee, Dean of Sciences

Submitted October 30, 2002

Forms

The following data will be utilized by the program to assist in the description and direction of its program. Data should be tabulated and presented in summary form.

Faculty Information:

Rank Distribution

Professor __4__Associate__2__Assistant __1__Instructor _____

Tenure Track __1__Tenured __6__Non-tenured _____

Highest Degree

Ph.D./Ed.D./Equiv. __7__M.S./M.A./Equiv. _____B.S./B.A./Equiv. _____

Length of Service at KSC (years)

0-5 __1__6-10 __2__11-15 __0__16 or more __4__

Specialization (List Areas)

Allen: Hydrogeology, Geochemistry, Petrology & Strucure
Mullens: Water Resources Geography
Gebauer: Plant Community Ecology and Physiology
Stepenuck: Environmental Chemical Analysis
Eggleston: Aquatic Ecology
Duston: Environmental Econmics
Roelofs: Environmental Politics and Public Administration

Part-time Faculty and Adjunct Faculty:

Course load (credits per year)

0-3 __X__4-6 ____7-9 ____10-12 ____13 or more ____

Highest Degree

Ph.D./Ed.D./Equiv. _____ M.S./M.A./Equiv. __X__B.S./B.A/Equiv._____

Specialization (List Areas)

Introduction to Environmental Studies

Length of Service at KSC (years)

0-5 __X__6-10 __X__11-15 _____16 or more _____

Student Information:

Majors: __34 (fall 2001)__

Options (list): _Environmental Policy, Environmental Science_

Specializations (list): _Economics, Geography, Political Science, Biology, Chemistry Geology, Individualized_

Minors: __0 (fall 2001)__

Undergraduate: __all__ Graduate: __0__

Independent Studies: __limited__

Other (General Education): __~160 (fall 2001) __

Age

17-23: __27__ 24-29: __2__ 30-39: __0__ 40 -: __5__

Gender

Female: __9__ Male: __22__

Keene State College • Verification of Faculty/Staff Review

Each full-time faculty member or staff member on duty in the Environmental Studies Program has been asked to sign the statement presented below:

By my signature below, I am verifying that I have had the opportunity to review the program's self-study that is being presented to the College's Program Review Subcommittee.

Signature	**Date**	**Additional Response in Appendix**
_____	_____	Yes_____ No_____
_____	_____	Yes_____ No_____
_____	_____	Yes_____ No_____
_____	_____	Yes_____ No_____
_____	_____	Yes_____ No_____
_____	_____	Yes_____ No_____
_____	_____	Yes_____ No_____

Table of Contents

Program Description 1

History of the Program 1

Program Content & Organization 4
Goals & Objectives 4
Relationship to College Mission 5
Relationship to General Education Program. 5
Relationship to External Factors 6
Design of Program 6
Overview 6
Contribution to General Education 7
Accreditation & Assessment 7
Program Revisions 7
Learning Outcomes Assessment 9
Advising Practices 9
Other Considerations 9

Faculty 10
Demographics and Qualifications 10
Joint Appointments 10
Workload 13
Faculty Reassigned Time & Overloads. 13
Acceptability of Workload 13
Evaluation 14
Advising Responsibilities 14
Faculty Interactions. 14

Facilities and Resources 15
Laboratories and Equipment 15
Physical Facilities 18
Learning Resources. 18
Computing 19
Support Staff 19
Budget 19

Students 21
Enrollment Trends. 21
Demographics 23
Admission Process 23
Participation in the Program 23
Honors & Recognition 24

Program Evaluation & Assessment 25

Outcomes 25
Program Comparisons. 25
Alumni Feedback 25
Senior Survey 26
Current Students 26
Summary 27

National Trends. 27
Science Education. 27
Integrated Science. 28

Program Strengths & Weaknesses 29

Planning 30
The Changing Academic Environment at KSC 30
Responding to Challenges & Opportunities 31
Staffing 31
Curriculum 31
Resources 31
Summary 32

References Cited and other Sources of Information . . . 33

Appendices. 35

I. 1996 Program Review AOC-Subcommittee Report 35
II. Catalog Information 39
Major Requirements 39
Minor Requirements 41
III. Course Descriptions 43
ENST Course Descriptions. 43
Supporting Course Descriptions 44
ENST Course Syllabi—un-numbered pages following p. 50
IV. General Education Program 51
Catalog Information 51
Quantitative Reasoning Competencies 52
Writing Competencies *53*
V. Faculty Curricula Vitae. 55
(pages un-numbered)
VI. Environmental Programs at Comparator Institutions 57
USNH-KSCEA Comparators 57
CoPLAC Member Institutions 58
VII. Courses to consider for cross-listing as ENST courses. 59

List of Tables

1: Initial proposal for assessment of learning outcomes 8
2: Faculty on the ENST Steering Committee 10
3: History of ENST course offerings 11
4: Possible course offerings for the next 3 years 12
5: Job descriptions of alumni in environmental fields 25

List of Figures . . . . . .

1: Students enrolled in ENST courses 21
2: Declared majors in ENST 21
3: Declared majors in other sciences 21
4: Entering student interest in ENST 22
5: Graduates with ENST majors 22
6: Declared minors in ENST 23

Notes

Program Description

History of the Program

Environmental Studies (ENST) at Keene State College (KSC) first began as individual courses, for example ecology courses and an environmental analysis course introduced around 1970. The first appearance of a major is in the 1976 catalog, where a degree in Environmental Science was listed. By 1980 the present interdisciplinary ENST major, with options in either "Policy" or "Science," was established. The program derived support from "volunteers" among the Biology, Chemistry, and Geology faculty on the Science side, and from among the Economics, Geography, and Political Science faculty on the Policy side.

Enrollments grew dramatically in the late 1980's and early 1990's. In January 1991 the position of Chair of the ENST Steering Committee was recognized by the College with a small salary stipend and 3 credits of re-assigned time (one course per year), similar to discipline Coordinators (although the ENST position was not codified in the then current Contract). The ENST program also received a modest budget line at this time. In a side agreement to the 1996 Contract, the Chair of the ENST Program Steering Committee was given 6 credits of re-assigned time (2 courses released per year, or 1 per semester) and a stipend of $750. The 1999 Contract redefined this position as a Program Coordinator (as discipline coordinators were re-defined as Department Chairs), still with 6 credits of re-assigned time and the stipend. The position of Chair or Coordinator has been filled by Steve Stepenuck from Chemistry (1991–1993; 1994-1995), Pete Nielsen from Geology (1993–94), Tim Allen from Geology and ENST (1995–1999, 2001-present), and Patrick Eggleston from Biology (1999-2001).

In addition to a coordinator and a budget, the program received additional recognition by the college in the form of faculty appointments. Tim Allen was hired in 1992 into a joint appointment in Geology (3/4) and ENST (1/4). JoBeth Mullens was hired in 1995 into a joint appointment in Geography (3/4) and ENST (1/4). Renate Gebauer was hired in 1998 into a 50/50 joint appointment between ENST and Biology.

The Program underwent Academic Program Review in 1995-1996. The Academic Overview Committee (AOC) report of May 1996 (Appendix I), building upon the report of the external review team, noted the important contributions of the ENST program to the College's mission, and highlighted several specific strengths: our faculty, our students, and the curricular initiatives arising out of our self-study process. The AOC report also noted several weaknesses and made a number of recommendations, paraphrased here together with brief responses or updates:

1) Further clarify goals and mission.

The external review team suggested that the program is trying to do too much with the resources it has.

> "If the program is to serve the college fully by being an excellent liberal arts major, supplying the state of New Hampshire with well trained environmental experts, and contributing to the development of an environmentally literate citizenry, then an expansion of resources is required."

Unfortunately, we have not had the kind and intensity of discussion needed to arrive at a real consensus around a common and strong vision for the program. None of the faculty involved has had the time to be able to really focus on ENST and provide the necessary leadership.

2) Increase depth of exposure to disciplines within the specializations.

There remains much debate about the relative merits of depth versus breadth in ENST across

the country and at KSC. We have tried to strike a balance and are relatively comfortable with the level of depth that exists in the specializations of our current program, which was at the proposal stage during the last review.

3) Incorporate the humanities into the ENST program.

Many recent faculty hires in diverse disciplines across campus—including the arts and humanities—have expressed interest in ENST, and are teaching some interesting environmental studies-related courses, but no formal relationships have been established. We did initiate discussions about how to incorporate a humanities component into our program, together with other changes to enhance the flexibility and responsiveness of the curriculum, but have made little progress.

4) Develop a course in Environmental Policy (i.e. Laws and Regulations)

Melinda Treadwell, a new faculty member in Safety Studies, has developed an experimental course on "Environmental Regulation" cross-listed between Technology, Design and Safety (TDS) and ENST that addresses this need at least in part. The course has yet to be added to the catalog and incorporated into our curriculum.

5) Improve advising for ENST students.

All prospective ENST majors are assigned by the College Advising Center to the ENST Program Coordinator. The Coordinator meets with the student (at the student's initiative) to assess their interests and direct them to approach an appropriate faculty member to be their advisor depending on their area of specialization. Changes to the ENST program, and improvements in the College's information systems have greatly reduced confusion among students and faculty advisors about the availability of course offerings and other issues.

6) Clarify whether ENST 100 should be serving a dual role as a general education offering and as the introduction to the major.

It seems certain that ENST 100 will continue to be an important general education offering. We have addressed some of our needs relative to the major program by introducing two additional ENST courses for majors: ENST 200 Intermediate Environmental Studies (taught for the first time in Spring 2002) and ENST 395 Junior Seminar (to be taught for the first time in Spring 2003). The introduction of these other courses helps alleviate some of the burden on ENST 100 in its dual role as a general education offering as well as the introduction to the major.

7) Expand the faculty with additional joint-appointments.

Renate Gebauer was hired in 1998 into a 50/50 joint appointment between ENST and Biology. This expanded the ENST faculty to one FTE. We are still short of faculty to teach our current offerings of ENST-labelled courses. As noted above, there are several new faculty across campus with an interest in environmental studies, but with no formal relationships to the ENST program.

8) Increase the budget for support of the ENST program.

Recent successful grant proposals have given the ENST program a very significant boost in equipment resources (see chapter on Facilities and Resources). The general operating budget remains limited, however.

9) Provide resources for faculty-development opportunities in ENST.

The ENST faculty have not engaged in any faculty development efforts as a group. Individual faculty have taken advantage of opportunities that present themselves, and faculty have been involved in other efforts (such as SENCER) that are not necessarily specific to the ENST program.

10) Provide dedicated space for the ENST program in the Science Building.

We are currently involved with architects, engineers, and construction managers in the design of a major $23 million renovation and expansion of the present Science Center. Construction will begin in May 2003, and will probably be complete sometime in 2004 or early 2005. The "new" building will have several dedicated spaces for the ENST program, including a reading/meeting/work room (a.k.a. "the Green room"), a project laboratory, and field equipment storage, as well as access to shared instrumentation and support laboratories, and shared classrooms and seminar rooms.

Several other events have transpired since the last program review. In 1996, the ENST program was approached by the Residential Life program about the possibility of establishing an environmentally-themed living-learning community in a newly acquired building renovated to serve as a residence hall with about 36 beds. The idea was that the students living together in the house would share a common interest and would take a few of their courses together in common, to further extend and enhance the learning experience beyond the classroom. The "E-house" program persisted in one form or another until 2002. Among other reasons, the discontinuation of the "E-house" reflects the dispersed interdisciplinary nature of the ENST curriculum and faculty—there just aren't that many courses (or faculty) that ENST students necessarily take in common—and it reflects declining interest in the ENST program, as discussed in the section on Enrollment Trends.

Also in 1996, a group called the "Green Team" was established. This group, composed of staff and faculty, arose out of the College's Speak Out "open space" planning meetings. It was in these meetings that the campus community had identified "Environmental stewardship and sustainability" as one of several core campus values (http://www.keene.edu/aboutksc/mission.cfm), articulated as goals in *Our Plan*. The "Green Team" has since morphed into the President's Council for a Sustainable Future (http://www.keene.edu/sustain/). The ENST Coordinator sits on the Council as an *ex officio* member.

In the fall of 1998, Keene State College hosted the annual gathering of the "NEES Group," a two-day meeting of program directors and faculty from Environmental Studies programs at colleges and universities from across the northeast.

❄ ❄ ❄ ❄

Program Content & Organization

Goals & Objectives

The following is a statement of mission that was articulated at a day-long retreat of the ENST Steering Committee in January 1995, prior to our last review:

> The goal of the ENST program is to educate students in the complex ways of the world so that they may be better prepared to make effective, meaningful and sustaining contributions to society in resolving vexing environmental issues. As specific objectives, we feel that all ENST graduates should have:
>
> 1) understanding of Earth system sciences including interaction and feedback between human and other biological communities and the physical and chemical environment;
>
> 2) awareness of basic political and economic structures, economic power relations, and the complexity of social change;
>
> 3) exposure to, practice with, and the ability to communicate about scientific research methodologies and verification techniques;
>
> 4) specialization in the biological or physical sciences or policy areas as preparation for entry-level environmental careers and/or graduate studies.

Discussions we have had since have not really addressed any fundamental revision of this statement. Issues remain around breadth versus depth, training environmental specialists versus providing a liberal arts education in environmental studies, and the relationships between the ENST program and General Education.

What follows is a new *draft* statement of goals and objectives for the ENST program, developed from various brainstorming sessions around learning outcomes and assessment, to help provoke further discussion:

The goal of the ENST program is to prepare students to better make effective, meaningful and sustaining contributions to society with respect to environmental issues. To do this our graduates must be capable of: (1) understanding and assessing the "state" of the environment, now and in the future; (2) envisioning what changes in our relationship to the environment might be necessary and how they could be made; and (3) taking action towards improving our relationship to the environment.

(1) Understanding the Environment

In order to understand (now and in the future) what the problems are (or will be), our graduates should:

(a) have and be able to maintain general knowledge about how the Earth System operates, particularly interaction and feedback between human and other biological communities and the physical and chemical environment, including: (i) the flow of energy and the cycling of matter, (ii) concepts of sustainability and carrying capacity (including I=PAT), (iii) the dynamics and growth of human population, (iv) the role of biodiversity and evolution;

(b) have and be able to maintain specific knowledge about: (i) food, water, energy and material resources, (ii) air, water, and ground pollution and toxicology, (iii) waste disposal, recycling, and energy efficiency and conservation, (iv) global environmental change including ozone depletion, climate warming, acidification of precipitation, and sea level rise; and

(c) be able to practice the scientific method in studying aspects of the Earth System, including being able to make observations, pose

questions, formulate hypotheses, design and carry out experiments or studies, analyze results, and draw conclusions.

(d) be able to reason quantitatively, including being able to read and interpret graphs and understand statistical analyses of experimental data (*Quantitative Reasoning Competencies for General Education*, Appendix IV)

(e) be able to read critically and effectively, including being able to evaluate information sources, to differentiate fact from inference, opinions and beliefs, and to locate and use government documents; and

(f) be able to prioritize identified problems.

(2) Envisioning Solutions

To envision reasonable solutions to environmental problems, our graduates should, in addition to items above:

(a) have and be able to maintain general knowledge of basic political and economic structures, economic power relations, and the complexity of social change, including (i) criticism of the institutions of society, (ii) cost-benefit analysis/life cycle costing vs. the precautionary principle, (iii) recognition of internal vs. external costs;

(b) have and be able to maintain specific knowledge about (i) the literature of the environment and the history of the environmental movement, (ii) environmental ethics and justice, (iii) environmental laws, regulations and policies, (iv) concepts of natural resource conservation, including the tragedy of the commons and the limits to growth, (v) globalization of trade and the environment, including the development of "global divides";

(c) be able to think critically and creatively; and

(d) be able to evaluate proposed solutions, including being able to apply risk assessment techniques.

(3) Taking Action

To take action towards implementing solutions, our graduates should:

(a) be able to effectively express themselves and make convincing arguments in written (*Writing Competencies for General Education,* Appendix IV), oral and graphic communication, including being able to communicate about scientific research methodologies and verification techniques, and being able to use economic arguments;

(b) have and be able to maintain well-developed values and a sense of personal responsibility;

(c) behave civilly, ethically, justly and responsibly; and

(d) work effectively in a group or on a team.

Relationship to College Mission

KSC has articulated "Environmental stewardship and sustainability" as one of several core campus values (http://www.keene.edu/aboutksc/mission.cfm). The Environmental Studies program, as an academic program, helps to further that value as the College strives to "provide and maintain an intellectual environment grounded in the liberal arts that fosters both the personal and professional growth of our students." (http://www.keene.edu/aboutksc/mission.cfm)

In support of this mission, KSC promotes strong relationships among students and faculty that emphasize creative and critical thinking, scholarship and research, and a passion for learning, with a commitment to service. Our efforts in ENST are entirely consistent with this mission.

Relationship to General Education

The ENST program addresses, at least in part, the following Goals for General Education at KSC (Senate Document 99/00-23):

* general knowledge of the natural world;
* an appreciation for the critical importance of ethical and civil behavior and personal responsibility;
* knowledge and skills necessary to engage as an informed and involved citizen in a democratic society;
* the development of social and personal values;
* an ability to communicate effectively with others both orally and in writing;
* an ability to read critically and effectively;
* an ability to reason quantitatively;
* an ability to think critically and creatively;
* fundamental research skills

Many students choose ENST courses, particularly ENST 100, as a means of meeting some of their Science and Mathematics General Education distribution requirement.

Relationship to External Factors

Interdisciplinary majors such as ENST develop and evolve because new areas of social concern arise which cut across traditional disciplines and hence are not easily assimilated within these standard fields of study. If the interest in these new areas survives over a long period of time and continues to generate research and policy questions, then institutions arise to conduct this research and answer these questions. As a field of social concern, the environment has survived the test of time and has been incorporated into the national and global thinking as a crucial consideration in many issues.

The US Department of Labor's Bureau of Labor Statistics Occupational Outlook Handbook (http://stats.bls.gov/oco/ocos050.htm) projects that employment of environmental scientists will grow faster than the average for all occupations through 2010, increasing between 21 and 35 percent. This growth will be driven by the continuing need for companies and other organizations to comply with environmental laws and regulations. In addition, the need to replace retiring environmental scientists will create additional job opportunities.

Design of Program

Overview

The ENST program supports a major with two options (Appendix II), leading to a Bachelor of Sciences degree, as well as a minor (Appendix II). The major and minor programs include a few ENST courses (Appendix III), but rely heavily on a large number of discipline-based courses (Appendix III). ENST courses are elected by many non-majors to meet General Education requirements (Appendix IV).

The major program includes a common core of courses that all students (in both options) must take. Students must choose either the Environmental Science Option, or the Environmental Policy Option, each with its own set of courses that all students in that option must take. In addition, students must meet a specialization requirement. For those in the Science option, there are established specializations in Environmental Biology, Environmental Chemistry, and Environmental Geology (Appendix II). Students in the Policy option must specialize by taking at least 12 credits at the 300-level or above within one discipline (i.e., Economics, Geography, or Political Science). Alternatively, students in either Option may if desired design an "Individualized Specialization." Recent examples include specializations in Safety Studies and in Journalism.

Because of the broad interdisciplinary nature of the ENST major, and thus the large number of courses required, students can use courses required by the major to also meet general education requirements.

The program is overseen by a Steering Committee with faculty representatives from the contributing disciplines, as well as other

interested faculty. The Coordinator is elected from the committee to a two year term. The committee and its Coordinator report to the Dean of Sciences, who may sit on the committee as an *ex officio* member.

Contribution to General Education

The College's current General Education program (Appendix IV) requires all students seeking a Bachelor's degree to take at least four courses in the Sciences or Mathematics. Courses in Environmental Studies may count for up to two of these four.

Environmental Studies courses available for General Education (i.e. those without pre-requisites) include:

* ENST 100 Introduction to Environmental Studies
* ENST 210 Energy and the Environment

In addition, students who have already taken ENST 100 and who also choose to take ENG 202, could take ENST 200 Intermediate Environmental Studies for the purpose of meeting their Science and Mathematics General Education requirements.

Accreditation & Assessment

We have not identified any mandates or standards for Environmental Studies programs promulgated by government or accreditation agencies.

Certain professions involved in the environmental field are regulated by various states, for example Professional Engineers (PEs), Land Surveyors, and Foresters are licensed in most states. Regionally, the State of New Hampshire licenses Professional Geologists (PGs), Soil Scientists and Wetland Scientists (http://www.state.nh.us/jtboard/home.htm). Maine certifies Professional Geologists and Soil Scientists (http://www.state.me.us/pfr/olr/categories/cat20.htm). Massachusetts licenses "Hazardous Waste Site Cleanup Professionals" or LSPs (http://www.state.ma.us/lsp/lsphome.htm), and Connecticut licenses "Environmental Professionals" or LEPs (http://www.dep.state.ct.us/pao/PERDfact/LEP.htm)

In general, these programs establish minimum education and experience requirements for licensure of professionals, but do not otherwise set standards for academic programs. For example, Professional Geologists in New Hampshire are required to have passed at least 30 semester hours of courses in Geology or related fields from an accredited College or University, among other requirements.

Program Revisions

Progress in academic planning and curriculum development comes through (1) individual faculty initiative, (2) developments in the contributing disciplines, and (3) day-long retreats of the ENST faculty, both on and off campus.

Significant changes were made to the ENST major program in 1996 . These changes brought the Policy and Science Option students together with a common core of courses, and further defined the Specialization requirements, particularly in the Science Option. We also consolidated two previous Environmental minors, Policy and Science, into a single Environmental Studies minor.

In 2000, the common core of course was expanded to include two new offerings, ENST 200 Intermediate Environmental Studies (taught for the first time in Spring 2002) and ENST 395 Junior Seminar (to be taught for the first time in Spring 2003). These are designed to help provide "stepping stones" from the first year (ENST 100) to the senior year (ENST 495) courses and reinforce the connections between the other courses required in the program.

Table 1: Initial Proposal for Assessment of Learning Outcomes

Outcome	*Assessment Mechanism*	*Criteria*
1) All ENST students will demonstrate an ability to differentiate facts from inference, opinions and beliefs in evaluating environmental information from a variety of sources.	1) Students will read a portfolio of source materials (to be selected by the ENST faculty) and then take an examination based on those readings (to be developed by the ENST faculty), to be administered in the Senior Seminar.	1) At least 80% of students will correctly answer at least 80% of the questions [we still need to identify sub-scales and criteria].
2) All ENST students will demonstrate knowledge of basic concepts of Environmental Science and Policy (as covered in the common ENST 100 course).	2) An exam developed by the ENST faculty [by compositing our exams from ENST 100] will be administered to students during their Senior Seminar. (If an acceptable national standardized exam is identified, that might be used instead.)	2) At least 80% of students will correctly answer at least 80% of the questions [we still need to identify sub-scales and criteria].
3) All ENST students will demonstrate an ability to design an environmental research project incorporating the collection and analysis of quantitative data relevant to the proposed project.	3) Project Proposals developed by students in the Junior Seminar will be reviewed by a panel of the ENST faculty (using a rubric that has yet to be developed).	3) All student research proposals will incorporate the collection and analysis of quantitative data relevant to the proposed environmental research project [we still need to identify sub-scales and criteria].
4) ENST Policy Option students will demonstrate an ability to effectively use policy arguments in discussing environmental issues.	4) A panel of the ENST faculty will review portfolios of Policy Option student project work done in the Junior and Senior Seminar series (using a rubric that has yet to be developed).	4) All ENST Policy Option student projects will use policy arguments in discussing environmental issues [we still need to identify sub-scales and criteria].
5) ENST Science Option students will demonstrate the ability to apply the scientific method to investigating the environment.	5) A panel of the ENST faculty will review portfolios of Science Option student project work done in the Junior and Senior Seminar series (using a rubric that has yet to be developed).	5) All ENST Science Option student projects will show evidence of scientific methodology in investigating the environment [we still need to identify sub-scales and criteria].

Learning Outcomes Assessment

Within individual courses, learning outcomes are assessed with course-based examinations and the evaluation of other student work. For those ENST courses that are pre-requisites to further ENST courses (e.g. ENST 100 as a pre-requisite for ENST 495), there is some informal assessment of learning outcomes from the previous courses in the later courses. The ENST 495 Senior Seminar is intended to serve as a capstone experience for all ENST majors, which has been an effective, albeit very informal, means of assessment for the program.

The new "stepping stone" courses, ENST 200 and ENST 395, were developed in response to our perception that the program was seen by students as an un-connected collection of courses from various disciplines, without much of a thread to bind them together. In part, this manifested itself in the apparent lack-luster performance of students in the capstone Senior Seminar.

KSC, like many other institutions, is now pushing programs to formalize their assessment processes and document their learning outcomes. Because of the broad interdisciplinary nature of the ENST program, we have had some difficulty coming together on narrowing the list of desired outcomes. Table 1 lists an initial proposal of outcomes, assessment mechanisms, and criteria for ENST for the first round of assessment.

Advising Practices

All prospective ENST majors are assigned by the College Advising Center to the ENST Program Coordinator, who meets with students (at the their initiative) to assess their interests and direct them to approach an appropriate faculty member to be their advisor, depending on their intended area of specialization.

Other Considerations

The program does not explicitly address gender or multi-cultural issues, although these may be touched upon in a number of courses—particularly in the Environmental Policy track. Certainly many cultures are influenced by the natural resources and environment of the place where the culture developed, and we do take a global perspective in many of our courses. We could do more to encourage our students to consider study of a foreign language, both for graduate school and for the possibility of international work in the environmental field. We have had students participate in international exchange programs or undertake internationally-based research projects, but these activities are at the discretion of the student and are not an formal part of our program.

❄ ❄ ❄ ❄

Faculty

Demographics and Qualifications

Table 2 lists faculty representing the disciplines on the ENST Steering Committee, including those with joint appointments in ENST. The table presents their year of appointment, current rank, areas of specialization, and year of degree. Table 3 lists faculty responsibility for ENST-labelled course offerings for the past twelve years, and illustrates the growth in the program and its offerings over that time. Curricula Vitae for selected faculty are presented in Appendix V.

The faculty involved in the program represent a broad cross-section of disciplines and interests. All hold an appropriate doctoral degree and are well qualified in their areas. Several have won special recognition of one form or another from their respective disciplinary communities. One has been recognized with the KSC Distinguished Teacher Award, another with the KSC Community Service Award.

We do often "borrow" resident faculty from other disciplines—and have also tapped the Dean of Sciences—to teach ENST courses. (Table 3 lists the following faculty, in addition to faculty listed in Table 2: Weed—Political Science; Cangialosi—Biology; Nielsen—Geology; Leversee—Dean of Sciences; and Wolf—Physics). Fall 2002 marks the first semester we have used an "outside" adjunct instructor to teach ENST 100 (Spear-O'Mara, Table 3).

Joint Appointments

We have pursued joint-appointments rather than full faculty lines because, given the competition for new faculty lines here at KSC, it seemed unlikely that we would ever get a whole faculty line just for ENST. Further, it wasn't clear, at least a few years ago, that we would be able to find suitable and acceptable candidates who could cover *all* the bases if we did get such a faculty line. So, we have

Table 2: Faculty representing the disciplines on the ENST Steering Committee

Faculty Member	Year Hired	Current Rank	Areas of Specialization	Year of Degree
Timothy T. Allen (1/4-time ENST)	1992	Professor	Geology: Geochemistry, Hydrogeology, and "hard rock"	1992
JoBeth Mullens (1/4 time ENST)	1995	Associate Professor	Geography: Water Resources	1995
Renate L. Gebauer (1/2 time ENST)	1998	Assistant Professor	Biology: Plant Community Ecology and Physiology	1994
Stephen J. Stepenuck	1970	Professor	Chemistry: Environmental Analysis	1970
Patrick M. Eggleston	1975	Professor	Biology: Aquatic Ecology	1975
Thomas E. Duston	1984	Associate Professor	Economics	1972
Joan Roelofs	1979	Professor	Political Science	1968

Table 3: History of ENST Course Offerings Since 1990

Semester	ENST 100	ENST 210	ENST 495	Coordinator
Fall 1990	*not offered*	*not offered*	*not offered*	*none*
Spring 1991	Duston (2)	*not offered*	Stepenuck	Stepenuck*
Fall 1991	*not offered*	*not offered*	*not offered*	Stepenuck*
Spring 1992	Weed (2)	*not offered*	Stepenuck	*Stepenuck*
Fall 1992	Cangialosi (3)	*not offered*	*not offered*	Stepenuck*
Spring 1993	Cangialosi (2)	*not offered*	Cangialosi	*Stepenuck*
Fall 1993	Cangialosi (2)	*not offered*	*not offered*	Nielsen*
Spring 1994	Allen (2)	Eggleston	Cangialosi	*Nielsen*
Fall 1994	Allen (2)	*not offered*	*not offered*	Stepenuck*
Spring 1995	Eggleston (2), Allen (1)	*not offered*	Cangialosi	*Stepenuck*
Fall 1995	Eggleston (2)	*not offered*	Allen	*Allen*
Spring 1996	Eggleston (2)	*not offered*	Cangialosi	Allen
Fall 1996	Mullens (2)	*not offered*	Leversee	Allen
Spring 1997	Mullens (2)	Allen	Duston	Allen
Fall 1997	Allen (2)	*not offered*	Mullens	Allen
Spring 1998	Allen (1)	Wolf	Mullens	Allen
Fall 1998	Gebauer (2), Leversee (1)	*not offered*	Mullens	Allen
Spring 1999	Gebauer (2)	Wolf	Mullens	Allen
Fall 1999	Gebauer (2), Leversee (1)	*not offered*	Allen	Eggleston
Spring 2000	Mullens (2)	Wolf	Gebauer	Eggleston
Fall 2000	Mullens (2), Eggleston (1)	*not offered*	Eggleston	Eggleston
Spring 2001	Gebauer (2), Eggleston (2)	Allen	Gebauer	Eggleston
Fall 2001	Gebauer (2), Eggleston (2)	*not offered*	Stepenuck	Allen
Spring 2002**	Eggleston (2)	*not offered*	Gebauer	Allen
Fall 2002	Eggleston (2), Mullens (1), Spear-O'Mara (1)	Allen	Gebauer	Allen
Spring 2003**	Eggleston (2)	*not offered*	Gebauer	Allen

*Stepenuck and Nielsen still taught a full 12-credit load, taking the 3 credits of re-assigned time as overload pay.
** ENST 200 Intermediate Environmental Studies was first offered in Spring 2002, taught by Gebauer; ENST 395 Junior Seminar will be first offered in Spring 2003, to be taught by Mullens.

been successful—in collaboration with other departments—in getting new faculty in joint positions.

We have also suggested to the administration that the potential for contribution to the ENST program be considered for *all* new faculty appointments across the college. Recently hired faculty in English (Mark Long, 1998) Mathematics (Richard Jardine, 1999), and Safety Studies (Melinda Treadwell, 2000) have interests in environmental studies related areas, even if they don't have formal commitments to the ENST program. The Sociology Department is this year conducting a search for (possibly) an environmental sociologist and has invited a representative of the ENST program to participate in the search, although this appointment is not envisioned as a joint one.

An advantage of using joint appointments is the ability to bring on several new faculty, each with their own perspectives and strengths to contribute to the program.

Issues with joint appointments include evaluation, doubling of commitments and dilution of effort, and a split sense of belonging. For those faculty with joint appointments in ENST, their "Discipline Peer Evaluation Committees" are composed of two or three colleagues from their "home" discipline plus one or two from ENST. We haven't yet experienced problems of conflicting standards, or disciplines slighting a jointly-appointed faculty member's work in ENST as opposed to work in the discipline. (The same cannot be said for some discipline-based faculty who "volunteered" time to support ENST.) In general, the faculty here seem pretty supportive of each other's work, and the administration seems to recognize the value of all of our diverse work.

However, those in these joint appointments are sometimes torn between wanting to build up their "home" department vs. the ENST program. These faculty have a double service load, as they must serve the needs of their home department as well as those of the ENST program. Also, with each of us "housed" in our respective home departments, there is no central "home" for ENST students.

Another potential source of conflict might be over "sense of ownership" of the program between the "old guard" faculty who started and sustained the program on a "voluntary" basis, and the new faculty who are hired with formalized commitments to the program. But with no faculty appointed solely, or at least primarily, in ENST, none of us really have the kind of undiluted time or energy necessary to provide truly dedicated leadership to the

Table 4: Possible course offerings for the next 3 years

Sem.	ENST 100	ENST 200	ENST 210	ENST 395	ENST 495	Coordinator
F2003	Eggleston (2) Allen (2?)	*not offered*	*not offered*	*not offered*	Mullens	*to be elected*
S2004	Eggleston (2)	Gebauer	Allen	Mullens	*not offered*	*to be elected*
F2004	Eggleston (2?) Allen (2?)	*not offered*	*not offered*	*not offered*	Mullens	*to be elected*
S2005	Eggleston (2?)	Mullens	Allen	Gebauer	*not offered*	*to be elected*
F2005	*to be determined*	*no offered*	*not offered*	*not offered*	Gebauer	*to be elected*
S2006	*to be determined*	Mullens	Allen	Gebauer	*not offered*	*to be elected*

program. Furthermore, none of us have the kind of broad interdisciplinary education that would help provide an over-arching perspective to our vision for the program.

Workload

Teaching assignments are determined by historical precedent, areas of faculty expertise, and mutual agreement of the faculty and their "home" disciplines.

Course offerings from the last five years are given in Table 3, and a projection of possible course offerings and faculty assignments for the next three years is given in Table 4.

We have offered multiple sections (at least 2) of ENST 100 as well as one section of the ENST 495 Senior Seminar every semester, and have offered ENST 210 Energy and the Environment most spring semesters. Together with the one course per semester of re-assigned time for the Coordinator, this has amounted to at least 1.125 FTE faculty load in ENST at a minimum.

The introduction of ENST 200 and the ENST 395 Junior Seminar, assuming at least one section of ENST 200 per year and one section of ENST 395 per semester, increases the faculty load to 1.5 FTE at a minimum.

Given the current trend in enrollments, as discussed later, reducing the offering of ENST 395 and ENST 495 to one section each per year may be warranted, while possibly increasing the offering of ENST 200.

Faculty Reassigned Time and Overloads

In a side agreement to the 1996 Contract, the Chair of the ENST Program Steering Committee was given 6 credits of re-assigned time (2 courses released per year, or 1 per semester) and a stipend of $750. The 1999 Contract redefines this position as a Program Coordinator, still with 6 credits of re-assigned time and the stipend. When Patrick Eggleston took on the duties of coordinator in 1999, he negotiated with the Dean an increased stipend of $1000, which level has been maintained. Both Allen and Eggleston have taken advantage of the re-assigned time, generally in the form of a 1-course release each semester. None-the-less, Allen often still had, as he does now, a full load of three distinct course preparations each semester.

Acceptability of Workload

The nominal teaching load at KSC is 12 credit hours—generally four 3-credit courses, but with no more than three distinct preparations—per semester. In the sciences, some of those credits normally consist of laboratory sessions at 2 or 3 contact hours per credit, often producing a teaching load of 16 or more contact hours per week. The accounting for laboratory preparations apparently is not handled consistently across the disciplines.

The balancing of teaching loads between the expectations of "home" disciplines and ENST also sometimes results in faculty either taking on more than three preparations in a semester, or they end up teaching fewer than 12 credit hours.

These kinds of teaching loads effectively preclude much scholarly work by faculty. "Faculty are torn between their roles as teachers in a teaching institution and by what they perceive as peer pressure to increase research productivity." (*KSC Self-Study for Reaccreditation,* 2000, p. 44) Of course, sometimes that pressure for increased research productivity comes from within; certainly, junior faculty coming to the college in the past decade, across the disciplines, have brought with them high expectations for themselves in all areas of their work.

Even more importantly, student scholarship is likewise limited—the student course load is nominally five distinct 3-credit courses per semester! Involvement in research, at some level, should be a fundamental part of a student's education—*they* need the time for it,

and they need to work with *faculty* who are actively engaged in research themselves.

In general, faculty are responsible for the set up and breakdown of the labs for their courses, as well as the maintenance of all equipment in their care. As our facilities expand and our curriculum evolves to incorporate more inquiry-based labs using these facilities, this is increasing faculty workload.

Faculty teaching ENST courses are also stretched because of their need to expand their expertise well beyond their discipline to encompass the interdisciplinary and ever-changing material that is Environmental Studies.

Evaluation

Evaluation of faculty is subject to the provisions of the Contract, with further guidelines set forth in the *KSC Faculty Handbook*. Evaluation of adjuncts is not yet subject to contractual guidance. Faculty are evaluated on their teaching and advising, their scholarship and professional activity, and their service to the college community.

The procedure involves the faculty member preparing a self-evaluation report, which together with documenting materials including student course evaluations and peer classroom observations, is submitted for consideration by a Discipline Peer Evaluation Committee (DPEC) which prepares an advisory report. The faculty member's file, the DPEC report, and any response from the faculty member, are forwarded to the Dean of Sciences, who writes a letter of evaluation. If the faculty member is a candidate for promotion and/or tenure, the faculty member's file along with the DPEC report and any response from the faculty member, are also considered by an elected, college-wide Faculty Evaluation Advisory Committee (FEAC). The FEAC and the Dean write independent letters of recommendation addressed to the Vice President of Academic Affairs. Un-tenured faculty are evaluated by DPEC and Dean annually. Once tenured, faculty may choose to be evaluated by DPEC and Dean every second year if they intend to pursue further promotion. Full professors are evaluated by DPEC and Dean only every five years.

Environmental Studies is not recognized as a Department for the purposes of evaluation in the Contract. The expectation has been that ENST faculty will be evaluated by a DPEC from their "home" department, typically with at least one member representing ENST from outside that department.

Advising Responsibilities

The Contract limits the number of advisees that can be assigned to a faculty member to a maximum of 21. Currently, the number of majors in ENST is far from pushing this limit, if one counts all of the faculty listed in Table 2 as potential advisees. However ENST really only has 1 FTE faculty (split between Allen, Mullens and Gebauer), thus the ratio of ENST majors (34 in fall 2001) to ENST faculty (1 FTE) does exceed 21.

For some faculty, balancing the assignment of advisees from their "home" discipline with the assignment of advisees from ENST has been difficult. The Biology Department, for example, expects that Renate Gebauer should be able to accommodate 10 or 11 Biology majors as advisees, in keeping with her half-time appointment.

The advising of ENST students may also be somewhat more taxing than the advising of students in the "home" discipline, due to the expectation that the ENST advisor be familiar with a broader range of programmatic requirements, job openings, and graduate school opportunities.

Faculty Interactions

Because of the interdisciplinary nature of the ENST program, faculty involved or interested

in the program are scattered across campus—many have offices in the Science Center, but some are in Rhodes, Parker, Morrison, Butterfield, and 88 Winchester. In addition, our schedules are very full and often in conflict, so it is very difficult to find a common time when we can all meet together.

❄ ❄ ❄ ❄

Facilities and Resources

Laboratories and Equipment

A number of major laboratory facilities and equipment are available to undergraduate students at KSC. All of those listed here are used in at least one, if not several, courses that are a part of the ENST program. These are also available for student projects in ENST 495 Senior Seminar or ENST 498 Independent Study.

Stable Isotope Biogeochemistry Laboratory

This laboratory was established with a grant in 2000 to Gebauer and Allen from the Keene State College Faculty Development Fund, and a grant in 2002 to Gebauer, Allen and Steve Bill from the National Science Foundation (Award #0126706) with matching funds from Keene State College. Additional funding came from the budgets of the Geology Department, Biology Department, and Environmental Studies Program.

The centerpiece is a ThermoFinniganMAT Delta^{plus} gas-source stable isotope ratio mass spectrometer (IRMS), equipped with both dual-bellows and continuous-flow inlet systems, a universal triple collector, and an H/D dual collector. We hope to eventually acquire an Elemental Analyzer to couple to the continuous flow inlet system soon.

There are also several Modular Multi-Purpose Vacuum Lines designed for (1) extracting water from plant or soil samples by vacuum-cryogenics, (2) preparing water samples for oxygen isotope analysis by equilibration with CO_2, (3) extracting CO_2 from carbonate minerals for both oxygen and carbon isotope analysis, (4) combusting graphite or organic carbon samples to CO_2 for carbon isotope analysis, (5) extracting N_2 from organic samples for nitrogen isotope analysis, and (6) reducing water samples to H_2 for hydrogen isotope analysis.

In addition to Edwards RV3 Vacuum Pumps and Edwards Active Pirani Vacuum Gauges, ancillary equipment includes a NESLAB model RTE-211D refrigerated constant temperature water bath, a Thermolyne F48025-80 8-segment programmable muffle furnace, a Denver Instruments TL204 Analytical Balance, a drying oven, glass-blowing torches, and numerous dewars. Some of this equipment is shared in common with the Analytical Geochemistry Laboratory, described below.

Analytical Geochemistry Laboratory

This laboratory was established with a grant in 2001 to Allen, Peter Nielsen, and Stepenuck from the National Science Foundation (Award #0087860) and matching funds from Keene State College. Additional funding came from the budgets of the Geology Department and the Environmental Studies Program.

The centerpiece is a Rigaku ZSX100e automated Wavelength Dispersive X–Ray Fluorescence Spectrometer (XRF). The instrument is configured with a 4 kiloWatt end-window X-ray tube, optimized for small spot analysis (down to 0.5 mm). A CCD camera and mapping sample stage facilitate interactive spot selection for small spot and mapping analyses. Samples can be analyzed in vacuum or under a Helium atmosphere (for the analysis of liquids).

With this instrument we can analyze mineral crystals, rocks, soils, sediments, ash, sludge, particulate filter papers, films, and other materials, for a wide range of elements from Fluorine to Uranium, at concentrations from as low as a few parts per million (ppm) up to 100%.

Sample preparation typically starts in the Geology Department's Rock Sample Preparation Laboratory, where crushed rock, soil, sediment or other samples are pulverized with a Fritsch Pulverisette 6 planetary ball mill. Powders are mixed with binding agent in a SPEX Mixer/Mill 8000 and then pressed into pellets with a SPEX 3620 X-Press Hydraulic Press, or are mixed with a flux in the mixer/mill and fused in the muffle furnace to produce glass beads. Such samples can be analyzed in either form (pressed pellets or glass beads) depending on the elements of interest and the nature of the original sample.

Laboratory for Environmental Chemical Analysis

This laboratory is housed in the Chemistry Department under Stepenuck's direction, and is equipped with an Instrumentation Laboratories Model 151 Atomic Absorption Spectrophotometer, a Beckman System 342 High-Performance Liquid Chromatograph, a Hewlett Packard 5890 Gas Chromatograph with purge and trap, and Chemstation software, a Hewlett Packard 5720 Gas Chromatograph with 3390A integrator, and a Photovac 10A10 portable Gas Chromatograph, a LaMotte Turbidimeter, two complete Hach kits, a couple of dissolved oxygen meters and several portable pH meters, plus various air, water, and soil sampling devices.

Physiological Ecology Laboratory

This laboratory is housed in the Biology Department under Gebauer's direction, and is equipped with a CIRAS-1 portable gas exchange system (PP systems) with leaf cuvette and soil respiration chamber, light sensors and thermocouples with Campbell CR-23-X digital datalogger, a LI-250 PAR quantum sensor, a PMS pressure chamber, a Wiley cutting mill, a Wescor vapor pressure osmometer, a drying oven and balances.

Geographic Information Systems Laboratory

This laboratory is housed in the Geography Department under the direction of Klaus Bayr, and is equipped with 11 workstations, a 36x48 inch digitizing board, a 36 inch printer, and three other printers. Software available includes Arc View, IDRISI, Surfer, AtlasGIS and STSS. This facility was originally funded

in 1993 by a grant from the National Science Foundation (Award #9352679) to Bayr, Albert Rydant, and Allen, with matching funds from the College. It has since been upgraded with College Technology, Science Division, and Geography Department funds.

Greenhouse and Herbarium

A 750 square foot Greenhouse with MicroGrow climate control system and an automated irrigation system, and an active herbarium, is operated by the Biology Department under the direction of Gebauer and Michelle Zjhra.

Arboretum and Gardens

The Arboretum & Gardens of KSC were created through the cooperation of the Biology Department and the Grounds Crew to support the teaching, research, and public service mission of the College. The purpose is to preserve unique and/or mature plant specimens which may have historic value; 2) use a planned and botanically systematic approach to collecting and installing new and diverse plant material; 3) create a model outdoor field laboratory to promote botanical and horticultural awareness as an educational resource for the College, the community, and region; 4) maintain interpretive materials, including plant identification, accession, mapping, and maintenance records; and 5) provide a visually appealing, diverse and cohesive, accessible landscape setting that provides a physical and emotional atmosphere conducive to academic advancement, recreation, and reflection. A printed brochure leads scholars and visitors on a self-guided walk through the central campus, introducing the ornamental trees and shrubs, and the landscape history of the campus (http://www.keene.edu/catalog/acadresources.cfm)

Ground Water Monitoring Wells

Allen has established three local Hydrogeologic Field Sites (well fields), each with several shallow (10 to 15 feet deep) nested piezometer and water-table monitoring well pairs, one including a 140-foot deep observation well in a semi-confined stratified drift aquifer. The College Fields location is about 1 mile from the Science Building at the south end of the College's athletic field complex; the other sites are at the College Camp on Wilson Pond (~2.5 miles away) and at the Keene Forestry Park adjacent to the airport (~2 miles away).

Hydrologic and Soil Sampling Field Equipment

Hydrologic field equipment includes several bucket augers, a hammer soil-corer, four Soil Moisture Equipment Corp. Jet-Fill Tensiometers, a Solinst model 101 electric water level meter, one Solinst model 3001 LevelLogger self-contained pressure transducer and digital datalogger with optical reader computer interface, two 12V submersible Ground Water purge & sample pumps with deep-cycle battery and charger, Oakton Pocket meters for pH, Conductivity, ORP and Temperature, and a Gurley Precision Instruments D622 Stream Current Meter with digital readout and both wading rod and bridge suspension systems. In addition, several pair of hip boot waders and two pair of chest waders are available. This equipment is maintained by Allen.

Field Mapping and Surveying Equipment

Brunton Pocket Transits, altimeters, GPS receivers, a plane table and alidade, sight levels, transits, a Theodolite, and other surveying and mapping equipment are available through the Geography and Geology Departments.

Weather Station

A weather station with Nimbus digital dataloggers for barometric pressure, temperature, relative humidity, precipitation, and wind speed and direction, along with a class A evaporation pan, was installed in the Science

Building with joint funding from Physics, Geography, Geology, and Environmental Studies. It is operated under the direction of Frederick Wolf in the Physics Department.

Natural Laboratories

Keene's location in the Ashuelot River watershed and the Monadnock region provides an excellent location for field studies, with "urban" pollution problems and relatively undisturbed "pristine" forests in close proximity. Keene is a city of about 23,000, with a diverse commercial and industrial economic base and a history as a manufacturing and railroad center. The city (and the KSC campus) lies on an the bed of an ancient glacial lake, much of it in the floodplain of the Ashuelot River or its tributaries. There are many wetlands and productive aquifers. Nearby Mount Monadnock is one of the most climbed mountains in the world. The region continues to face many development pressures.

The Ashuelot River runs right through the KSC campus, which is at about at the half-way point along the river's course. Over the river's sixty-three mile length, its water quality varies significantly. The KSC campus also includes Brickyard Pond, the Arboretum and Gardens (as described earlier) and a Wildlife Management Area along the banks of the Ashuelot River near the College's athletic field complex, established by the KSC Grounds Crew in cooperation with the USDA Natural Resources Conservation Service (Merrill, 2002).

The College also owns a camp on Wilson Pond in nearby Swanzey and the 400-acre Louis Cabot Preserve on Lake Nubanusit in the towns of Nelson and Hancock. This latter property is managed for the College by the Harris Center for Conservation Education in Hancock.

Other Significant Facilities at KSC

These include the Geology Department's Petrographic Microscopy Laboratory and Rock Sample Preparation Laboratory; the Biology Department's Molecular Biology Laboratory equipped with DNA sequencer, real-time PCR system and a differential display system (NSF Award #0116466); and additional instrumentation in the Chemistry Department, including a Single-Crystal X-ray Diffractometer (NSF Award #8818307), an FT-NMR Spectrometer (NSF Award #9252227) and two FTIR Spectrometers (NSF Award #9351495).

Physical Space

The ENST program does not currently "own" any classrooms or other physical space. ENST classes are now taught in shared or "borrowed" classrooms. Most of the courses that make up our program are discipline-based courses taught in appropriate discipline "owned" or other shared spaces.

We are currently involved with architects, engineers, and construction managers in the design of a major $23 million renovation and expansion of the present Science Center. Construction will begin in May 2003, and will probably be complete sometime in 2004 or early 2005. The "new" building will have several dedicated spaces for the ENST program, including a reading/meeting/work room (a.k.a. "the Green room"), a project laboratory, and field equipment storage, as well as access to shared instrumentation and support laboratories (in particular new labs for Stable Isotope Biogeochemistry and Analytical Geochemistry), and shared classrooms and seminar rooms.

Learning Resources

The Mason Library collection is not huge, but it has been adequate. The Library is aggressively developing its collections, for example subscribing to an "approval program," and has budgeted extra dollars to meet collections

needs in the Sciences. A special gift fund has been established to support the acquisition of environmental library materials, in honor of Malcolm "Mac" Keddy, professor emeritus of English, and his wife, Ruth Keddy, former Dean of Women.

The Library currently subscribes to many journals and other serials, and numerous other journals and resources are available through the Library's subscriptions to on-line services.

A variety of databases and indexes are now fully accessible anywhere on campus (and in some cases, off-campus via password). In addition, the Library has assembled an Environmental Studies resource site accessible from its web home page (http://www.keene.edu/library/topics2.cfm?ShortName=ENST&FullName=Environmental%20Studies).

Other media resources in Mason Library include a variety of videos. The Geography Department has maintained a federal depository library for USGS topographic maps since 1970.

Computing

Each of the full-time faculty have reasonably up-to-date, networked computer workstations in their offices. The College subscribes to a site-license for basic personal productivity software (Microsoft Office). Other software needs are the responsibility of departments or even individual faculty. For example, Dr. Allen regularly relies on illustration, image processing, scientific graphing, database, programming, and graphic design/page layout software, all of which he has provided for himself out-of-pocket.

Students have access to the central general-purpose computing clusters in Rhodes Hall, the Library and other locations, and ENST students sometimes also make use of the Geography Department's GIS lab, as many of them take related coursework. All Residence Hall rooms are wired for network connections, and dial-up internet connections are subsidized for off-campus students.

Much work remains to be done on integrating the use of computers into our curriculum. We also await the further development of more "smart" classrooms.

Support Staff

There are no laboratory or technical support staff available specifically to the ENST program. The Biology and Chemistry Departments do have some laboratory or technical support staff available to them (at some level). In general, faculty are responsible for the set up and breakdown of the labs for their courses, as well as the maintenance of all equipment in their care. As our facilities expand and our curriculum evolves to incorporate more inquiry-based labs using these facilities, this is increasing faculty workload.

Secretarial support is available but very limited (there is one secretary to serve the needs of all the faculty housed within the Science Center). Computer technical support (for faculty) is available through the centralized helpdesk and the Faculty Resource Center.

Budget

The operating budget for the ENST program (for FY2003; representative of our funding level for many years) includes $2200 for supplies, equipment, and other support, $600 for photocopying, and $500 for maintenance and repairs, in addition to the Coordinator's stipend.

In some past instances, departments have pooled funds to purchase shared equipment (for example, the weather station was a combined effort of Physics, ENST, Geology, and Geography; the stream current meter, a combined effort of Geology, Geography, and ENST). Certainly, we try to coordinate ENST expenditures with those of the departments, in the hopes of enhancing both areas. These

efforts can and sometimes do lead to conflict between the priorities of the department and the needs of the ENST program. The departments may dismiss requests perceived as supporting the ENST program and not relevant to the department's own mission. In addition to the pooling of departmental budgets, the Dean of Sciences usually has additional funds not allocated to the departments intended to help meet "critical needs" and larger expense items.

Technology funds, such as for departmental computing clusters, are managed by the College Information Technology Committee with input from the Academic Technology Committee.

The College maintains a Grant Match Account, used to meet the matching requirements of external grants, such as the recent successful NSF proposals for the XRF and the IRMS.

Individual faculty have access to a "Professional Enhancement" allowance ($750 for FY2003, although we may also draw this year upon our FY2004 allowance of $800) which may be used for professional travel or the purchase of supplies or equipment needed for research or teaching.

Faculty may also apply for competitive grants from the Faculty Development Pool (up to $2500 for individual projects, or $5000 for collaborative ones; establishment of the Stable Isotope Biogeochemistry Laboratory was greatly facilitated by an interdisciplinary collaborative faculty development grant).

Students, working in collaboration with a faculty sponsor, may apply to the College's Undergraduate Investigative and Creative Projects Fund for small grants (up to $750) to support their work.

Finally, the Development Office maintains a gift account for Environmental Studies, to receive any donations from friends and alumni.

For our basic day-to-day operations, the budget has so far been adequate. However, as we develop our facilities and capabilities in order to involve students in more hands-on activities, we will begin to really test our budgetary limits. Of particular concern are the anticipated costs for maintenance and the replacement of parts (e.g. the turbo vacuum pump on the IRMS, or the X-ray tube on the XRF). New KSC and USNH initiatives in planning budgets and managing funds, for example the ability to carry some funds forward from year to year in order to accumulate enough for more expensive equipment items, should help (some).

Department Chairs and Program Coordinators will soon receive training on and access to the USNH financial information system, BANNER, and so will be able to track all transactions affecting their budgets. This will be a giant leap forward in information access here at the College.

❄ ❄ ❄ ❄

Students

Enrollment Trends

Enrollment in ENST courses (mostly ENST 100) has been steady or growing over the last few years, as shown in Figure 1. (All enrollment data come from the *KSC Factbook 2001*.) These data show only enrollment figures for fall semester courses, not for the academic year, but are none-the-less illustrative. The large numbers in the fall of 1992 represent a single triple section of ENST 100 that was offered to relieve pent-up demand for the course from previous years. At the time, we were only able to offer ENST 100 one semester each year. The low numbers for fall 1998 probably represent an error in the database. For most of the 1990's we were offering at least one double section of ENST 100 each semester (~100 seats per semester), adding an additional single section (or two), at least in the fall semester, toward the end of the period (see Table 3).

While enrollment in ENST courses (mostly ENST 100) appears to be growing (Figure 1), the number of majors in the ENST program has declined since a peak in 1996, as shown in Figure 2. Over the last 10 years, we have averaged about 50 declared majors in the program,

Figure 1
Students enrolled in ENST courses
Fall semesters

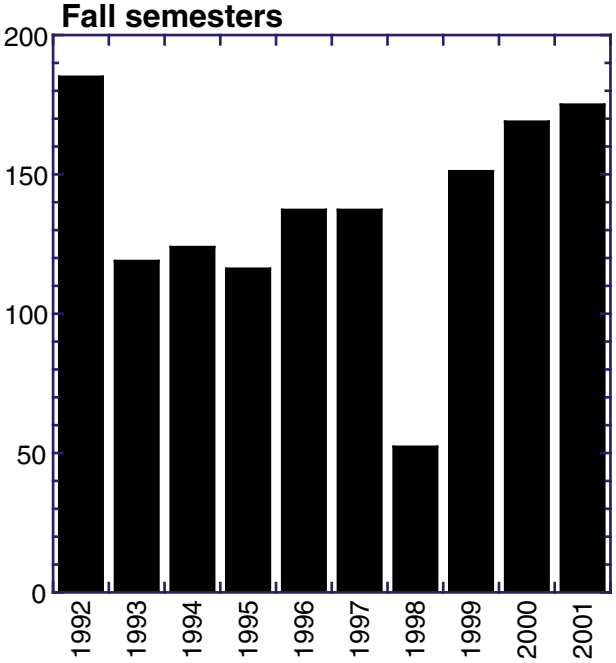


Figure 2
Declared Majors in ENST
Fall semesters

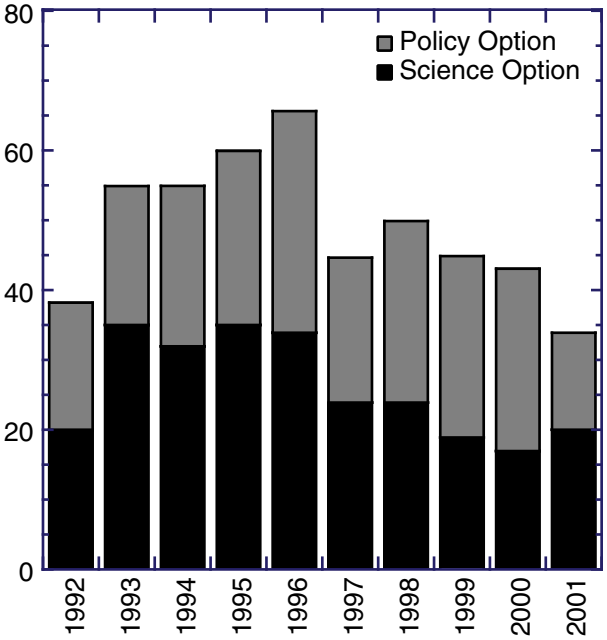
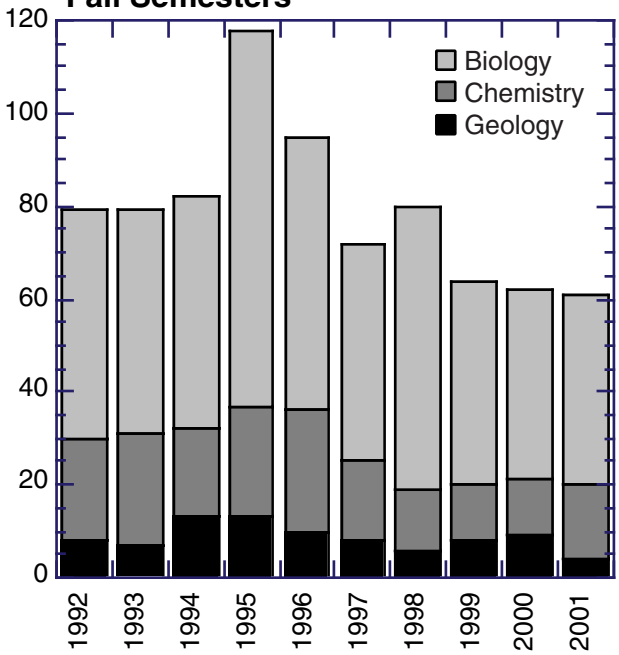


Figure 3
Declared Majors in other Sciences
Fall Semesters



with roughly equal numbers in the Policy and Science options. In the fall of 1996, we had 33 declared majors in each option, for a total of 66. In the fall of 2001, there were only 34 declared majors in the ENST program, 14 in the Policy option and 20 in the Science option.

The graph shown in Figure 2 suggests that much of the decline appears to be among students choosing the Science option. We revised the ENST program in 1996 including the requirements for the Science option specializations. Perhaps the new program is less appealing to students. We also note, however, that over the same time period, there has been an overall decline in the number of declared majors in the rest of the natural sciences (Biology, Chemistry, Geology; Figure 3).

Figure 4 shows the numbers of entering students who expressed interest in majoring in ENST Policy or ENST Science. Entering students are probably more familiar with the concept of Environmental Science than with Environmental Policy, as the science is one that they are often exposed to in high school. Comparing the interests of entering students (Figure 4) with actual declarations of majors (Figure 2), it would seem that many students initially interested in Environmental Science must ultimately decide to pursue the Policy option instead. Perhaps they find science in college to be more rigorous than expected.

The numbers of students graduating with majors in ENST (Figure 5) roughly follows the number of declared majors. As addressed in the 1995-1996 Self-Study, the ENST Program was experiencing significant growth in the early 1990's. At the time, we were concerned about the possibility of exceeding our capacity. Following the spike of graduates in 1997, it is apparent that the demand for the ENST major levelled off, and may now be in decline.

Pursuit of the ENST minor has also been declining (Figure 6). In fall 2001, there were *no* students who had declared the ENST minor. Along with revisions to the major program in 1996, we combined separate Environmental Policy and Environmental Science minors into a single ENST minor. The courses required in the minor each have pre-requisites which ultimately limits the number of students who

Figure 4
Entering Student Interest in ENST
Fall semesters

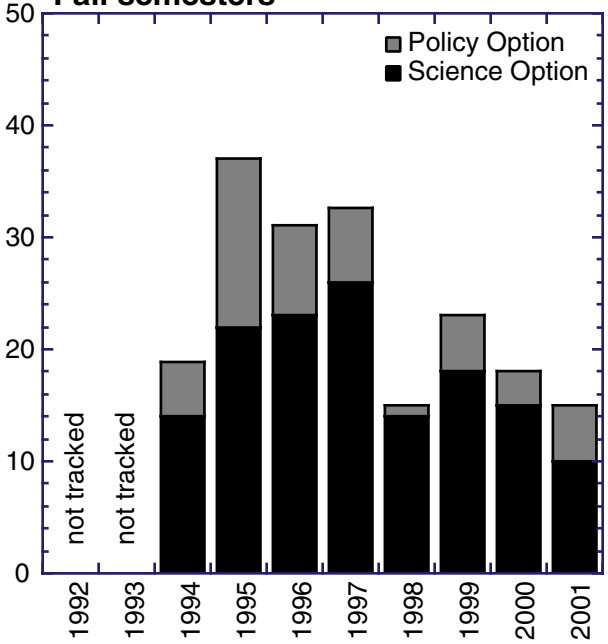
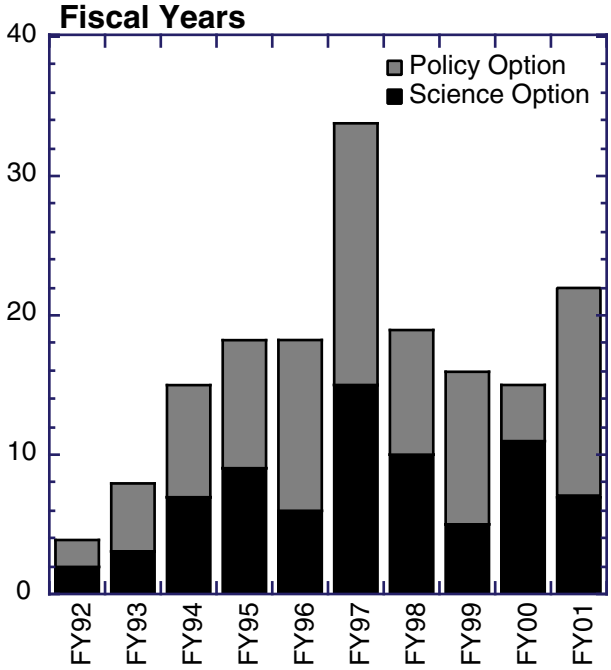


Figure 5
Graduates with ENST majors
Fiscal Years



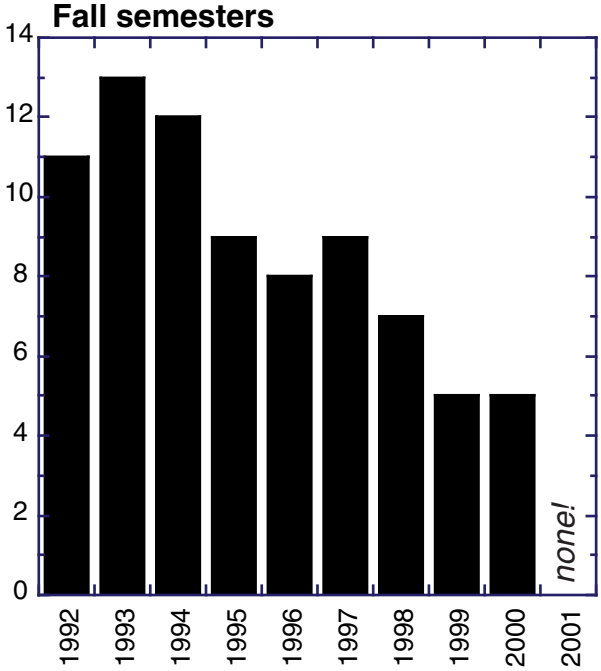
choose to obtain the minor. Perhaps we ought to reconsider the minor?

Demographics

The ENST major program is not attracting female students in proportion to their numbers at the college as a whole. In Fall 2001, only 29% of the 34 declared ENST majors were female (Office of Institutional Research), while in 2001 about 57% of students at the college were female (*KSC Factbook 2001*). Surprisingly, among the two options, the Science Option is attracting more females than the Policy Option: in Fall 2001, 50% of declared majors in the Science option were female, while only 23% of declared majors in the Policy option were female (Office of Institutional Research).

In 2001, racial or ethnic minorities comprised only about 2.2% of the student population at KSC (*KSC Factbook 2001*). The numbers of minorities in ENST are in keeping with this—in Fall 2001, only one declared ENST major (3%) identified themself as a minority (Office of Institutional Research).

Figure 6
Declared Minors in ENST
Fall semesters



The ENST program *does* seem to be attracting "adult learners" (students over the age of 24). In fall 2001, there were 6 declared ENST majors older than 24 (18%)—5 of them were over 40! (Office of Institutional Research) At the college as whole in 2001, 5% of students were between the ages of 25 and 34 inclusive, 3% were 35 or older (*KSC Factbook 2001*).

Admission Process

There are no special requirements or processes for admission into the ENST program. Admission to the College is managed by the Admissions Office. The College expects all students to officially declare their major before completing 60 credits, in other words before the end of their sophomore year. Students who have not met the deadline are sent to the back of the line at course registration time.

Participation in Program

In the past, we used to have appointed or elected student representatives to the ENST Steering Committee, but that has atrophied. Resurrection of the practice is controversial among the current faculty. Thus there currently is no formal means of communication between ENST students and faculty. The dispersed interdisciplinary nature of the faculty involved in ENST, the general lack of any collective sense of group identity among ENST students, and the absence of any common gathering place for ENST students and faculty greatly impede even informal communication.

ENST students often are involved in the academic club associated with the discipline in which they are specializing, for example the Biology Club, Chemistry Lyceum, GEODES geology club, or the Geography Club. The GEODES geology club, in particular, takes interested students on full-week or longer extended field trips to areas typically outside of New England. Dr. Stepenuck also traditionally accompanies interested ENST students to the annual Environmental Expo in Boston each spring.

Two other student organizations with ties to the ENST program include:

(1) the Outing Club, which used to be known as the "Environmental" Outing Club and was previously advised by Dr. Stephen Stepenuck. The Outing Club describes itself as follows: "We are a club of outdoor enthusiasts. We meet only to plan and carry out trips that meet the interests of our members. Our goal is to build a foundation of equipment, experience, defensive drivers and connections. Each semester we carry out a big trip and several skill builders." (http://www.keene.edu/young/recreation.cfm)

(2) Campus Ecology, advised by Mary Jensen, Recycling Coordinator in the Physical Plant Department, and Dr. JoBeth Mullens. "The purpose of the campus ecology is to establish environmentally sound practices on campus by promoting leadership, environmental awareness, and action within the campus community." (http://www.keene.edu/young/interest.cfm; http://wcb.keene.edu/~ecologyclub/ce.html)

Honors and Recognition

Presently, no formal mechanisms exist for recognizing ENST-specific student academic achievements or service to the program. Some ENST students get involved in cooperative research projects with faculty and may give presentations at regional scientific meetings or at the college's own Academic Excellence Conference. Several of the disciplines involved in the ENST program have their own academic achievement or service awards that are presented at the Honors Convocation every spring. These awards sometimes go to ENST students specializing within that discipline. For example, the George T. Faust Geology Award has been presented to ENST-Geology students Sean Kennedy in 1999, Destiny Saxon in 2001, and Elizabeth Hurd in 2002.

❄ ❄ ❄ ❄

Program Evaluation & Assessment

Outcomes

In evaluating our program, there are no widely accepted professional organization or accrediting body standards or recommendations against which to compare. As discussed below, even comparison to similar programs at other institutions is problematic. We have relied heavily on feedback from our alumni—their success is the ultimate measure of outcomes for the program.

Program Comparisons

After citing numerous assessments and studies, Maniates and Whissel (2000) note that "Consensus on both the state and best design of environmental studies and science programs ... remains elusive, even as the number and size of these programs grow and the disciplinary diversity of the faculty staffing them increases." This is supported by Romero and Eastwood (2002) who conclude that "this is a field where there is a lack of unifying principles and a clarity of what environmental studies programs should be."

In support of their conclusion, Romero and Eastwood (2002) note a "high diversity of names and emphases." This is born out by a brief review of environmental studies or related programs at comparator institutions (Appendix VI). In contract negotiations, USNH and the KSCEA developed a list of 30 comparator institutions, also useful for comparing programs among similar institutions (Appendix VI). In addition, KSC is a member of the Council of Public Liberal Arts Colleges (CoPLAC), which group provides another basis for comparison (Appendix VI). (Besides KSC, one other institution shows up on both lists, Sonoma State University.) We have not attempted to compare program structure or course requirements among these programs, given the expected diversity.

Alumni Feedback

Dr. Tom Duston surveyed alumni of the ENST program in 1997 and again in 2001. For the 2001 edition, a questionnaire was sent to 156 ENST alumni, as listed by the Alumni Records Office. Sixty-five (42%) responded, with 30 identifying themselves as graduates of the Policy option, 28 from the Science option, and 7 as "other." This proportion is in pretty good agreement with the average 1:1 ratio between the Policy and Science options among declared ENST majors (Figure 2) and graduates with ENST majors (Figure 4).

While only about 25% of respondents reported that their first job after graduation required an environmental studies degree, about 50% indicated that they are currently employed in an environmental field. Job descriptions are listed in Table 6. In the 1997 survey, we were surprised that Policy option graduates seemed to be holding jobs we would have expected to go to Science option graduates, and vice-versa.

The alumni were asked, based on their personal experience and observations, whether they thought it better to have a degree in a specific discipline (like Biology or Economics) or

Table 5: Job descriptions of alumni respondents in environmental fields

Policy option (15 of 30)
- Resource Management and Planning (5)
- Public Health Inspection/Remediation (4)
- Environmental Consulting (2)
- Environmental Advocacy (2)
- Conservation Enforcement (1)
- Management (1)

Science option (16 of 28)
- Environmental Testing (5)
- Environmental Education (4)
- Environmental Consulting (4)
- Park Ranger (1)
- Waste Water Treatment (1)
- Environmental Permitting (1)

in Environmental Studies. For both Policy and Science option respondents who have environmental jobs, 60% indicated that an environmental degree was better, 13% thought a specific discipline better, and the remainder were ambivalent or gave other responses. Of those not having environmental jobs, 37% said an environmental degree was better and 28% said a specific discipline was better.

There was overwhelming support for the value of field experience in one's education, across the board. Among Policy option respondents who have environmental jobs, 60% reported having had some field experience while at KSC. For Science option alumni with environmental jobs, 87% had some field experience, although some described their particular experience as "modest." Our alumni feel strongly that a significant field experience should be a more important part of the ENST program.

This is supported by Romero and Eastwood (2002) who note: "most programs include internships opportunities and about one third of them require that internship to be completed as part of the graduation requirements." Data from O'Reilly et al (1995) showed that KSC alumni were *not* as involved in field studies, internships, or mentor programs in their undergraduate education as alumni from other Environmental programs from across the country.

Regarding courses from the ENST major that alumni found especially important, 39% of those holding environmental jobs (including both Policy and Science option respondents) mentioned environmental chemistry; 32% noted the helpfulness of geology, and 19% cited geography. Thirty-three percent of the Policy option graduates mentioned the usefulness of environmental economics. No other course or discipline had a significant "helpfulness" response.

Asked about content areas and/or skills in which our alumni wished they had better preparation, communication skills, particularly writing (29%) but also public speaking (19%), were the most frequently mentioned. The only other item of any significance was environmental law (10%). In the 1997 survey, in contrast, computer skills were mentioned most frequently (20%).

Alumni who are not currently employed in the environmental field are none-the-less involved in environmental activities (63%). Of those who do have environmental jobs, only 42% report being involved in environmental activities outside the workplace.

Finally, the average grades given to the ENST major program by our alumni, from both options, and from those employed in the environmental field or not, all are in the "B" range.

Senior Survey

In the May 2002 survey of graduating senior class conducted by the Office of Institutional Research, 5 respondents mentioned ENST 100 as the most valuable course in the General Education program. Among those respondents graduating with an ENST major, 2 mentioned ENST 210 Energy and the Environment, and 2 mentioned Ecological Physiology (a BIO courses), as the most valuable course in the major. Several other courses were mentioned by 1 respondent each: Environmental Chemistry (a CHEM course), Natural Resource Management (a GEOG course), as well as a History course that is not a part of the ENST major, Environmental History of America.

Current Students

We have not formally surveyed our current students about their perceptions of the ENST program, but we have informally discussed the program with students in several sections of the Senior Seminar, particularly regarding the declining numbers of majors. It is their sense that prospective students do not recognize KSC as having much of an Environmental Studies program. There are only a few ENST

courses listed in the College catalog, and no listing of ENST faculty. Regarding the specialization requirements, current students have wondered whether they might be better off just majoring in that field rather than ENST. Students want to take courses in Environmental Studies taught by Environmental Studies faculty, not seemingly un-related courses in Biology and Geography (for example). On many campuses, Environmental Studies is recognized as a stand-alone department with a cadre of full-time faculty, rather than being an inter-disciplinary program supported by faculty "volunteers" or joint appointments (although those programs exist, too). Indeed, at least 146 programs now offer doctoral programs in Environmental Studies, and many more offer masters degree programs (Romero and Eastwood, 2002).

Summary

Ultimately, the outcomes that matter are the impacts we have on the students that pass through our programs. About 82% of our alumni are either employed in an environmental job and/or are otherwise involved in environmental activities. Overall, our graduates have given us a "B" grade. Among non-majors, some students recognize Environmental Studies as a most important part of the General Education experience at KSC. We believe that the ENST program has had a substantial and positive impact relative to the mission of KSC. Not only do our ENST students and graduates represent the ideals espoused in the College's mission statement, but many other students have benefited from exposure to environmental studies through the General Education program. These are all positive results, but they also make clear that there is opportunity for improvement.

❄ ❄ ❄ ❄

National Trends

Environmental Studies, despite its broad inter-disciplinary nature, still has roots in the natural sciences—in understanding and assessing the "state" of the environment. (This is probably why we allow ENST courses to be used towards the Science and Mathematics distribution requirements of General Education.) As we evaluate the ENST program and plan for its future, let us consider national trends in science education, and in science.

Science Education

There is a strong trend in science education across the country towards student-centered, inquiry-based, active participatory learning (e.g. Culotta, 1994; Markovics, 1990) and the involvement of undergraduates in authentic scientific research (e.g. Goodwin & Hoagland, 1999; McConnaughay et al., 1999; McGinn & Roth, 1999).

Leaders in undergraduate science education—Project Kaleidoscope (PKAL) Faculty for the 21st Century (F21)—foresee a future of inter-disciplinarity, integrated classroom-laboratories, engagement of all students in the active practice of science, and increased use of technology to support this active learning (PKAL, 1999). The emphasis will be less on content and more on process—teaching students how to learn on their own. The NSF notes: "Active research experience is considered one of the most effective ways to attract talented undergraduates to and retain them in careers in science and engineering, including careers in teaching" (NSF 00-107, 2000). They also note that:

> NSF encourages research by faculty members of [predominantly undergraduate] institutions, both to ensure a broad national base for research and to help faculty members stay at the cutting edge of their disciplines. Such research not only contributes to basic knowledge in science and engineering, but also provides an

> opportunity for integration of the excitement of scientific discovery into undergraduate education. As the ultimate in inquiry-based learning, undergraduate research is a critical component of high-quality education in science... (NSF 00-144, 2000).

As one of the PKAL F21 group wrote:

> The best way to learn science is to do science, at any level, freshman to senior, major or non-major. Just as with language or art, there may be some fundamentals that can be introduced efficiently via texts and lectures, but ultimately, the student must practice (PKAL, 1999).

But what is the science that ENST students must gain practice in?

Integrated Science

The NSF Geoscience Directorate's plan for the first decade of the 21st century notes:

> Over the next ten years, environmental stresses in society such as those associated with population growth, pollution, dwindling resources, extreme weather, climate change, land-use changes, and space weather are expected to become even more acute and costly. A balanced strategy to respond to these stresses should include efforts to use the best available scientific data and reduce scientific uncertainty along with responsible mitigation and adaptation. The strategy must include an effective educational component to ensure a competitive workforce for the 21st Century. (NSF 00-28, 2000)

The Ecological Society of America, the Geological Society of America, and the United States Geologic Survey (an agency which includes Water Resources and Biological Resources as well as Geology and Mapping) cooperated in a workshop on "Enhancing Integrated Science" (see USGS, 1998). At this workshop, it was noted that:

> Science is increasingly required to take a more comprehensive approach in our understanding of natural systems, thereby seeking to link and integrate disciplines that have been traditionally separated. But interdisciplinary science is not easy to do, nor is it easy to manage. It is an evolution in the conduct of science. Opportunities must be made available where interdisciplinary science may be taught and is practiced. Strong disciplinary science will remain critical, and is necessary to rigorous integrated approaches. (USGS, 1998, Appendix 2)

As May and Ashley (1999) describe it:

> We know it as scientists because we know that the world is complex and must be understood eventually in wholes, as well as in parts. Society knows this too; it is intuitive, and often more sensible to the lay person than reductionism.

Environmental Studies sits nicely at the top of the integration pyramid, and clearly there is a strong need for continuing interdisciplinary Environmental Studies research and education. None-the-less, the KSC ENST program has opportunities to better integrate, to focus more of our teaching on process without worrying so much about content, and to engage students more in their learning and in practicing.

❄ ❄ ❄ ❄

Program Strengths & Weaknesses

A strength of the KSC ENST program is our core of dedicated and accessible faculty (Table 2). The interdisciplinary make-up of the Steering Committee brings a breadth of experience and perspective to the program. At the same time, however, this structure also presents significant challenges. There are no faculty with sole or even primary allegiance to ENST. Even with joint appointments, none of us really have adequate time or energy to provide appropriate leadership. The Steering Committee needs to engage in some intense conversations to resolve divergences of vision for the program. The issues include breadth vs. depth in our curriculum; content vs. process in our teaching; and liberal education vs. vocational training in our mission.

While the breadth of the faculty and of the program is a strength, we must be vigilant of being only multidisciplinary rather than fully interdisciplinary. It is the *integration* of the disciplines that we seek to achieve in ENST. Our students must see the relevance and inter-connectedness of their learning.

The Specializations, particularly in the Science option, and the balance between breadth and depth that they represent, are also a strength of the program. However, we have not been successful in developing strong student commitment and sense of community in ENST. Our students tend to identify more with the discipline in which they are specializing than with ENST.

A important strength is the availability to our undergraduate students of labs with state-of-the-art instrumentation. Certainly there are some "holes" and some equipment is dated, but we have some pretty amazing resources. The most significant of these facilities are new and their use has yet to be fully implemented. Similarly, the renovation and expansion of the Science Center will have a significant impact on our program and the rest of the Sciences. ENST students and faculty will finally have a physical "home!" The challenge will continue to be to take the fullest advantage of these resources.

Another special strength of the KSC ENST program is our location and setting—the natural laboratories in our surroundings, and the supportive community with which we interact. Perhaps because of the location and setting in which we all live, work and study, the KSC community holds environmental stewardship and sustainability as a core value. There are tremendous opportunities here for "hands on" field work and for service learning through coordination and cooperation with the rest of the campus as well as the larger community and potential employers. The Ashuelot River watershed has often been touted as way to organize a coordinated research effort. As suggested by our alumni, the KSC ENST program could do more to provide students with a significant field experience. As suggested by the national trend in science education, student engagement in research—particularly research in integrated sciences—must become a fundamental aspect of our teaching, at all levels.

There is much that we can do with the resources, facilities, and people we have now, it just takes *time and energy* (as well as *leadership and vision*) to do it! But time and energy (and leadership and vision) translate to faculty positions, which in turn has implications for organizational structure, and resource allocation.

The KSC ENST program has several weaknesses, as well. The program does not have much visibility, particularly to prospective students, in terms of the numbers of courses listed in the College catalog, or in the numbers of identifiable ENST faculty. Also, the major requirements lack flexibility and responsiveness. Often the disciplines on whose courses our program relies change their offerings and it takes a year or two for those changes to propagate and be reflected in our program. New faculty are hired and begin teaching interesting courses that go un-recognized as

part of the ENST program. This includes courses in the humanities, an area that has so far been overlooked in our program. Finally, while many of our alumni cite the importance of environmental chemistry, the current general chemistry offerings do not address this need. The Chemical Analysis of the Environment course and lab, now required only of Science Option students specializing in Environmental Chemistry used to be required of all Science Option students prior to the 1996 program revisions.

While we have opportunities to establish relationships with new faculty in a number of disciplines across campus, we are also seeing an erosion of strength in one of the core disciplines of the ENST program, Political Science. Their major program was discontinued, and there are only two resident faculty left in that field, both relatively near to retirement. Maintaining some expertise in "Environmental Politics" will be critical to the continuing success of the current ENST program. Likewise, the lone "environmental chemist" is also relatively near to retirement—maintaining expertise in that area will be critical, as well.

ENST students surveyed in 1991 felt that the program needed to be strengthened (*ENST Self Study 1995*): more ENST faculty, more ENST courses, more labs, and courses offered on a more regular basis. More field work, internships, and "concentrated" or topical courses were requested. Improved visibility and more formal structure or organization were also cited as needed changes. While we've made some progress in some of these areas (e.g. courses offered on a more regular basis, three new jointly-appointed ENST faculty, recognition of the Coordinator position), all of these issues remain today.

❄❄❄❄

Planning

The Changing Academic Environment at KSC

Much is in flux at KSC right now (as always?), with many potential impacts to the Environmental Studies program. These include a new Vice President for Academic Affairs, the assessment initiative, 4-credit course and program proposals, possible revisions to the General Education program, creation of the General Science major, the construction of the "new" Science Center, and continued evolution in the role of chairs as well as changes to our basic organizational structures and systems.

Many of these institutional changes provides opportunity for positive change and improvement in the ENST program. For example, the opening of the "new" Science Center will undoubtedly increase science enrollments—we should be ready to assimilate and challenge new students in ENST. To fully take advantage of these opportunities, however, requires time and energy, leadership and vision.

Can the ENST program continue and thrive as an interdisciplinary program staffed by joint appointments? Can the ENST program establish itself as a stand alone department with its own cadre of faculty? In reviewing Environmental programs at comparator and CoPLAC member institutions, we were struck by the variety of places in the organizational structure and institutional hierarchy these programs reside. Some are stand-alone departments staffed with dedicated tenure-track faculty; others—like ours—are interdisciplinary programs drawing upon faculty resources from a number of disciplines; and many are housed entirely within or otherwise closely associated with more traditional disciplines, most notably Earth Science/Geology and/or Geography (Appendix VI).

Responding to Challenges & Opportunities

Staffing

We need faculty who can truly dedicate their time and energy, undiluted, to the ENST program, to provide it with leadership and vision. Our current arrangements of faculty "volunteers" and discipline-based faculty with 1/4 or 1/2 time joint appointments in ENST is not meeting this need.

Several faculty who provide important contributions to the ENST program *may* be approaching retirement sometime over the next five years. Patrick Eggleston in Biology has been teaching a significant load of ENST courses. Steve Stepenuck in Chemistry has special expertise in environmental chemical analysis. It will be critical to the ENST program that when Steve does retire, KSC hire a replacement chemist with similar expertise. Joan Roelofs in Political Science has specialized in *Greening Cities*—Environmental Politics and Public Administration—among other things. A strong ENST program will require continued strength in this area.

As our facilities expand, and as we attempt to engage our students in more practice of integrated science, our faculty will need more technical and organizational support. Appropriate staff could really make a huge difference in both the quality and quantity of environmental experience we are able to offer to students. We could use an appropriately trained, professional, non-faculty staff person to help manage our laboratory facilities and maintain our instruments; and a similar professional person to help coordinate and organize internships, field trips, community outreach and service learning opportunities.

Curriculum

We must face the challenge of giving students the opportunity to "practice" integrated environmental science, at all levels from the introductory course through advanced field experiences. For those courses that are important parts of the ENST program we must have conversations around pedagogy—content vs. process—and how the course relates to and integrates with the ENST program. We must examine our curriculum and ensure that it has the flexibility to accommodate and encourage, if not require, internships, field experience and/or research activity.

We might fundamentally re-think the structure and organization of the ENST program, particularly the way in which it is supported by the disciplines. Can we cross-list many of the discipline-based environmentally-related courses as ENST courses (see Appendix VII), and construct our major from those? This could facilitate the addition of both a humanities component and a "major electives" portion of the program, allowing students to take many interesting and useful courses now in the catalog but not yet a part of the ENST major. It would also give the ENST program more of a presence in the catalog, attracting prospective students. Students might see themselves as enrolled in ENST courses together with a cadre of other ENST students, helping to develop a sense of community.

Should the ENST major perhaps be a "coordinate" major—one that can only be taken as a double major with another field (as Education is now at KSC)? Perhaps the Specializations in the ENST major should be deepened, such that we require ENST students to minor in their field of specialization? For example, students taking the specialization in ENST-Geology can earn a minor in Geology by taking only one additional upper-level Geology course beyond those required in the specialization. Still, ENST-Geology graduates would not have a sufficient education to qualify for licensure as Professional Geologists in New Hampshire...

Resources

While we've made tremendous advances in our equipment and facilities, and we are eagerly awaiting the completion of the Science

Center construction project, there are several significant "holes" in our capabilities. We do not have appropriate instrumentation for rapid, multi-element analyses of natural water samples. An inductively coupled plasma (ICP) spectrometer and a pair of ion chromatographs (IC, one for cations and one for anions) would complement existing facilities quite nicely. A gas chromatograph-mass spectrometer (GC-MS), with its ability to separate and positively identify volatile organic compounds, is a critical need. An Elemental Analyzer Gas Chromatograph coupled to the IRMS would enhance our capability to apply stable isotope analysis to environmental problems. We do not have the ability to "see" into the subsurface. Geophysical exploration equipment such as a modern multi-channel seismograph for shallow seismic refraction studies, or a ground-penetrating radar system, is widely used in a variety of environmental investigations. We can always use more or better field meters for water quality, soil gas, metals detection, etcetera, particularly coupled with data loggers, field portable computers, and GPS receivers.

A larger budget would help facilitate the organization of an on-going speaker series to enhance the ENST program—speaker fees, travel costs, refreshments. Of course, it would require time to organize this, not only just to see that it happens, but to ensure that the series is integrated with the curriculum and the program goals.

A larger budget could also support group efforts of the ENST faculty to engage in professional development together—retreats, conferences, summer stipends. Such support would no doubt help encourage faculty to undertake the intense and difficult conversations that are needed.

Summary

The Environmental Studies program at Keene State College has been fairly successful and has several important strengths. The program serves the College mission well, and reflects one of the core values of the College community. Consideration for environmental concerns is of continuing and growing importance to the people of our region, the state, the nation, and the whole globe. Employment opportunities for Environmental Scientists are expected to grow faster than for other occupations.

There are many wonderful opportunities for further development of the program. The program also faces many challenges, many of which have been on-going throughout its history. The most important of these is providing faculty leadership with sufficient time to attend to and truly focus on the continued development of the program.

❄ ❄ ❄ ❄

References Cited and other Sources of Information

Connecticut Department of Environmental Protection Licensed Environmental Professional Program (http://www.dep.state.ct.us/pao/PERDfact/LEP.htm)

CoPLAC, 1998, *Prospectus: The case for public liberal arts colleges,* Council of Public Liberal Arts Colleges.

Culotta, E, 1994, "New models for making scientists," *Science,* vol. 266:875-888.

Goodwin, T, and Hoagland, KE, 1999, *How to Get Started in Research,* Washington DC: Council on Undergraduate Research, 37 pp.

KSC Campus Ecology (http://wcb.keene.edu/~ecologyclub/ce.html)

KSC Catalog, 2001-02

KSC Environmental Studies Program Self Study 1995

KSC Factbook 2001

KSC Faculty Handbook 2001-02

KSC Mason Library Environmental Studies (http://www.keene.edu/library/topics2.cfm?ShortName=ENST&FullName=Environmental%20Studies)

KSC Mission and Values (http://www.keene.edu/aboutksc/mission.cfm)

KSC Office of Institutional Research, 2002, Data report prepared for ENST Self Study.

KSC President's Council for a Sustainable Future (http://www.keene.edu/sustain/)

KSC Quantitative Reasoning Competencies for General Education (http://www.keene.edu/assessment/gened_quant.cfm)

KSC Self-Study for Reaccreditation, September 2000, prepared for the Commission of Institutions of Higher Education, New England Association of Schools and Colleges.

KSC Senate Document 99/00-23, *Goals for General Education* (http://www.keene.edu:8001/offices/senate/genedgoals.asp).

KSC Writing Competencies for General Education (http://www.keene.edu/assessment/gened_writing.cfm)

KSC Young Student Center Recreation Clubs (http://www.keene.edu/young/recreation.cfm)

KSC Young Student Center Special Interest Clubs (http://www.keene.edu/young/interest.cfm)

Maine Department of Professional and Financial Regulation Office of Licensing and Registration, "Geologists and Soil Scientists," (http://www.state.me.us/pfr/olr/categories/cat20.htm)

Maniates, MF, and Whissel, JC, 2000, "Environmental Studies: The Sky Is Not Falling," *BioScience,* 50(6):509-517.

Markovics, G, 1990, "The 'Involvement' Component in Teaching Earth Science," *Journal of Geological Education,* vol. 38:456-457.

Massachusetts Board of Registration of Hazardous Waste Site Cleanup Professionals (http://www.state.ma.us/lsp/lsphome.htm)

May, CL, and Ashley, GM, 1999, "Catalysis and Integrated Science: Goal 2 of GSA's Strategic Plan," *GSA Today,* January 1999, vol. 9(1):10 (http://www.geosociety.org/science/9901catalysis.htm)

McConnaughy, K, Welsford, I, and Stabenau, E, 1999, "Inquiry, Investigation, and Integration in Undergraduate Science Curricula," *CUR Quarterly,* vol. 20:14-18.

McGinn, MK, and Roth, W-M, 1999, "Preparing Students for Competent Scientific Practice: Implications of Recent Research in Science and Technology Studies," *Educational Researcher,* vol. 28:14-24.

Merrill, LS, 2002, "Athletes & Wildlife Share a Habitat," *Keene State Today,* 27(3):10-13.

New Hampshire Joint Board of Licensure and Certification (http://www.state.nh.us/jtboard/home.htm)

NSF 00-28, 2000, *NSF Geosciences Beyond 2000: Understanding and Predicting Earth's Environment and Habitability,* (http://www.nsf.gov/pubs/2000/nsf0028/nsf0028.htm)

NSF 00-107, 2000, *Research Experiences for Undergraduates (REU) Program Announcement,* (http://www.nsf.gov/pubs/2000/nsf00107/nsf00107.htm)

NSF 00-144, 2000, *Research in Undergraduate Institutions (RUI) Program Announcement,* (http://www.nsf.gov/pubs/2000/nsf00144/nsf00144.htm)

O'Reilly, Douglas, Jacqui Deegan and Lori Colombo, 1995, *Environmental Studies: 2000. An overview of undergraduate, interdisciplinary environmental programs and the careers of their graduates.* The Environmental Careers Organization, Boston.

PKAL, 1999, *Faculty for the 21st Century Collection of Statements 1999-2000,* Washington DC: Project Kaleidoscope. 400 pp.

Romero, A, and Eastwood, H, 2002, "Not All Are Created Equal: An Analysis of the Environmental Programs/Departments in U.S. Academic Institutions Until March 2002," *Macalester Environmental Review* (http://www.macalester.edu/~envirost/MacEnvReview/equalarticle2002.htm)

US Department of Labor Bureau of Labor Statistics, 2002, "Environmental Scientists and Geoscientists," *Occupational Outlook Handbook* (http://stats.bls.gov/oco/ocos050.htm)

USGS, 1998, *Summary Report of the Workshop on Enhancing Integrated Science, November 4-5, 1998 in Reston, Virginia,* Reston, VA: United States Geological Survey (http://www.usgs.gov/integrated_science/index.html).

USNH-KSCEA, *Collective Bargaining Agreement between USNH Board of Trustees, Keene State College, and Keene State College Education Association, July 1, 1999 – June 30, 2003.*

USNH-KSCEA list of comparator institutions

Appendix I: 1996 Program Review AOC-Subcommittee Report

KEENE STATE COLLEGE SENATE
ACADEMIC OVERVIEW COMMITTEE FINAL REPORT
ENVIRONMENTAL STUDIES PROGRAM REVIEW
MAY 1996

TO: R. Golden, VPAA; G. Leversee, Dean of Sciences; and T. Allen, ENST coordinator

FROM: ENST Program Review Subcommittee of the AOC (S. Bill, L. Denis, A. Miller, S. Whittemore)

General Comments on the ENST Review Process

We would first like to comment on the Environmental Studies (ENST) program review to give an overall impression of the quality of participation and cooperation by the various parties involved in this process. The ENST self-study was concise, informative and made available to the AOC at the beginning of the Fall 1995 semester as requested. The ENST subcommittee carefully analyzed the self study and requested some additional information which was supplied to us by T. Allen, ENST coordinator, in a timely manner. The ENST faculty also supplied us with an ample list of qualified external reviewers. We were able to bring two of these qualified reviewers to the campus in March, one reviewer is a specialist in environmental policy and the other in environmental science. The external reviewers submitted their report, complete with important insights, within the requested time period of three weeks. ENST requested the opportunity to respond to the external review report and held a retreat during PEPT week to generate that response. Overall, the AOC subcommittee responsible for the ENST program review experienced a high degree of cooperation from the ENST faculty and is very satisfied that all necessary information was made available to us to generate this report.

Contribution of the ENST Program to the Mission of the College

The interdisciplinary ENST major, with its "Science" and "Policy" options, (the subject of this review) has been available to Keene State students since 1980. This popular program accommodates a significant number of majors (55 for past two years) and based on information provided by recent KSC orientation programs, there is every indication that this number will continue to grow. The goals and objectives of the program are well-articulated by the ENST steering committee (see self-study) and certainly support the mission of the ENST program which is to educate students so that they are able "to make effective, meaningful and sustaining contributions to society in resolving vexing environmental issues". Furthermore, we concur with the ENST self study and the external review team report with respect to their statements that the ENST program serves the mission of Keene State College by "maintain(ing) an intellectual environment which will enhance the development of enlightened individuals capable of critical thinking... (and) contributing to a complex and dynamic society". This is accomplished, to a great degree, by the nature of the program itself which encourages students to make connections across disciplines. The ENST program effectively models how to make such connections through the active participation of faculty from a broad spectrum of specialized disciplines including Biology, Chemistry, Economics, Geography, Geology, and Political Science. This interdisciplinary model for providing an ENST major not only has pedagogical validity but also seems appropriate because it parallels the multi-dimensional approach used for addressing

environmental concerns by field professionals. The ENST program also can serve as a model for the development of other interdisciplinary programs at KSC. ENST majors graduate with a solid liberal arts education (good breadth and sufficient depth) and this also serves the mission of the College. The ENST program further contributes to the mission of the College through its significant involvement in the General Education Program, primarily through the highly popular ENST 100: Introduction to Environmental Studies course, designed to promote environmental awareness of all KSC students, and also through the availability of an environmental studies minor.

Current Strengths of the ENST Program

In addition to the contributions of the ENST program to the mission of the college as described above, we would also like to highlight some of the specific strengths of the current program.

1) Faculty: ENST is fortunate to benefit from the participation of several quality KSC faculty who are obviously committed to the perpetuation and growth of the program. With the exception of two faculty members (T. Allen and J. Mullens) who were hired with 1/4 time responsibility to the ENST program, the remaining ENST faculty contribute at the discretion of their "home" disciplines. All ENST faculty meetings for the discussion and coordination of the ENST program, are in addition to similar efforts required by the "home" disciplines. This underscores the dedication required of the ENST faculty to both maintain and improve this program. The evidence of this dedication is also readily apparent in the thoughtful quality of both the self study and the response to the external review (clearly defined goals, well-researched program development process, well-informed analysis of needs for continued improvement). This faculty is obviously highly responsible in their commitment to the continued improvement of this valuable program.

2) Students: The ENST program fosters the participation of a highly significant number of enthusiastic and committed students.

3) Recent Curricular Initiatives: One of the most significant curricular achievements in recent ENST history was the creation of two different specializations within the science option. The external review team saw this innovation as a substantial improvement over the prior program. Additionally, the ENST program has joined the Division of Student Affairs in developing a living-learning facility for 36 first year students who express an interest in environmental issues.

Areas of the ENST Program that Need Improvement

The external review team, who are far more qualified than we are to evaluate any weaknesses of the current program, outlined a few areas they feel need some attention. These include:

1) The mission and goals of the ENST program are not entirely well-defined and certain courses (ENST 100) may be attempting to achieve an unrealistic number of outcomes given the present level of support.

2) There is a lack of depth in both of the major's options with the "science" option being of particular concern to reviewers.

3) Some ENST majors perceive that they are receiving insufficient advisement for long-range course planning and feel that certain ENST faculty advisors are not adequately informed about program requirements.

4) ENST lacks a "home" or space to call its own which limits the sense of community among ENST faculty and students. (Note: Recent developments concerning creation of an ENST residential experience will somewhat help to remedy this deficiency).

5) There are insufficient numbers of faculty with dedicated ENST time. This weakness is perceived as the major underlying cause for most of the other identified problem areas. In the opinion of the external reviewers, the current ENST faculty are "spread too thinly".

Recommendations

The major recommendations of this AOC subcommittee for the continued improvement of the ENST program fall into two basic categories: those under the control of the ENST faculty given their current level of resources (dedicated teaching time, budget, space) and those requiring some additional support from the institution (disciplines, division, and the college). Those recommendations that can be addressed by the ENST faculty without any additional or significant support from the college have, for the most part, already been taken under consideration by ENST, as stated in their response document, and include:

1) Further clarification of goals and mission as recommended by the external review team.

2) Consider methods for increasing the depth of exposure to key disciplines within the specializations as recommended by external reviewers.

3) Work with some of the humanities disciplines to develop a humanities course for ENST majors.

4) Define the goals for an environmental policy course as it would integrate into current program and, if necessary, identify adjunct faculty qualified to teach it.

5) Identify ways to strengthen the effectiveness of advising ENST majors (e.g. training sessions for advisors, keeping advisors better informed of course offerings for next 3 years).

6) Clarify the role of ENST 100 in the major. Should this course be serving the dual roles of an introductory course to the major and as a general education offering?

Our other recommendations will require the contribution of additional resources by the college and these include:

7) Increased support for designated ENST faculty by increasing the number of joint appointments with participating disciplines. Expansion of faculty contributing to the program will facilitate many of the curricular improvements deemed to be essential by external review team (team teaching, development of field-based projects, expansion of ENST 100, and addition of other key courses).

8) Increase in budget for ENST program. Some of the recommended curricular improvements mentioned under #7 will also require additional resources. Currently ENST's budget is low

in comparison to other disciplines and limits the development of the discipline's equipment and supply base. This budgetary enhancement should also include some funds dedicated to a seminar series for benefit of students and faculty.

9) Dedicated money and course release time for faculty development opportunities to enhance the program (e.g. faculty retreats, development of the AWESOME project and pursuit of external funding opportunities).

10) Dedicated ENST space in the Science Building would facilitate communication among ENST faculty and students while also serving to enhance the sense of community. This space could potentially serve as an office, reading room, and/or seminar/meeting room. ENST bulletin boards, a web site, regularly scheduled meetings (ENST faculty only and joint faculty/student), and faculty/student socials (picnics etc.) might also promote communication.

In summary, this AOC subcommittee concurs with the ENST self study and the External Review Report in the conclusion that the interdisciplinary ENST program at Keene State College is both valuable and effective (despite significant resource limitations) in meeting both the mission of the program and the College. We strongly recommend that the ENST program receive greater support and recognition for its important contribution so that the further improvements, as outlined above, can be instituted.

Members of the AOC Subcommittee to Review the ENST Program:

(signed and dated 6/14/96):

Steve Bill

Linda Denis

Anne Miller

Susan Whittemore

Appendix II: Catalog Information (Major and Minor Requirements)

Environmental Studies, Bachelor of Science

Environmental Studies is an interdisciplinary program comprised of courses in Biology, Chemistry, Economics, Geography, Geology, and Political Science. The major is designed with two options, Environmental Policy and Environmental Science, to prepare students for a wide range of environment-related career opportunities. Students intending to major in Environmental Studies should select an advisor and formally declare their major as early as possible, preferably by the end of their first year.

GENERAL EDUCATION REQUIREMENTS
(minimum) 42 credits

Because of the interdisciplinary nature of the major and because some required courses are prerequisite to others, the Social Sciences (C) and Sciences/Mathematics components (D) of the General Education requirements (12 credits each) are mostly fulfilled. ENG 202 may apply toward the Arts and Humanities (B) General Education requirements (3 credits). Thus many credits of the major may apply toward completion of General Education requirements.

MAJOR REQUIREMENTS

Environmental Studies Core
(35 credits)

All Environmental Studies students must take the following common core of courses, giving them broad exposure to the wide range of fields of environmental study and background for further specialization:

ENST 100 Introduction to Enviromental Studies
ENST 200 Intermediate Enviromental Studies
ENST 395 Junior Seminar
ENST 495 Senior Seminar
ECON 202 Microeconomics
ENG 202 Expository Writing
POSC 201 Introduction to Political Science
GEOG 204 Physical Geography
GEOL 201 Introductory Physical Geology
MATH 141 Introductory Statistics
BIO 151/152 Life: Diversity and Lab

Environmental Policy Option
(34 - 36 credits)

This option is designed for students wishing to acquire a strong environmentally oriented background in the Policy areas. Students completing this option should be prepared to investigate problems, and formulate and implement policies, relating to the environment, or alternatively, to continue environmental policy studies at the graduate level.

POSC 332 Public Policy Analysis
ECON 340 Environmental Economics
GEOG 330 Natural Resource Management
CHEM 103/107 Fundamentals of Chemistry and Lab

One of the following map skills courses:
GEOG 221 Maps and Map Reading
GEOG 323 Cartography and Surveying
GEOG 326 Geographical Information Systems
GEOG 327 Introduction to Remote Sensing

Two of the following Environmental Science Courses:
BIO 252 Ecology and Evolution
CHEM 131 Chemistry and the Environment
ENST 210 Energy and Environment
GEOL 315 Environmental Geology

SPECIALIZATION REQUIREMENT:
12 credits at the 300 level or above in either Economics, Geography, or Political Science, selected in consultation with your advisor; or in an individualized specialization approved by the ENST Steering Committee in advance.

Environmental Science Option (42-46 credits)

This option is designed for students wishing to acquire a strong environmentally oriented background in the Natural Science areas. Students completing this option should be prepared to explore and resolve scientific problems relating to the environment, or alternatively, to continue environmental science studies at the graduate level.

BIO 153/154 Life: Processes and Lab
CHEM 111/115 and 112/116 General Chemistry I, II and Labs
PHYS 141 and 142 College Physics I, II
MATH 130 Precalculus or MATH 151 Calculus

One from:
GEOL 206 Oceanography
MET 225 Meteorology

SPECIALIZATION REQUIREMENT:
16-19 credits in either Biology, Chemistry, or Geology as outlined below; or in an individualized specialization approved by the ENST Steering Committee in advance.

ENVIRONMENTAL BIOLOGY SPECIALIZATION (16-17 credits)

BIO 252/256 Ecology and Evolution and Lab
BIO 456 Research Methods

One lecture course:
BIO 251 Genetics
BIO 253 Physiology of Plants and Animals

One Ecology course:
BIO 451 Population Ecology
BIO 452 Community and Ecosystems Ecology
BIO 454 Ecological Physiology

One Organismal course:
BIO 322 Flowering Plant Biology
BIO 325 Dendrology
BIO 333 Invertebrate Zoology
BIO 334 Vertebrate Zoology
BIO 351 Ornithology
BIO 352 Entomology

ENVIRONMENTAL CHEMISTRY SPECIALIZATION (16-18 credits)

CHEM 221/225 and 222/226 Organic Chemistry and Lab
CHEM 352/356 Environmental Chemical Analysis and Lab

One of the following:
CHEM 382/386 Occupational Safety and Health and Lab
CHEM 401/403 Biochemistry and Lab
BIO 315 General Microbiology
GEOL 412 Geochemistry

ENVIRONMENTAL GEOLOGY SPECIALIZATION (17-19 credits)

GEOL 202 Historical Geology

Two of the following "environmental" Geology courses:
GEOL 315 Environmental Geology
GEOL 412 Geochemistry
GEOL 460 Hydrogeology

One of the following "structural" Geology courses:
GEOL 303 Structural Geology
GEOL 306 Stratigraphy
GEOL 309 Geomorphology

One of the following map skills courses:
GEOG 323 Cartography and Surveying
GEOG 326 Geographical Information Systems
GEOG 327 Introduction to Remote Sensing

ELECTIVES
27 – 42 credits

DEGREE REQUIREMENTS
126 credits

Environmental Studies Minor 21-22 credits

This minor introduces students to the wide range of fields of environmental study.

ENST 100 Introduction to Environmental Studies
ENST 200 Intermediate Environmental Studies

Two of the following:
ECON 340 Environmental Economics
GEOG 330 Natural Resource Management
POSC 332 Public Policy Analysis

Two of the following:
BIO 252/256 Ecology and Evolution and lab
CHEM 352/356 Environmental Chemical Analysis and lab
GEOL 315 Environmental Geology

Notes

Appendix III: Course Descriptions (ENST and Supporting)

Courses are 3 credits unless otherwise specified.

Environmental Studies Courses

ENST 100 INTRODUCTION TO ENVIRONMENTAL STUDIES
An exploration of environmental issues including population growth, energy use, global climate change, and pollution. Through readings, lecture, and discussion we will examine physical, biological, chemical, economic, political, and social aspects of environmental problems on personal, local, and global scales. Fall, Spring

ENST 200 INTERMEDIATE ENVIRONMENTAL STUDIES
Experimental problem solving and analysis of environmental issues. Case studies and environmental literature will be used to explore key issues and concepts in environmental science and policy. Assignments and projects will emphasize critical thinking. Prerequisites: ENST 100, prior or concurrent enrollment in ENG 202. Fall, Spring

ENST 210 ENERGY AND THE ENVIRONMENT
An ecological view of energy problems, their causes, and alternative solutions. Emphasizes the ecological effects of various solutions to energy problems. Spring

ENST 294 COOPERATIVE EDUCATION
1-6 credits
Introductory work-learning experience related to career interests, for which compensation may be received. Placements arranged and supervised by Cooperative Education with approval and evaluation by full-time faculty. Elective credit only (normally 120 hours/credit) to maximum of 12 credits per degree program. Prerequisites: 24 total credits earned, 2.0 cumulative GPA and permission of instructor. Graded Pass/Fail.

ENST 395 JUNIOR SEMINAR
In-depth analysis of environmental research literature and methodologies. Emphasis on proposal writing, and written and oral presentations. Development of a project proposal to be completed in ENST 495. Exploration of postgraduate opportunities. Prerequisites: ENST 200, MATH 141, junior standing. Spring

ENST 494 ADVANCED COOPERATIVE EDUCATION
1-6 credits
Sequential work-learning experience for which compensation may be received. Placements arranged and supervised by Cooperative Education with approval and evaluation by full-time faculty. Elective credit (normally 120 hours/credit) to maximum of 12 credits per degree program. Prerequisites: ENST 294, 2.0 cumulative GPA, Declaration of Major, and permission of instructor. May be repeated for credit. Graded Pass/Fail.

ENST 495 SENIOR SEMINAR
A capstone experience integrating science and policy aspects of environmental studies. Emphasis on critical analysis of research literature. Research project developed in ENST 395 will be completed. Prerequisites: ENST 395, senior standing. Fall

ENST 498 INDEPENDENT STUDY
1-6 credits
Advanced work in various fields of environmental science through individual reading, writing, laboratory work, and/or field investigation. Requires research project and a written report. One hour conference. May be repeated to a total of 6 credits.

Supporting Courses

BIO 151 LIFE: DIVERSITY An introduction to living organisms, emphasizing the principles of adaptation and diversity, with examples from the five kingdoms. Topics include systematics, Mendelian genetics, life cycles, evolution, and ecology. Designed for non-majors and majors. Lab (BIO 152) required for Biology majors. Fall

BIO 152 LIFE: DIVERSITY LAB 1 credit Explorations into the world of living organisms. Laboratory and field projects providing first-hand experience with organisms, the methods of biology, and the process of scientific inquiry. Prerequisite: concurrent or prior enrollment in BIO 151. Fall

BIO 153 LIFE: PROCESSES Biological mechanisms at the cellular and molecular level. Topics include cell structure and function, macromolecular structure and function, molecular genetics, cellular respiration and photosynthesis. Lab (BIO 154) required for Biology majors. Background in basic chemistry is recommended. Spring

BIO 154 LIFE: PROCESSES LAB 1 credit Explorations into the world of living organisms. Experimental analysis of structure and function in cells and organisms. Prerequisite: Concurrent or prior enrollment in BIO 153. Spring

BIO 251 GENETICS A survey of the development of ideas on variation and heredity, the chromosomal and molecular basis of inheritance; medical, agricultural and social implications of genetics, population genetics and evolutionary change. Quantitative analysis and stochastic reasoning emphasized. Prerequisites: Grades of C or higher in BIO 151 and BIO 153. Knowledge of algebra is recommended. Fall, Spring

BIO 252 ECOLOGY AND EVOLUTION This course emphasizes evolutionary, biological, and physical processes explaining the abundance and distribution of organisms. Basic evolutionary theory and ecological concepts at the individual, population, community and ecosystem levels will be covered. Prerequisites: Grades of C or higher in BIO 151. Fall

BIO 253 PHYSIOLOGY OF PLANTS AND ANIMALS An introduction to fundamental physiological processes of plants and animals. Topics may include gas exchange, water and ion balance, nutrient uptake and energy balance, and control systems. Prerequisites: Grades of C or higher in BIO 151 and BIO 153. Spring

BIO 256 EXPERIMENTAL ECOLOGY AND EVOLUTION 2 credits Laboratory, field work, and computer modeling in ecology and evolution emphasizing experimental design, data analysis and interpretation, scientific writing, and critical analysis of ecological literature. Prerequisites: Grades of C or higher in BIO 152 and 154; MATH 141; and pre- or co-requisite: BIO 252. Fall

BIO 315 GENERAL MICROBIOLOGY 4 credits An introduction to the microbial world: the nature of microorganisms and their role in the biosphere and in human life, including health and disease, food and technology. Laboratory includes aseptic transfer, isolation, enumeration, identification and control of microorganisms. Prerequisites: BIO 153/154 and CHEM 220 or 221. Fall

BIO 322 FLOWERING PLANT BIOLOGY 4 credits Plant systematics integrates taxonomy (identification, nomenclature, and classification of flowering plants), evolution, (speciation, reproductive biology, adaptation, convergence, biogeography), and phylogenetics (phenetics, cladistics, morphology and molecules). Lab emphasizes representative flowering plant families and genera of New England, keys and plant collecting. Prerequisites: Grades of C or higher in BIO 151/152 and BIO 153/154. Spring

BIO 325 DENDROLOGY 4 credits Both a field course concerned with the collection and identification of trees and shrubs in the local flora and a course concerned with basic concepts of forest ecology and alternative uses of local forest resources. 3-hour lecture, 2-hour lab, field trips. Prerequisite: Permission of instructor; grades of C or better in BIO 151/152 and BIO 153/154. Spring, alternate years

BIO 333 INVERTEBRATE ZOOLOGY 4 credits Lecture and laboratory course focusing on the behavior, ecology, anatomy, physiology, evolution, taxonomy, and natural history of invertebrates. Occasional field trips. 3-hour lecture, 2-hour lab. Prerequisite: Grades of C or better in BIO 151/152 and BIO 153/154. Fall, alternate years

BIO 334 VERTEBRATE ZOOLOGY 4 credits Lecture and laboratory course focusing on vertebrate anatomy, physiology, behavior, ecology, natural history, evolution, and systematics. Occasional field trips. 3-hour lecture, 2-hour lab. Prerequisite: Grades of C or better in BIO 151/152 and BIO 153/154. Spring, alternate years

BIO 351 ORNITHOLOGY 4 credits Avian anatomy, physiology, behavior, life histories, ecology, conservation, systematics and phylogeny. Ornithological research methods, species identification, and field observation. Three hours lecture, three hours lab, field trips. Prerequisite: Grades of C or better in BIO 151/152 and BIO 153/154. Summer, occasionally

BIO 352 ENTOMOLOGY The anatomy, physiology, and life cycle of the more important species of insects. Attention is given to ecological and economic aspects. 2-hour lecture, 2-hour lab, field trips. Prerequisite: Grades of C or better in BIO 151/152 and BIO 153/154. Occasionally

BIO 451 POPULATION ECOLOGY Study of the interactions of organisms with their biotic and abiotic environment. Emphasizing factors and processes that influence organisms within and between populations. Prerequisites: BIO 252, MATH 141; and BIO 256 or 257. Spring, alternate years

BIO 452 COMMUNITY AND ECOSYSTEM ECOLOGY Study of the interactions of organisms with their biotic and abiotic environment. Emphasizing structure of and function within biological communities and ecosystems. Some exploration of the biological basis of current global environmental problems. Prerequisites: BIO 252, MATH 141; and BIO 256 0r 257. Fall, alternate years

BIO 454 ECOLOGICAL PHYSIOLOGY Use of physiological data to better understand the distribution, abundance, and evolution of organisms. This course will examine the physiological responses of plants or animals to environmental stressors. Prerequisites: BIO 252, 253; and BIO 256 or 257. Spring, alternate years

BIO 457 RESEARCH METHODS: ECOLOGY 2 credits Laboratory and field work in ecology emphasizing experimental design, data analysis and interpretation, scientific writing, and critical analysis of recent ecological literature. Prerequisites: MATH 141 and pre- or co-requisite: BIO 451 or BIO 452.

BIO 458 RESEARCH METHODS: PHYSIOLOGY 2 credits Laboratory work in the physiology of animals or plants emphasizing experimental design, data analysis and interpretation, scientific writing, and use of scientific literature. Prerequisites: MATH 141 and pre- or co-requisite: BIO 454 or BIO 455.

CHEM 103 FUNDAMENTALS OF CHEMISTRY Survey of general chemical principles. A quantitative and qualitative review of matter including atomic and molecular structure, bonding, reaction chemistry and chemical equilibria. Knowledge of algebra, exponentials, and logarithms expected. (Not open toward a major program in Biology, Chemistry, Geology, or Chemistry/Physics.) Co-requisite: CHEM 107 or permission of instructor. Fall, Spring

CHEM 107 FUNDAMENTALS OF CHEMISTRY LAB 1 credit Experimental principles and basic concepts of chemistry. Evaluation of data related to the quantitative and qualitative investigation of matter. 3-hour lab. (Not open toward a major program in Biology, Chemistry, Geology, or Chemistry/Physics.) Prerequisite: Taken concurrently with CHEM 103 or permission of instructor. Fall, Spring

CHEM 111 GENERAL CHEMISTRY I The first course in a one-year sequence covering fundamental principles and concepts, including stoichiometry, atomic and molecular structure, periodicity and thermochemistry. Previous chemistry recommended. For students who plan to take further chemistry courses. Knowledge of algebra, exponentials and logarithms expected. Prerequisite: Concurrent or prior enrollment in CHEM 115 or permission of instructor. Fall

CHEM 112 GENERAL CHEMISTRY II The second course in a one-year sequence covering bonding, atomic and molecular structure, solutions, chemical equilibria, kinetics, acid-base equilibria, qualitative and quantitative analysis. For students who plan to take further chemistry courses. Prerequisite: CHEM 111 and CHEM 115, concurrent or prior enrollment in CHEM 116, or permission of instructor. Spring

CHEM 115 GENERAL CHEMISTRY LAB I 1 credit The first of a two-semester laboratory sequence in General Chemistry. Topics include chemical separations and synthesis, energetics, gases, radioactivity, and periodicity. For students who plan to take further chemistry courses. Co-requisite: CHEM 111 or permission of instructor. Fall

CHEM 116 GENERAL CHEMISTRY LAB II 1 credit The second of a two-semester laboratory sequence in General Chemistry. Topics include equilibrium, kinetics, acid-base equilibria, qualitative and quantitative analysis. For students who plan to take further chemistry courses. Prerequisite: CHEM 115. Co-requisite: CHEM 112 or permission of instructor. Spring

CHEM 131 CHEMISTRY & THE ENVIRONMENT A chemistry-oriented study of various environmental topics, including normal and abnormal environmental chemistry, environmental laws and regulations, the energy problem, water, air, and soil pollution, radiation, chemical hazards, risk assessment, etc. Prerequisite: CHEM 100 or permission of instructor. (Not open toward a major program in Biology, Chemistry, Geology, or Chemistry/Physics.) Fall

CHEM 221 ORGANIC CHEMISTRY I The first of a two-course sequence in organic chemistry, emphasizing modern concepts and problem-solving in structure, synthesis and mechanism, based on a functional group approach.Theoretical and practical aspects of modern spectroscopy supports its use in the laboratory course. Prerequisite: CHEM 112 and CHEM 116 or permission of instructor. Taken concurrently with CHEM 225. Fall

CHEM 222 ORGANIC CHEMISTRY II The second of a two-course sequence in organic chemistry, emphasizing modern concepts and problem-solving in structure, synthesis and mechanism, based on a functional group approach. Theoretical and practical aspects of modern spectroscopy supports its use in the laboratory course. Prerequisite: CHEM 221 and CHEM 225 or permission of instructor. Taken concurrently with CHEM 226. Spring

CHEM 225 ORGANIC CHEMISTRY LAB I 1 credit Practical laboratory experience in organic chemistry, including instrumental methods and concepts in molecular synthesis and mechanistic study. Basic techniques, multi-step synthesis and mechanistic experiments are enhanced by use of spectroscopic and chromatographic tools. Prerequisites: Taken concurrently with CHEM 221. Fall

CHEM 226 ORGANIC CHEMISTRY LAB II 1 credit Practical organic chemistry, including instrumental methods and concepts in molecular synthesis and mechanistic study. Group work and experiment design are highlighted. Prerequisite: CHEM 225. Taken concurrently with CHEM 222. Spring

CHEM 352 ENVIRONMENTAL CHEMICAL ANALYSIS An interdisciplinary view of the subject, including its complexity, history, environmental laws and regulations, chemical hazards and risk assessment, biohazards, analytes and matrices, sampling, wet and instrumental methods, data handling and quality assurance, and legal aspects. Prerequisite: CHEM 112 or permission of instructor. Taken concurrently with CHEM 356. Spring

CHEM 356 ENVIRONMENTAL ANALYSIS LAB 2 credits A five-hour, field-oriented laboratory, including orientation, ôreal-worldö sampling, lab analysis, and computer-assisted data collection and reduction. Includes chain-of-custody, calibration, quality assurance, air and water sampling, with emphasis on chromatography and other instrumental techniques. Prerequisite: CHEM 116 or permission of the instructor. Taken concurrently with CHEM 352. Spring

CHEM 382 OCCUPATIONAL SAFETY AND HEALTH A study of occupational safety and health resources, laws, and standards. Covers chemical, biological, radiological, electrical, mechanical, and physical hazards, their evaluation and control. Emphasizes chemical hazards. Students wishing laboratory may take CHEM 386. Prerequisites: BIO 101 or higher and CHEM 100 or higher, or permission of instructor. Spring

CHEM 386 INDUSTRIAL HYGIENE LAB 1 credit Laboratory and on-location experience, including gaseous, liquid, and particulate matter analyses. 3 hour lab/meeting. Prerequisite: CHEM 122/126, or permission of instructor. Taken concurrently with CHEM 382. Spring

CHEM 401 BIOCHEMISTRY Explores the relationship between structure and function of macromolecules and other biologically active compounds to metabolism and the utilization of energy by the cell. Prerequisites: CHEM 221/CHEM 225 and CHEM 222/CHEM 226 and BIO 153/BIO 154 or permission of instructor. BIO 254 recommended. Taken concurrently with CHEM 403. Course also listed as BIO 401. Fall

CHEM 403 EXPERIMENTAL BIOCHEMISTRY 2 credits Practical experience in biochemical laboratory manipulations. Concepts relating to proteins, carbohydrates, lipids and other biologically active compounds. Pre- or co-requisites: CHEM 401 and BIO 153/BIO 154 or permission of instructor. BIO 254 recommended. Taken concurrently with CHEM 401. Course also listed as BIO 403. Fall

ECON 202 MICROECONOMICS An introduction to the functions of the component parts of the economy. An analysis of the consumer, industry, markets, and the use of resources. Fall, Spring

ECON 340 ENVIRONMENTAL ECONOMICS Detailed evaluation of policy alternatives for environmental protection with regard to other economic goals. Prerequisite: ECON 202. Fall

ENG 202 EXPOSITORY WRITING Extensive writing and reading of various types of expository essays and other prose forms. Emphasis on stylistic techniques and rhetorical devices. Prerequisite: ENG 101. Fall, Spring

GEOG 204 PHYSICAL GEOGRAPHY An introductory study of maps, land forms, weather, climate, and vegetation patterns. Fall, Spring

GEOG 221 MAPS AND MAP READING The fundamentals of maps, map contents, and the theory of map reproduction, as well as an overview of the maps of the United States and other countries. Spring

GEOG 323 CARTOGRAPHY AND SURVEYING 4 credits Fundamental and modern techniques of surveying and map making. 3 hour lecture, 3 hour lab. Fall, alternate years

GEOG 324 GIS: ARCVIEW 4 credits ArcView GIS is a vector-based geographic information system. Lecture and lab-based instruction emphasize data input, manipulation, and production of maps for geographic analysis. Prerequisite: GEOG 204 or GEOG 221. Spring

GEOG 325 CARTOGRAPHY AND COMPUTER MAPPING 4 credits Introduction to analyzing and mapping statistical geographical data with computer programs. 3-hour lecture, 2-hour lab. Prerequisite: CS 140 or permission of instructor. Spring

GEOG 326 GIS: IDRISI 4 credits An introduction to the raster-based Geographic Information Systems (GIS) IDRISI. Data input, modeling, and analysis of remotely sensed imagery are emphasized. 3-hour lecture, 3-hour lab. Prerequisite: GEOG 204 or GEOG 221. Fall

GEOG 327 INTRODUCTION TO REMOTE SENSING The basics of aerial photography and remote sensing and the identification and analysis of objects. Imagery of low as well as high altitude is interpreted. Spring, alternate years

GEOG 330 NATURAL RESOURCE MANAGEMENT Examination of the use and management of renewable and non-renewable resources, including patterns of assessment, conservation policies and practices, and human impact on the environment. Resources discussed include land, water, air, forests, wilderness, and recreation from an international perspective. Prerequisites: ENST 100; 6 credits in Geography. Fall, alternate years

GEOL 201 INTRODUCTORY PHYSICAL GEOLOGY 4 credits An introduction to the Earth, emphasizing an overview of the external and internal processes which shape the planet. Labs emphasize the study of Earth materials and topographic maps. 3-hour lecture, 2-hour lab (field trips may be required). Fall, Spring

GEOL 202 HISTORICAL GEOLOGY 4 credits An introduction to Earth History and the processes which have shaped the Earth since its formation. Topics include absolute and relative correlations, plate tectonics, and the origin and evolution of the atmosphere and biosphere. 3-hour lecture, 2-hour lab (some Saturday field trips required). Prerequisite: GEOL 201 or GEOL 100 and 101. Spring

GEOL 206 OCEANOGRAPHY Introduction to the study of the sea; nature of sea water and its processes; marine life; features and sediments of the ocean floor; theories on the origin of ocean basins, trenches, ridges, and continental terraces. Fall, Spring

GEOL 303 STRUCTURAL GEOLOGY Study of the structural features of rock bodies and interpretation of these features in terms of the forces that caused them; methods of geological field work; graphic representation of geological field data; interpretation of geological maps; preparation of field reports. 5-hour lecture, lab, field work. Prerequisites: GEOL 201-202, or permission of instructor. Spring, odd years

GEOL 306 STRATIGRAPHY Principles of stratigraphy and sedimentation; properties and classification of sedimentary rocks; sedimentary processes and environments; stratigraphic procedures and correlations; and stratigraphic relationships of North America. 2-hour lecture, 2- hour lab. Prerequisite: GEOL 202. Fall, odd years

GEOL 309 GEOMORPHOLOGY Nonglacial surface processes. The evolution of land forms and influence of lithology, tectonics, and climate on land forms. Surface processes related to land use and environmental planning. Labs involve interpreting topographic and geologic maps, field projects. Prerequisite: GEOL 201 or GEOL 100/101. Fall, even years

GEOL 315 ENVIRONMENTAL GEOLOGY 4 credits Relationships between humans and our geological environment, including resources, hazards, and human impacts. Field methods in obtaining geologic information for resource evaluation and protection, risk reduction, and environmental remediation. 3-hour lecture, 2-hour lab, field trips. Prerequisites: GEOL 201 or GEOL 100 and 101. Formerly GEOL 450. Fall

GEOL 412 GEOCHEMISTRY Abundance of the chemical elements and the principles of distribution and migration of elements in geological environments. Applications to selected examples. Prerequisites: CHEM 112/116 and GEOL 302, or permission of instructor. Spring, even years

GEOL 460 HYDROGEOLOGY 4 credits Occurrence and movement of groundwater as it relates to the hydrologic cycle, water resource evaluation (well hydraulics), and transport and fate of contaminants; theoretical and practical aspects, including computer modeling. Three-hour lecture, two-hour lab; field trips may be required. Prerequisites: GEOL 201 (or equivalent), MATH 151, and PHYS 141, or permission of instructor. Spring, odd years

MATH 130 PRECALCULUS Polynomials, rational functions, exponents and logarithms, trigonometric functions with an exploration of their graphs. A high-level algebra-trigonometry course intended for students who plan to take calculus. (Not open to students who have taken calculus in college.) Presumes competency in the content of MATH 120. Fall, Spring

MATH 141 INTRODUCTORY STATISTICS Basic tools of descriptive statistics, an introduction to probability, probability distributions, normal distributions, estimates and sample sizes, hypothesis testing, elementary correlation and regression and contingency tables. (May not be taken for credit by students who have completed PSYC 251.) Fall, Spring

MET 225 METEOROLOGY Measurement and discussion of temperature, pressure, humidity, precipitation and wind. The atmosphere, solar influence, gas laws, and layer stability. Study of horizontal motion, circulation of the atmosphere, fronts, and analysis of weather maps. Fall, Spring

PHYS 141 COLLEGE PHYSICS I 4 credits Algebra-based introduction to Newtonian mechanics. Emphasis on conceptual understanding and problem solving. Forces, motion, dynamics (linear, 2-D, and rotational), momentum, energy, and conservation laws; fluids. Vector notation requires working knowledge of trigonometry. Math competency assessment administered. Prerequisite: Math 120 or demonstrable skills and mastery of college-level algebra, right triangle trigonometry and geometry concepts, and scientific notation. Co-requisite: Must take laboratory, which is an integral part of the course. Fall, Spring

PHYS 142 COLLEGE PHYSICS II 4 credits
A continuation of PHYS 141 with extension of basic concepts to include applications in electricity and magnetism. Other topics include vibrations and waves, light and sound. Introduction to heat, heat flow, thermodynamics, classical and physical optics, some atomic or nuclear physics. Prerequisite: PHYS 141. Co-requisite: Must take lab, which is an integral part of the course. Spring

POSC 201 INTRODUCTION TO POLITICAL SCIENCE A survey of Political Science and politics, fields, and methods. U.S. government, international affairs, comparative government, and contemporary domestic and international issues. Fall, Spring

POSC 332 PUBLIC POLICY ANALYSIS
Qualitative and comparative analysis of policy in such areas as rights, welfare, health, education, environment, and criminal justice. Study of the policy process, options, outcomes and evaluation methods. Prerequisite: POSC 201 or 205, or permission of instructor. Spring, odd years

Course Syllabi follow on un-numbered pages:

ENST 100, Spring 2001, Renate Gebauer
ENST 100, Fall 2002, Patrick Eggleston
ENST 100, Fall 2002, JoBeth Mullens
ENST 200, Spring 2002, Renate Gebauer
ENST 210, Fall 2002, Tim Allen
ENST 495, Fall 2001, Steve Stepenuck
ENST 495, Fall 2002, Renate Gebauer

ENST 100-02 - INTRODUCTION TO ENVIRONMENTAL STUDIES
Spring 2001

MW 12:00-1:30 pm, Science Center 102

Instructor: Dr. Renate L.E. Gebauer
310 Science Center
(603) 358-2577
rgebauer@keene.edu (best way to contact me)
Office Hours: M 9:00-10:00, T 2:00-3:00, W 2:00-3:00 or by appointment

Required Text: Environment by Raven and Berg 3rd ed. Hartcourt College Publishers, 2001

Description of Course In recent decades, environmental issues have received a great deal of attention from scientists, the media, politicians, and the general public. To understand current environmental problems, we need to study the physical, biological, chemical, economic, and social processes that are often the basis of those problems. The purpose of the course is to give you an analytical framework and a set of concepts that you can use to judge environmental issues, to guide your own life, and our responsibility to future generations. The course covers a wide variety of topics at a moderate level of intensity. Many of these topics can be explored in greater depth in other courses.

.

Attendance Regular attendance and participation (e.g. in discussions) is essential and expected; the assigned chapters in textbook should be completed **before** lectures and again **after** class to reinforce important concepts. Material and specific examples may be presented in lecture which are not found in the readings. Therefore, you should take careful notes in class. Handouts may also be passed out in lecture. You are responsible for, and may be tested on, all readings, handouts, and lecture material. Please note that it is **not** the instructor's responsibility to make missed material available to absentees.

Office Visit: I would like to be able to associate names with faces. The best way to do so is to visit me in my office during office hours or other times that I might be in. This is not strictly "required," but will be counted as part of your attendance-participation points if done prior to spring break.

Tests There will be 3 midterm and one final exam. Tests will consist of a combination of multiple choice, fill in the blank, short essay or problem solving, and evaluation of experimental data. Questions require you to think and apply what you have learned.

Make-ups for missed exams can be granted only by **prior** arrangements (within 1 week before exam date), unless due to documented emergency. Requests for make-ups must be in writing and must explain exactly why it will be impossible for the student to attend during the specified time period.

Quizzes and assignments: There will be periodic in-class quizzes and take-home assignments designed to enhance learning and to inform students of the type and content of questions to be expected on hour exams. There are **no** make-ups for quizzes. Late take-home assignments will receive a penalty of 10% per day late; after the homework is returned to your classmates, your late homework is not acceptable and earns a grade of 0%.

Academic Honesty Please be sure you understand the College's policy and regulations, particularly the section on Academic Honesty (Student Handbook 2000/2001 page 54-56). It is my intention to hold you to its provisions. You should consult with me if you are not clear about your responsibilities or expected conduct during any assignment or activity in this course.

Students with Disabilities
I encourage students with documented disabilities, including "invisible" disabilities like chronic diseases, learning disabilities, and psychiatric disabilities to see me after class or during office hours to discuss appropriate accommodations that might be helpful to them.

Bad Weather Please call for voice mail messages if there is a question about class cancellation during severe weather.

Grading

3 Midterm Exams (100 pts. each)	300 points
Final Exam	100 points
Quizzes	50 points
Homework assignments (total)	100 points
Attendance/Participation	50 points

TOTAL 600 Points

Grades: Letter grades will be assigned as follows at the end of the semester

A	546-600		C	426-473
AB	534-545		CD	414-425
B	486-533		D	360-413
BC	474-485		F	< 360

Tentative schedule: ENST 100 Spring 01

Day	Date	Topic	Read	Notes
W	17 Jan.	What is Environmental Studies?	Ch. 1	
M	22 Jan.	Addressing Environmental Problems	p. 21-25, 44-56	
A CROWDED WORLD				
W	24 Jan.	Understanding population growth	p. 168-177	Quiz
M	29 Jan.	Human population and demography	p. 177-188	
W	31 Jan.	The population bomb	tba	
M	5 Feb	Can we stop the population explosion?	Ch. 9	
FOOD RESOURCES: A CHALLENGE FOR AGRICULTURE				
W	7 Feb	Food production and the path of energy flow	Ch. 4	
M	12 Feb	Midterm exam I		Exam
W	14 Feb	Agriculture - yesterday and today	p. 428-444	
M	19 Feb	Pesticide Dilemma	Ch. 22	
W	21 Feb	Genetic engineering		Quiz
ENERGY RESOURCES				
M	26 Feb	Energy sources and trends in energy use	p. 444-447 tba	
W	28 Feb	Fossil fuel resources	Ch. 10	Quiz
M	5 Mar	Nuclear power and radioactive waste	Ch. 11	
W	7 Mar	Renewable Energy	p. 268-282	
M	12 Mar	Energy conservation + strategies for the US	p. 284-292	
W	14 Mar	Midterm exam II		Exam
M	19 Mar	Spring break		
W	21 Mar	Spring break		
CHANGES IN THE ATMOSPHERE				
M	26 Mar	Air pollution	p. 458-475	
W	28 Mar	Ozone depletion + acid deposition	p. 500-507	Quiz
M	2 Apr	Global warming	p. 485-496, 508	
SOLID AND HAZARDOUS WASTE				
W	4 Apr	Solid waste production and landfills	p. 569-576	Quiz
M	9 Apr	Hazardous wastes	p. 581-587	
W	11 Apr	Midterm exam III		Exam
M	16 Apr	Reduce - reuse - recycling	p. 576-581	
PRESERVING EARTH'S BIOLOGICAL DIVERSITY				
W	18 Apr	Why we need species diversity	p. 97-99, 370-376	Quiz
M	23 Apr	Human causes for a decline in biodiversity	p. 377-382	
W	25 Apr	Conservation biology	p. 383-393	
R	3 May	Final exam (10:30 - 12:30)		Exam

Syllabus: **ENST 100-01** **Fall 2002**
Introduction to Environmental Studies

Professor: Patrick M. Eggleston, Ph.D. in Zoology from the Ohio State University
Address: Biology Section, Keene State College, Keene, NH 03435-2001
Office: 314 Science
Office Hours: Mon 9 am, Tues 3 pm and by appointment.
E-mail: pegglest@keene.edu
Phone: 603 358-2579

Class meets:
ENST 100-01 MWF 10:00 to 10:50 am Science 101
Texts: *Environment* by Raven and Berg 2001
The Consumer's Guide to Effective Environmental Choices by Brower and Leon.

Goals: Study ecology, ecological science, economics, political processes, and concepts about the protection of the environment. Major topics in the course will include population, global change, energy, waste and pollution, biodiversity and the loss of species, and sustainability. We will also look at the ways in which consumer choices will affect the environment.

Methodology: Lecture, discussion, homework, Blackboard quizzes, and exams.

Exams: There will be mid-term exams and one final exam. Each exam will be comprehensive for lecture and book material. The book, lecture, and extra readings will be covered on each exam. A short quiz may be given at any time in class, and may not be made up if missed. Leave your books up front while taking an exam, or leave your books at home. Do **not** leave an exam if you want to come back later for that exam. **Bring to each exam**: number 2 pencil, a quality eraser, a portable pencil sharpener, and your KSC photo ID card. I will not supply pencils for the exam. Pens do not work on an exam.

Final exam: Science 101 Tuesday 10 Dec 2002 at 10:30 am to 12:30 pm

Snow days: If you can not make it to class because of bad roads, e-mail me about the reason for missing class as soon as possible. Do not risk your life to get to class in bad weather. If it is so bad that I can not get to class, I will post an announcement on **Blackboard** site under Announcements.

Homework should be typed on plain white paper. Word processing and spell checking is strongly suggested. Homework must be handed in on time and on the date due by 12 noon at the latest. Late work will have many points deducted.

Attendance will affect your grade. For days that you arrive on time and stay for the full class and stay awake, you will earn points. Participation may help your grade.

Grades: Only the percent grade will be entered for each exam. The mid-term exams and the final exam will all have the same weight. Points will be entered for homework and Blackboard quizzes.

E-mail: Get signed up for your own KSC e-mail account and give me your KSC e-mail address as soon as possible. When you send me e-mail, please use proper English, complete sentences, and give me your full name, course number and section, and the time this course meets.

Disability: Students with disabilities who may need classroom accommodations are encouraged to make an appointment with Jane Warner or Jessica Bigaj in the Office of Disability Services (x2353). Please meet with me during office hours so that we can collaborate with the Office of Disability Services to provide the appropriate accommodations and supports to assist you in meeting the goals of the course.

Blackboard Instructions

While many students have already been introduced to Blackboard (Bb) last semester, there will be some who are not familiar with it at all. Find Blackboard by going to the KSC home page, then click on "Academics", then click on "Blackboard". Usernames for students are the first part of their KSC e-mail account addresses (e.g. John Doe is jdoe@keene.edu and will log into Bb with username jdoe). All student passwords are **blackboard** (all lowercase). Once students log in, have them change their passwords **immediately** by clicking on the "my blackboard" tab, then clicking on "personal information". It is important to change your password before someone else does. If someone else changes your password, you will not be able to get into your own account. I am sorry to say that this does happen.

While nearly all students have a KSC e-mail account, many do not know the name of their account. They can find out easily by checking the STSS help page at http://www.keene.edu/it/stss/ . They can also change their password there if they want to. Students MUST have a KSC e-mail account to use Blackboard because all of our usernames are based on the KSC e-mail account names to insure that we will never have any duplicate accounts in the system. If students do not have a KSC e-mail account, please have them contact STSS at 358-2535 to set one up. And once the new e-mail account is set up, please have your students e-mail Maria Erb (merb@keene.edu) with their full name and the name of the KSC email account and Maria Erb can set up a Bb account for them. This usually takes only a few days.

Students often choose not to use their KSC e-mail accounts because the size allotted to the accounts is very small. If your students are using other e-mail accounts such as hotmail, juno, yahoo, msn or something else, make sure that they forward their KSC e-mail accounts to the address that they are using. Full instructions on how to do this are available on the STSS help page at http://www.keene.edu/it/stss/ . It is very important that they forward to the address they are using. What will happen is that when you send e-mail to all the students in your class using the "send e-mail" function in Bb, many messages will bounce back to you from KSC email accounts that are full. This is because the students are not using those accounts and never check them to clean out old mail. This is why it is very important that the mail directed to their KSC accounts from Bb gets forwarded to an address that the students check regularly.

For problems send Maria Erb (merb@keene.edu) an e-mail message . Problems are usually resolved very quickly and usually have to do with browser issues or third party software issues.

Study tips

1. You should spend 3 hours per week in lecture and at least 10 hours per week in study time for a 3 credit college course. If you do not read well, expect to study many more hours per week to keep up. Attend all classes and take good notes in lecture on the main points covered.

2. In the first two weeks, skim the assigned chapters of your text. This will give you an overview of the subject. Then go back and read the assigned material carefully. Highlight the most important points at this time. Highlight no more than 10% and no less than 4% of the material. I find that yellow highlighters work best for me. Highlight only the most important points.

3. One week before the exam, find one friend in this class with whom you may study. Quiz each other on the material to be covered. The one being quizzed should have his/her book closed. Ask questions on the tables and graphs. Look for the main points in each chapter and section. This is a powerful study tool for most people. Large group study usually does not work as well as a two person study group.

4. Make up multiple choice exam questions on the material in the book and lecture. Try the questions on your study partner. Are they good questions? Do they cover the main points?

5. Make vocabulary cards and work to expand your vocabulary and your knowledge of concepts. When using vocabulary cards, sort them into two piles: those that you know and those that you do not know. Next time you work on the cards, work only on those that you did not know last time. Work on the cards at odd times like while you are waiting in the lunch line.

6. My office hours are for your use. When you come in for extra help, bring in a list of specific questions for which you need help. For example, mark a paragraph or table in your book that you do not understand. If you miss a lecture, get lecture notes from a friend. For a short question try calling me at 358-2579. For my schedule, see Blackboard. Feel free to come in for help at any time that I am in, except for about 20 minutes before one of my classes is about to start. My schedule is posted on the web.

7. In science, your knowledge gained at the start will be used many times later. After the first exam, go back and review the questions you missed and try to understand why you missed them. Build on what you know. Try to tie ideas together.

8. When you have a good question to ask in class, please ask it. Good questions seem to help the whole class to do better. Always hand in assignments on time.

9. While taking an exam, answer the easy questions first. Later do the harder questions on the second pass. Because of the way that the human mind works, you may be surprised at how easy the hard questions have become. Do not change the answer once you have marked it. On the average, you will lower your score if you change an answer. Erase well if you must change an answer. Do **not** make stray marks on the left side of exam answer sheet.

10. Use the study materials on Blackboard. Some materials will be at the reserve desk in the Mason Library. You may use a computer to find out what is on reserve and if it is presently available.

11. Schedule your time well. Start studying tonight. Work hard now. Please complete all assigned readings before they will be discussed in class. Have all assigned readings finished one full week before the exam. Review the material the last week before the exam.

12. Think of the material like a picture puzzle. If you see it as 500 unrelated pieces, you will not understand the material. If you try to put the pieces together, they will make much more sense, and you are more likely to remember the important points.

Date	Chapt	Topic		Assign
26-Aug	1	Intro, sustainability, impact	Intro	
28-Aug	2	Science, scientific method	Science	Quiz 1 RB 1
30-Aug	4	Thermodynamics, energy	Energy	Quiz 2 RB 2
4-Sep	4	Respiration, photosynthesis	Energy	Quiz 3 RB 4
6-Sep	6	Energy flow, matter cycle	Energy	
9-Sep	4	Food chain, food webs	Energy	Quiz 5 RB 8
11-Sep	8	Population ecology	Population	Quiz 6 RB 9
13-Sep	8	Population demographics	Population	Quiz 7 RB 18
16-Sep	9	Overpopulation, impacts	Population	
18-Sep	18	Food	Population	
20-Sep		**Exam 1**		**Exam 1**
23-Sep	13	Water	Food	Quiz 8 RB 13
25-Sep	6	Nitrogen, phosphorus cycles	Food	Quiz 9 RB 22
27-Sep	22	Pesticide	Food	Quiz 10 RB 20
30-Sep	20	Global change: ozone	Global	Quiz 4 RB 6
2-Oct	20	Acid rain	Global	
4-Oct	6	Carbon cycle, climate	Global	
7-Oct	20	Global warming	Global	
9-Oct	20	Global warming	Global	
14-Oct	20	Global warming	Global	
16-Oct	12	Energy efficiency	Energy	
18-Oct		**Exam 2**		**Exam 2**
21-Oct	10	Fossil: coal	Energy	
23-Oct	10	Fossil: oil, natural gas	Energy	Quiz 11 RB 12
25-Oct	11	Nuclear reactors	Energy	Quiz 12 RB 10
28-Oct	11	Nuclear fuel cycle	Energy	Quiz 13 RB 11
30-Oct	11	Nuclear waste	Energy	
1-Nov	12	Solar active, passive	Energy	
4-Oct	12	Solar active, passive	Energy	
6-Nov	12	Wind, biomass, hydro	Energy	
8-Nov	12	Geothermal	Energy	
13-Nov	12	Hydrogen, fuel cells	Energy	
15-Nov		**Exam 3**		**Exam 3**
18-Nov		Economic world divide	Econ	
20-Nov	5	Biodiversity, niche	Biodiversity	**Assignment due**
22-Nov	5	Biodiversity, evolution	Biodiversity	Quiz 14 RB 5
25-Nov	16	Biological diversity	Biodiversity	Quiz 15 RB 16
2-Dec	17	Land conservation	Biodiversity	Quiz 16 RB 17
4-Dec		Consumers Guide	Solutions	
6-Dec		Consumers Guide	Solutions	
9-Dec		Reading day		
10-Dec		**Final exam**		10:30 AM
		Patrick M. Eggleston		ENST 100-01
		603 358-2579		Fall 2002
		pegglest@keene.edu		Science 101

Assignment for **ENST 100** Introduction to Environmental Studies
Patrick M. Eggleston Fall 2002

Any assignment should be **typed** on plain white paper and **single** spaced. Type face should be about this size, and this type face. Do not use a face sheet, but start in on the first page with your paper. Do not use a plastic cover. All work is due by **12 noon** on the date due. Hand the work in at the start of class that day or slide it under my door, Room 314 Science, by 12 noon. Late work will have a large point deduction. Your papers should be well thought out and very clear. This is a formal research paper, so give it real content. Be sure that you put your **full name**, **paper title**, and **ENST 100** and **section number** in the upper right corner of both papers. Each paper will have a maximum of 100 points. Papers should be 6 to 8 pages and single spaced. Do not pad your paper. Each paper should contain internal citations in the form: (Author last name, year published: page) for example (Raven and Berg, 2001: 179). I would use a citation at the end of most paragraphs where you have taken data or key ideas from some source. Each paper should have a **bibliography** with only the literature which you used cited. Be sure to have at least two books, one scientific journal, and five web sites in your literature that you have used.
Use the following format for citations:
Book: Raven, P. H. and Berg, L. R. 2001. Environment. Harcourt College Publishers, Philadelphia, PA.
Journal article: Wikfors, G. H. and Ohno, M. 2001. Impact of algal research on aquaculture. Jour. Phycology 37(6): 968-974.

Assignment: Title: Global Climate Change. We now have some climate change that has been documented. Read your text book and look at several web sites. Discuss the things that climate change will do to our environment. Group these effects into the ones that will hurt us and the ones that might help us. Be specific. **How can we act to slow climate change**? Make sure you have the following headings within your paper: 1. Helpful effects if any. 2. Harmful effects. 3. Global climate change: More helpful or more harmful? 4. What **can one person do** to slow global climate change? 5. What **this nation** needs to do to slow global climate change, including what energy options should the USA adopt, and which energy options should the USA avoid or phase out? How can we conserve energy? 6. How does world population affect the problem?

Due: 20 November 2002

Books: Raven, P. H. and Berg, L. R. 2001. Environment.
Miller, G. T. 2002. Living in the Environment.
Mazria E. 1979 The Passive Solar Energy book.
Brower, M. and Leon, W. 1999 The Consumer's Guide to Effective Environmental Choices.

Web sites: See Blackboard under Resources for good web sites.

Introduction to Environmental Studies
ENST 100
Fall 2002

"Never doubt that a small group of thoughtful committed citizens can change the world; Indeed, it is the only thing that ever has"Margaret Mead

Professor: ***Dr. Jo Beth Mullens***
Office: ***Science Center #214***
Email: ***jmullens@keene.edu***
Phone: ***(603) 358-2547***
Office Hrs.: Tuesday and Thursday 4:30 p.m. - 5:30 p.m.
Wednesday 1:00 p.m. - 2:00 p.m. (and by appointment)

Required Text: Raven and Berg. 2001. Environment (3rd Edition)

Course Focus:
Introduction to Environmental Studies is designed to familiarize you with the basic principles of environmental science and policy. This synthesis class integrates ideas from the physical and ecological sciences with those of the social sciences in order to examine interactions between humans and environment. The course will focus on three areas: the current conditions of the environment; the pressures that create environmental problems; and responses to environmental challenges. Case studies will be used to illustrate environmental problems and issues.

Course Objectives:

Three basic objectives for this class are:

- Gain an understanding of the multi-faceted components of environmental science and policy
- Develop skills to critically read, analyze, and discuss environmental issues.
- Learn how to incorporate an environmental ethic into daily practice

Course Evaluation:

Evaluations in this course will be based on 3 exams (which includes the final), assignments (papers and projects), and class attendance and participation. Approximately 75% of your grade will be based on the exams and 25% on assigned work and class participation. The following letter grade breaks apply to this class.

A	=	100% - 93%	C	=	77% - 73%
AB	=	92% - 88%	CD	=	72% - 68%
B	=	87% - 83%	D	=	67% - 60%
BC	=	82% - 78%	F	=	59% and below

Course Policies

Regular attendance is required (please do not miss more than 2 classes). In order to maximize your benefits from enrolling in ENST 100, it is critical that you maintain a high attendance record. It is also important to keep-up with assigned readings and participate in class discussions.

All exams and assignments are required and must be completed when due. No make-up exams will be given (exception will be made for students with legitimate excuses who have made arrangements with me PRIOR to the exam date). Assignments will be assessed a 20% penalty each day after they are due. If you miss a class and an assignment is given or due, it is still your responsibility to get the assignment in on time.

Course Outline

		Required Readings
Week One		
Aug. 27th	Why Environmental Studies?	Chapter 1
Aug. 29th	Global Connections in a Divided World	
Week Two		
Sept. 3rd	Environmental Sustainability	
Sept. 5th	Science and the Environment	Chapter 2
Week Three		
Sept. 10th	Scientific Research and Uncertainty	
Sept. 12th	History of the Conservation Movements	Chapter 3
Week Four		
Sept. 17th	Environmental Movement of the Late 20th Century	
Sept. 19th	Environmental Concepts and Cycles	Chapter 4
Week Five		
Sept. 24th	Biological Communities	Chapter 5
Sept. 26th	**1st Exam (Chapters 1, 2, 3, 4, & 5)**	
A CROWDED WORLD		
Week Six		
Oct. 1st	Population Dynamics	Chapter 8
Oct. 3rd	Human Population	
Week Seven		
Oct. 8th	Overpopulation Issues	Chapter 9
Oct. 10th	Addressing our Population Dilemma	
RESOURCES FOR THE FUTURE		
Week Eight		
Oct. 15th	World Water Resources	Chapter 13
Oct. 17th	Water Resource Problems	
Week Nine		
Oct. 22nd	Preserving Soil Resources	Chapter14
Oct. 24th	Securing Food Resources	Chapter 18
Week Ten		
Oct. 29th	Conventional Energy Resources	Chapter 10
Oct. 31st	Renewable Energy and Conservation	Chapter 12

Week Eleven

Nov. 5th	Land Resources	Chapter 17
Nov. 7th	**2nd Exam (Chapters 10, 12, 13, 14, 17, & 18)**	

GLOBAL CHANGE

Week Twelve

Nov. 12th	Air Pollution	Chapter 19
Nov. 14th	Global Atmospheric Change	Chapter 20

Week Thirteen

Nov. 19th	Addressing Global Change	
Nov. 21st	Biodiversity	Chapter 16

Week Fourteen

Nov. 26th	Endangered Species	
Nov. 28th	No Class Thanksgiving Holiday	

Week Fifteen

Dec. 3rd	Solid Waste and Hazardous Waste	Chapter 23
Dec. 5th	Building a Sustainable Society	Chapter 24

FINAL EXAM **Friday, December 12, 8:00 a.m. – 10:00 a.m.**
(Chapters 16, 19, 20, 23, & 24)

ENST 200 – INTERMEDIATE ENVIRONMENTAL STUDIES Spring 2002

MW 12:00-1:20 pm, Science Center 207

Instructor: Dr. Renate L.E. Gebauer
310 Science Center
(603) 358 2577
rgebauer@keene.edu (best way to contact me)
Office Hours: M 2:30-3:30, W 9:00-10:00 or by appointment

Text:

- Required: Principles of Environmental Management. The Greening of Business by Rogene A. Buchholz. 2nd edition Prentice Hall 1998.
- Recommended: Your introductory textbook from ENST 100 such as: Environment by Raven and Berg 3rd ed. Hartcourt College Publishers, 2001
- Additional reading will be handed out in class, placed on reserve, or pointed-to on the website.

Pre-requisite: ENST 100. It is strongly recommended that you are a sophomore!

Class website: Our class website (http://keene.blackboard.com) will be an integral part of this course. It is an important source of information, provides the due dates for reports and homework assignments, and allows you have discussions with other students outside the class. Please make sure to regularly check the class website.

Course Objectives and Goals: Over the past century humans have been changing the local and global environment at a pace and to a degree few people can comprehend. Ever-increasing populations, our mastery of technology, and an increasing need for consumer goods have a tremendous impact on land, air, water, and biological resources. Our generation faces some of the most difficult environmental issues, which will take understanding, creativity, and hard work to solve. In this course we will examine real-world examples of environmental issues and learn how we can use the knowledge and tools of ecology and science, economics, ethics, and political science to understand these complex issues and to develop possible solutions.

The specific goals of this course are for you to:

- Identify and describe major environmental challenges which modern societies face at local, national, and international scales.
- Understand the scientific basis and ecological background of environmental problem.
- Understand the multidisciplinary nature of environmental problem solving and decision making on individual, institutional, or nation wide levels.
- Improve your skill to critically evaluate information, to reason logically, to solve problems, and to be creative.
- Develop the skill to communicate effectively and to work together in groups

Class format: In this class I plan students to become the center of activity in the classroom! Much of the course material will be presented in form of case studies, which are "team learning" projects. They build and expand on your background knowledge acquired in "Introduction to Environmental Studies" and require you and your team to develop arguments, make decisions and come up with creative solutions for environmental problems. We will also spend time on focused lectures and discussion, where we explore some theoretical background required to solve environmental problems. At the end of the semester, we will devote class time to a series of debates about environmental issues, which groups will prepare and present.

Formation and functioning of groups: Heterogeneous groups of 4-5 people will be formed at least at the 3rd class period, which will remain the same for the entire semester. I will determine who

will be in the group. One of the first group activities will be to formulate some "rules" which each student agrees to abide by.

Preparation: It is critical that each individual student does the assigned readings and comes prepared to class to share and discuss the information with other group members or with the entire class. I expect group and class discussions to be engaging, self-driven, rewarding, and FUN!!!

Participation: Students must be active participants in all aspects of the class. Participation will be assessed over the entire semester and it can take many forms e.g. responding to questions and challenges, asking questions, listening carefully to other students, gathering information for team projects, being a responsible group member by working collaboratively as part of a team etc.

Format of evaluation and grading: This is your chance to take charge of your learning process! This is your education and it is only you who can determine its real value to yourself through self-evaluation and reflection. You owe it to yourself and others to be thoughtful, prepared, and critical in a positive manner. Here are my criteria for evaluation and grading purposes: (1) the extent to which you participate and do the work, (2) the quality of the work that you do and the level of skill you develop, and (3) your knowledge of the information content of the course and your ability to apply it.

With several of the case studies there will be follow-up write-ups and position statements. We will use the "blackboard" class website to facilitate communication among group members outside the class. In addition there will be individual homework assignments and occasional quizzes throughout the semester. For the environmental debates at the end of the semester, groups and individuals in the group will be responsible for several products, including a literature search, a position paper with concise arguments for the different positions, and the presentation of the debate.

Peer evaluation**:** In order to determine your individual contributions to the team work I will determine a factor that will weigh for individual team member the score earned by the group. This factor is based on peer evaluations. I will provide you with a list of criteria, which will help you in your evaluation.

Here is a simple example for how to calculate this factor. Lets assume that we will form groups of 4. Then each student will rate anonymously all other members of their groups at the end of the course. In this case the following will happen.

a. Each individual will assign a total of 30 points among the three members in their group, for an average of 10 points per person (you will not rate your own performance).

b. So, student Linda might receive from her team mates peer evaluations scores of 10, 11, 9 = 30 points for an average of 10, while Mary might receive 10, 12, 14 = 36 points for an average of 12.

c. The peer evaluation score will be used to modify the group score. This is how it will work: if a students gets an average score of 10 from his/her group members, then s/he will receive all the possible points of the group. If s/he receives an average of 9, he will receive only an average of 90 % of the possible scores earned by the group.

d. Additional directions: 1) when you assign points, only assign equal numbers of points to everyone if they really make equal contributions to the group work. 2) Also, you must not give anymore than 15 pts. regardless of how much s/he did. 3) Finally, you do not have to distribute all 30 points. If you feel it is unwarranted. That is don't give pts. away to poor performers just because you have some extra points.

Academic Honesty: Please be sure you understand the College's policy and regulations, particularly the section on Academic Honesty in the Keene State College Catalog (2001-2002) p 171-174 including what constitutes plagiarism. It is my intention to hold you to its provisions. You should consult with me if you are not clear about your responsibilities or expected conduct during any assignment or activity in this course.

Students with Disabilities: I encourage students with documented disabilities, including "invisible" disabilities like chronic diseases, learning disabilities, and psychiatric disabilities to see me after class or during office hours to discuss appropriate accommodations that might be helpful to them.

Bad Weather Please call for voice mail messages if there is a question about class cancellation during severe weather.

Grading

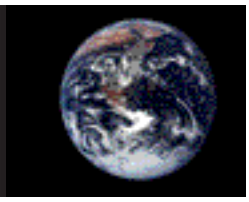
Homework assignments (Individual and group)	40 %
In class assignments and quizzes	20 %
Environmental debate	30 %
Participation	10 %

Grades: Letter grades will be assigned as follows at the end of the semester.

A	92-100 %	Represents excellent and creative work
AB	89-91 %	
B	82-88 %	Represents good and disciplined work
BC	79-81 %	
C	72-78 %	Represents competent and acceptable work
CD	69-71 %	
D	62-68 %	Represents passable work
F	< 62 %	Represents failing work

	Date	Topic	Read
W	23 Jan	Introduction/Environmental history	
M	28 Jan	The job market	Case study
W	30 Jan	Review of basic concepts and scientific method	P. 6-8, 10-19
M	4 Feb	"Eating PCBs from Lake Ontario"-Can we trust data?	Case study
W	6 Feb	Concepts and principles of ecology	Chapt. 2
M	11 Feb	Concepts and principles of ecology	Chapt. 2
W	13 Feb	Bambi syndrome and Quabbin reservoir	Case study
M	18 Feb	Quabbin reservoir case study continued	
W	20 Feb	Social responsibility and environmental ethics	Chapt. 3
M	25 Feb	The bear facts: grizzly recovery in the Bitterroot ecosystem	Case Study
W	27 Feb	The bear case study continued	
M	4 Mar	The tragedy of the commons	tba
W	6 Mar	Environmental economics	Chapt. 12
M	11 Mar	The deforestation of the Amazon	Case study + Chapt. 10
W	13 Mar	The deforestation of the Amazon continued	
M	18 Mar	Spring break	
W	20 Mar	Spring break	
M	25 Mar	Policy-making process	Chapt. 4
W	27 Mar	Wetlands	Chapt. 11
M	1 Apr	Salton, a sea of controversy	Case Study
W	3 Apr	The urban sprawl: How are cities different?	tba
M	8 Apr	Divorcing your car – the pros and cons of transportation	Chapt. 6
W	10 Apr	Toxic Waste	Chapt 8
M	15 Apr	Solid waste management: Disposal versus Recycling	Case study + Chapt. 9.
W	17 Apr	Sustainable cities	tba
M	22 Apr	The practical aspects of pesticides application	tba
W	24 Apr	Presentations	
M	29 Apr	Presentations	
W	1 May	Presentations	

ENST 210: Energy & Environment



Fall 2002

"An ecological view of energy problems, their causes, and alternative solutions. Emphasizes the ecological effects of various solutions to energy problems." (Keene State College Catalog)

Course and Instructor Information

Meeting Time:	Tuesdays and Thursdays, 8:00 - 9:20 am,
Meeting Place:	Science Center 203, Keene State College
Web Page:	on the College's Blackboard site (http://keene.blackboard.com/)
Instructor:	Dr. Timothy T. Allen
	Professor of Geology & Environmental Studies
Office:	212 Science Center
E-Mail:	tallen@keene.edu (probably the best way to reach me)
Telephone:	(603) 358-2571
Office Hours:	Mondays, Wednesdays, and Fridays: 11:00 am to 12:00 noon
	Tuesdays and Thursdays: 9:30-10:00 am
Address:	Mailstop 2001, Keene State College, Keene, NH 03435-2001

Course Description

Well before most of you were born, the United States went through "The Energy Crisis," brought on by an "OPEC" oil embargo. In the time since, we have consumed more oil than the total of all that was consumed up until then. Now, a new energy crisis is lurking around the bend, and we are faced with significant environmental (and socio-political) problems that can be directly attributed to our use of energy. To solve these problems and ensure a livable future, we need to better understand how we use energy, what we use it for, where we get it from, and what the alternatives are. Thus we will consider (1) some basic physics about energy, (2) the flow of energy through the Earth's natural environment, (3) the history of mankind's use of energy and its impact on the environment, and (4) some of the alternatives in our energy future.

This course is also about the process of science—an approach to observing and thinking about the world around us, involving the asking of questions and the seeking of answers. Throughout, there will be an emphasis will be on critical, creative, and analytical thinking, problem-solving, quantitative reasoning, and scientific communication skills (e.g., discourse and visual representation).

Resources

The basic textbook for the course is:

1. **H&K**: Roger A. Hinrichs and Merlin Kleinbach, 2002, *Energy, its use and the Environment,* 3rd edition, Brooks/Cole, ISBN 0-03-031834-3

Several other books are "*highly* recommended" and are available from the bookstore or other sources:

2. **VS**: Vaclav Smil, 1999, *Energies: An Illustrated Guide,* MIT Press, ISBN 026269235X (also available on reserve at Mason Library)
3. **KD**: Kenneth S. Deffeyes, 2001, *Hubbert's Peak: The Impending World Oil Shortage,* Princeton University Press, ISBN 0-691-09086-6
4. **KA**: Katie Alvord, 2000, *Divorce Your Car!,* New Society Publishers, Gabriola Island, BC Canada, ISBN 0-86571-408-8

In addition, the following books will also be available on reserve at Mason Library:

5. **FM**: Fred T. Mackenzie, 1998, *Our Changing Planet,* [GE 105 .M33 1998]
6. **SciAm**: Scientific American, 1991, *Energy for Planet Earth: Readings from Scientific American,* [TJ 163.24 .ES39 1991]
7. Keene State's *The Guide: A New Way to Think About Writing & Research in College*.

The course schedule lists assigned and suggested readings for each class meeting. Readings should be completed prior to the class meeting in which they are featured. While class presentations and the readings will be closely intertwined, there may material in assigned readings that we won't be able to cover in class, but that I will expect you to be familiar with. Likewise, we may cover some material in class that is not in any of the readings.

You will also need a **calculator**. I recommend using a pencil (rather than a pen) when working problems, and invest in a good eraser. Bring these things to class with you everyday, just in case...

The Work

Your regular **attendance and participation** will be an important factor in gaining something meaningful from this course, and will certainly help you to be prepared for the exams. To reinforce this, your attendance and participation in the class will be considered in determining your final course grade. I won't necessarily take attendance every day, but note that I cannot give you attendance and participation credit if you are absent, regardless of your excuse. There are sometimes good reasons for missing class—that's understood—but you are either in class and participating or you are not. *Missed exams can only be made up by prior arrangement, unless due to documented emergency circumstances.* There are a total of 25 points (5%) available for participation.

As part of your participation, I encourage each of you to come **visit me** during my office hours or other times that I might be around (Please do so before September 27!). I like to be able to associate names and faces, and can best do this if I have an opportunity to meet each of you one-on-one. Such a visit also provides you with an opportunity to get to know me. Your office visit will count towards your participation grade only if done before September 27.

To give you practice with some of the concepts covered in class, I will assign **four Problem Sets** (25 points each) and **two Short Projects** (75 points each). These will generally be quantitative and analytical in nature, and will give you an opportunity to work with some real data, including your own personal energy audit. You can earn up to 250 points (50% of your grade!) through the successful completion of these assignments. Please note that the number of points available for each assignment diminishes rapidly once the agreed-upon submission deadline has passed. Detailed instructions for each assignment will be provided in class and on the course web site.

Evaluation and Grading

In addition to the work described above, you will take a **Mid-Term Exam** and a **Final Exam**, worth 100 and 125 points (20% and 25%) respectively. The scope of the questions will be comprehensive, touching on every aspect we've covered. The questions will primarily be short-answer, with some multiple-choice questions, some matching exercises, some graphics to draw or annotate, and some hands-on problems (examples will be available on the course web site). I try to write questions that require you to think and solve problems, applying what you have learned, rather than questions that can be answered (poorly) by merely regurgitating stuff you memorized the night before and will forget the next day. The exams will be very hard, no doubt about it. Prepare yourselves! *Missed exams can only be made up by prior arrangement, unless due to documented emergency circumstances.*

Letter Grades will be assigned only at the completion of the course. I will use the total points earned as guides, however the final determination of grades is at the Instructor's discretion. There are a total of 500 points available (as outlined above): You will need at least 455 of these points to get an A, 445 for an AB, 405 to get a B, 395 for a BC, 355 to get a C, 345 for a CD and 300 or more to pass with a D. I generally consider a "C" to be an Average or Median grade (D means less than average, B better than average; A's and F's are reserved for truly outstanding students). Please note: you start with 0 points! But then almost everything you do adds to your total, nothing is ever subtracted.

Other Policies

Writing: All written submissions must be typed or sent by E-mail. I expect good, coherent reports, free of spelling mistakes and grammatical errors. Please use the spelling checker that comes with your word processor! Even then, you still must proofread! See the course web page for suggestions on writing scientific research papers. You might

also find Keene State's *The Guide: A New Way to Think About Writing & Research in College* useful (available on reserve at Mason Library).

Academic Support: Take advantage of the many support services on campus, particularly the Writing Center, the Math Center, and the Reference Librarians. I'm here to help, too!

Disabilities: Appropriate accommodations for disabilities may be arranged by contacting Jane Warner, Disability Services Coordinator, at the Office of Disability Services in the Elliot Center (358-2354).

Academic Honesty: Please be sure you understand the College's policy on Academic Honesty (see the Catalog). It is my intention to hold you to its provisions.

Withdrawals: The deadline to withdraw from this or any course is November 8. Up until that time, you can withdraw (by completing the necessary forms and paying the appropriate fee) and only a "W" will show up on your transcript (your official grade record), which will not affect your grade point average. After November 8, however, you will be stuck with whatever grade you end up with, even if you have stopped coming to the class. See the College's policy on adding and withdrawing from courses, which you can find in the Catalog.

Bad Weather: Unless the College closes, I will be here for class regardless of the weather. If you live on campus or within a mile or so, I would generally expect you to be here too. Travel in adverse conditions can be life-threatening, so if you live away from Keene please consider your own situation carefully.

ENST 210 Energy and the Environment
Fall 2002
Tentative Course Schedule

chapters listed, rather than pages....

Day/Date	Topic/Work Due	**H&K** (pages)	**VS** (pages)	**KD**	**KA**	**FM**	**SciAm**
T 27-Aug	Introduction			1			
R 29-Aug	What is Energy?	1-2, 35-52, 84-88	x-xviii				
T 3-Sep	Thermodynamics	73-81, 93-120					
R 5-Sep	Earth's Energy Balance: In	158-165	1-36			3, 11	1
T 10-Sep	Earth's Energy Balance: Out		1-36			3, 11	1
R 12-Sep	Energy and Life		37-104			4, 5	
	Problem Set 1 (25 points)						
T 17-Sep	Human Energy History	3-31, 81-86	105-174	1, 4, 5	1, 2	7	1
R 19-Sep	What do we use Energy for?	3-14	133-200		3, 4, 5, 9		1,3,4,5
	Project 1 (75 points)						
T 24-Sep	Internal Combustion Engines	111-114	160-162		7		
R 26-Sep	Electricity	322-381	134-159				2
T 1-Oct	Building HVAC	125-149					
R 3-Oct	Fossil Fuels	201-226	134-142	2,3,4,5,6	7	7	8
	Problem Set 2 (25 points)						
T 8-Oct	Air Pollution & Acid Rain	239-277			6, 7	10	
R 10-Oct	Greenhouse Effect & Climate	284-298				11	
T 15-Oct	**Mid-Term Exam (100 points)**						
R 17-Oct	Fossil Futures	227-228		7,8,9	14	7	
T 22-Oct	Nuclear Energy	447-464 (422-442)	152-154	10			9
R 24-Oct	Radioactive Waste Disposal	464-494 (498-518)		10			9
T 29-Oct	Geothermal Energy	572-584	21-23	10			
R 31-Oct	Hydro Power	409-415	149-152	10			
	Problem Set 3 (25 points)						
T 5-Nov	Solar Heating	155-191	4-7				10
R 7-Nov	Solar Electricity	386-398, 415-417		10			10
T 12-Nov	Wind, Waves & Tides	398-409	122-125, 130-132	10			
R 14-Nov	Biomass	540-568	37-78, 117-120		14		
	Problem Set 4 (25 points)						
T 19-Nov	Energy Storage?	189-191, 326-331			14		
R 21-Nov	Efficiency & Conservation	303-313		11	11, 12, 13		2, Ep.
T 26-Nov	Where do we go from here?	586-589	175-200	11	16, 18	12	6, 7, 11, Ep.
	Project 2 (75 points)						
R 28-Nov	Thanksgiving Recess (no class)						
T 3-Dec	*IRMS Training* (no class)						
R 5-Dec	*IRMS Training* (no class)						
M 9-Dec	Reading Day						
W 11-Dec	**Final Exam, 8:00-10:00 (125 points) — note the day and time!**						

ENST 495: ENVIRONMENTAL STUDIES SEMINAR

NOMINAL SCHEDULE

Monday:	**Subject[s]**	**Notes**
August 27	Introduction; logistics; Project criteria	
September 3	**Holiday: No class**	
September 10	Schedule; some possible projects; graduate school; Intro to Excel	
September 17	Intro. to literature searching: Pls. Meet in **Library classroom;** Career office presentn on job hunting, etc.	**Please have your short talk topic ready [i.e. chosen] when you go to the library.**
September 24	Short ["3-minute"] talks	
October 1	Controversial Topics I [10-min. presentations, with references, visuals]	**Semester project chosen by tonight**
October 8	Environmental Careers Night: Panel Discussion	
October 15	Controversial topics II	
October 22	Initial Project presentations	
October 29	Tba	
November 5	Interim Project Presentations I	
November 12	**Holiday: No class**	
November 19	Interim Project Presentations II	
November 26	Final Project Presentations: I	20 minutes each, plus Questions, discussion.
December 3	Final Project Presentations: II	
December 10	Final Project Presentations: *Finis*	

Some “ingredients” in ENST 495, Environmental Studies Seminar:

1. Synthesis of your courses, i.e. using them to research, discuss, and investigate environmental topics.
2. Further practice with literature searching skills, writing, use of electronic media for information transfer, etc.
3. Development of presentation skills, including oral presentations using chalkboard, overhead transparencies, and Power Point or equivalent. [sjs: have them email the refs to you, then compile them and distribute.] [Say one researched topic, with short report, then another on a controversial topic, with refs from both [several?] sides, then project progress reports.
4. Presentations on
   a. the environmental business: career possibilities
   b. the job market
   c. recruiting and job hunting
   d. resume preparation
   e. interviewing skills
   f. grad school
   g. consulting
   h. industry, government, and academe
   i. etc.
5. Learn some more about the environment via reading, listening, and discussion.
6. Personal GROWTH via work on and completion of a project. Criteria for the project:
   a. It must help you to GROW professionally.
   b. It must be DOABLE in one semester.
   c. It must be USEFUL to the community or some persons or group in it.

d. It must result in a TANGIBLE PRODUCT, which is YOUR work.

ENST 495- SENIOR SEMINAR IN ENVIRONMENTAL STUDIES
Fall 2002

M 3:00-5:50 pm, Joslin 101

Instructor: Dr. Renate L.E. Gebauer
310 Science Center
(603) 358-2577
rgebauer@keene.edu (best way to contact me)
Office Hours: M 2:00-3:00, T 1:30-3:00 or by appointment

Text: We will read a selection of articles from different sources. See attached literature list

Course objectives

This senior seminar is designed to (1) integrate and advance your experience, knowledge, and skills in environmental studies (2) help to prepare you for a career or post graduate opportunities and life as an environmentalist beyond Keene State College and (3) develop and enhance your research and critical thinking abilities and your oral and written communication skills.

Format of a seminar:

A seminar is mainly for advanced students who under the guidance of a professor get together to discuss ideas, literature and research findings. Therefore the success of this class will depend strongly on your preparedness and active participation in class discussions.

Course requirements

Attendance: Given the small size of a seminar, the absences of any participant will be painfully obvious. Furthermore, since we meet only once a week, any absence results in your missing a significant fraction of the seminar experience. If you miss more than two scheduled meetings, you should consider withdrawing from the course.

Assignments: There will be regular assignments, oral presentations and discussions, a project proposal, and a final written report. Late assignments will receive a penalty of 25 % per day late after the due date (in other words, after the assignment is four days late, it is not worth anything).

Severe Weather: Please call for voice mail messages (358-2577) if there is a question about class cancellation during severe weather.

Academic Honesty: Please be sure you understand the College's policy on Academic Honesty (published in the Student Handbook, as well as the Catalog and on the College's web site). It is my intention to hold you to its provisions. You should consult with me if you are not clear about your responsibilities or expected conduct during any assignment or activity in this course.

Evaluation

This is your education and you must actively be involved in it and at the end it is only you who can determine the value for yourself. Near the end of the semester I would like you to turn in an essay (1-2 pages) in which you write about your goals when we began the course, what you have learned from the course, and how your experience in class relates to your original goals. This essay won't be graded but recorded as completed or not.
I still have to assign grades at the end of the semester. The final grade in this class will be based on regular assignments, oral presentations and discussions, a project proposal, and a final written report. Letter grades will be assigned at the discretion of the instructors.

The following scheme will be used as a guide:

Assignements	Due	Points
Participation/leading of discussions	all semester	75
Literature list		25
Project ideas		20
Proposal (1st draft)		25
Proposal presentation		25
Proposal (final draft)		50
Environmental jobs		25
Resume and cover letter (1st draft)		20
Project report (outline)		25
Resume and cover letter (final draft)		40
Project report (final draft)		100
Learning log		20
Final Project presentation		50
Total		500

Grades: Letter grades will be assigned as follows at the end of the semester

A	455-500	C	355-394
AB	445-454	CD	345-354
B	405-444	D	300-344
BC	395-404	F	< 300

Schedule (subject to change)

Date	Topic	Read before class	Assignments due
26 Aug	• Introduction/ Environmental cluster diagram • Scientific method and problem solving		
2 Sept	Labor day: No class		
9 Sept	• The ecological footprint for beginners • How to search the literature	Wackernagel and Rees 1996	Project ideas
16 Sept	• Population and consumption / Seven rules for responsible consumption • Proposal writing	Kates 2000; Brower and Leon 1999	Literature assignment
23 Sept	• The future of growth • How to prepare presentations	Brown 1999	Proposal (1st draft)
30 Sept	• Limitations of oil as an energy source • Career preparation	Defreyes 2001; Hatfield 1997; Kerr 1998	Environmental jobs
7 Oct	• Stronger evidence of human influence on climate • Proposal presentations and discussions	Trenberth 2001	Proposal presentation
14 Oct	• Feeding the world in the new millennium • Resume and cover letter	Pinstrup-Anderson 2001	Proposal (final draft)
21 Oct	• The commons: 30 years later • Interview process/ How to apply for graduate school	Burger and Gochfeld, 1998	Resume and cover letter (1st draft)
28 Oct	• The value of the world's ecosystem services • Update on project progress	Constanza et al. 1997	
4 Nov	• Interviews • Global scenarios and sustainability	Gallapin and Raskin 1998	Meeting with Dr. G.
11 Nov	Veteran's day: No class		
18 Nov	• Principles of conservation • How to write the final report	Goldfarb 1997	Resume and cover letter (final draft)
25 Nov	• Determined opposition against environmentalism • Deep ecology and political activism	Brick, P. 1995; Deval 2000	Outline of the final report
2 Dec	• Final project presentations		
9 Dec	No class		Project report (final draft) Learning log Self evaluation essay

Literature list:

The following papers are available in the library (on the shelves). Please make copies and bring to class.

- Brick, P. 1995. Determined opposition: The Wise Use movement challenges environmentalism. Environment, 37(8): 17-42.
- Burger, J. and M. Gochfeld 1998. The commons: 30 years later. Environment, 40(10): 5-27.
- Constanza, R., R. d"Arge, R. de Groot, S. Farber, M. Grasso, B. Hannon, K. Limburg, S. Naeem, R. O'Neill, J. Paruelo, R.G. Raskin, P. Sutton, and M. van den Belt. 1997. The value of the world's ecosystem services and natural capital. Nature, 387: 253-259.
- Gallapin, G.C. and P. Raskin 1998. Windows on the future: Global scenarios and sustainability. Environment, 40(3): 7-31.
- Hatfield, C.B. 1997. Oil back on the global agenda. Nature, 387: 121
- Kates, R.W. 2000. Population and Consumption. Environment, 42(3): 10-19.
- Kerr, R.A. 1998. The next oil crisis looms large – and perhaps close. Science, 281: 1128-1131
- Pinstrup-Anderson, P. 2001. Feeding the world in the new millennium: Issues for the new US administration. Environment, 43(6): 22-30.
- Trenberth, K.E. 2001. Stronger evidence of human influence on climate. Environment, 43(4): 8-19.

- *The following papers are from books and I will provide you with copies:*

- Brower, M and W. Leon. 1999. The consumer's guide to effective environmental choices. Three Rivers Press, New York pp. 292 (Chapter 6).
- Brown, L. 1999. The future of growth. In: Brown, L.R., C. Flavin, H. French (eds.) State of the World. World Watch Institute (Chapter 1).
- Defreyes, K.S. 2001. Hubbert's Peak: the impeding world oil shortage. Princeton University Press, Princeton pp. 208 (Chapter 1).
- Deval, B. 2000. Deep ecology and political activism. In: Kaza, S. and K. Kraft (eds.). Dharma rain. Shambala, Boston & London.
- Goldfarb, T. D. 1997. Sources - Notable Selections in Environmental Studies. Dushkin Publishing, Guilfornd CT (Chapter 1)
- Wackernagel and Rees 1996. Ecological footprints for beginners. In: Wackernagel and Rees (eds.) Our Ecological Footprint, New Society Publishers, Gabriola Island, B.C. Chapter 1

Appendix IV: General Education Program

Catalog Information

Goals

Every liberally educated person should have familiarity with and facility in natural sciences, mathematics, social sciences, the arts, and the humanities. To achieve this goal, the purpose of general education at Keene State College is to help students cultivate:

- general knowledge in the natural world, the social world, and the world of arts and letters;
- an understanding of their own cultural background and place in human history;
- an understanding of and respect for diversity and cultural differences;
- familiarity with the practice of creative expression;
- an appreciation for the critical importance of ethical and civil behavior and personal responsibility;
- the knowledge and skills necessary to engage as an informed and involved citizen in a democratic society;
- the development of social and personal values;
- life skills which will promote mental, physical, and emotional well-being.

Competencies

Keene State College students will demonstrate the following basic competencies:

- an ability to communicate effectively with others both orally and in writing;
- an ability to read critically and effectively;
- an ability to reason quantitatively;
- an ability to think critically and creatively;
- fundamental computer skills;
- fundamental research skills.

Requirements

General Education at Keene State College has four components: English Language Competence, Arts and Humanities, Social Sciences, and Sciences/Mathematics. All bachelor's degree programs have the same General Education requirements. In general, the selection of courses for purposes of General Education is open. However, some major programs specify courses because (1) they are required or suggested prerequisites for major courses, (2) the courses are an integral part of the overall goals of the major program, or (3) they fulfill competency standards required for certification and licensing.

A.English Language Competence

Essay Writing (ENG 101) is required of all students. It should be completed during the freshman year and is not open to juniors or seniors unless they are transfer students.

B.Arts and Humanities

A minimum of five courses totaling at least 15 credits as follows:

- One course in literature, which may be any 200-300 level English course except 202, 203, 204, 208, 301, 302, 303, 304, 308, 312. French 303 and Spanish 303 may also be used to fulfill this requirement.
- One course in History
- One course in Art, Film Studies, Music, or Theatre and Dance.
- Two courses from Arts and Humanities disciplines: American Studies, Art, Communication, English, Film Studies, History, Journalism, Modern Languages, Music, Philosophy, Theatre and Dance, or an approved interdisciplinary course (WS 201 or an IDAH course).

C.Social Sciences

A minimum of four courses totaling at least 12 credits in three or more of the Social Sciences disciplines: Economics, Geography, Political

Science, Psychology, Sociology/Anthropology, or an approved interdisciplinary course (WS 201 or an IDSS course).

D.Sciences/Mathematics
A minimum of four courses totaling at least 12 credits as follows:
One course in Biology
One course in the Physical Sciences (Astronomy, Chemistry, Geology, Meteorology, or Physics)
Two courses from Sciences/Mathematics disciplines: Astronomy, Biology, Chemistry, Computer Science, Environmental Studies, Geology, Mathematics, Meteorology, Physics, or an approved interdisciplinary course (designated IDSM).

Quantitative Reasoning Competencies for General Education

(from http://www.keene.edu/assessment/gened_quant.cfm)

A. Quantitative Problem Solving

Students will demonstrate problem-solving skills by:

* reading and understanding written problems which require one or more steps to solve.

* understanding and conceptualizing non-verbal (visual) problems.

* identifying relevant facts in the problem and what (if any) additional information is needed to solve the problem.

* identifying the assumptions needed to solve the problem.

* developing strategies needed to solve the problem.

* implementing the chosen strategy to solve the problem.

* evaluating the reasonableness of answers/results.

* recognizing that the results obtained are contingent upon the assumptions and that more than one correct answer may exist.

* understanding the significance of the results in a larger context.

B. Data Analysis

The students will demonstrate the ability to:

* read and interpret graphs, charts and tables found in newspapers, magazines, textbooks, journals, etc.

* understand the basic measurements of statistics, such as mean, median, standard deviation and percentiles.

* perform simple data analysis both numerical and graphical.

* draw conclusions and inferences supported by data analysis.

* critically evaluate the validity of data.

* critically evaluate whether conclusions and inferences drawn by others are supported by the data presented.

A. Fundamental Skills

In order to be successful in problem solving and data analysis, students will demonstrate proficiency working with:

* ratios and proportions (e.g. teacher to student ratio).

* percentages, decimals, fractions (e.g. grade point average).

* scales of measurement (e.g. map reading).

* unit conversions (e.g. miles to kilometers).

* relationships between two variables (e.g. population growth over time).

* perimeter, area and volume.

Writing Competencies for General Education

(from http://www.keene.edu/assessment/gened_writing.cfm)

Students will demonstrate an ability to:

* write with purpose.

* write for an audience.

* write with authority.

* write with an organizational schema.

* state and develop and ideas clearly.

* write with syntactical/grammatical competence.

* use appropriate research methods.

* recognize plagiarism and avoid it.

Students will demonstrate the ability to write:

* essays

* research papers

* essay exams

* project/lab reports

* application papers (papers that relate theory and/or concepts to personal experience or data).

Notes

Appendix V: Faculty Curricula Vitae

Curricula Vitae for the following faculty follow on un-numbered pages:

Timothy T. Allen
Thomas E. Duston
Patrick M. Eggleston
Renate L.E. Gebauer
JoBeth Mullens
Joan Roelofs

Notes

Timothy Thorpe Allen

Geology Department, Mailstop 2001
Keene State College
Keene, NH 03435–2001
(603) 358–2571
tallen@keene.edu
http://kilburn.keene.edu/

45 Woodbury Street
Keene, NH 03431
(603) 355–3280
catamount@top.monad.net
http://top.monad.net/~catamount/

EDUCATION

Ph.D. in Geology, 1992, *Dartmouth College, Hanover, NH.*
Dissertation: "Migmatite Systematics and Geology, Carter Dome – Wild River Region, White Mountains, New Hampshire"

M.S. in Geology, 1990, *Dartmouth College, Hanover, NH.*
Thesis: "Part I, Thermal Consequences of Mantled Gneiss Dome Emplacement; Part II, Petrologic Constraints on the Tectonic History of the Northern – Shyok Suture and the Main Karakorum Thrust, Baltistan, Northern Pakistan"

B.A. *cum laude* in Geological Sciences, 1984, *Harvard University, Cambridge, MA.*
Thesis: "The Fall Mountain Outlier, a piece of the Fall Mountain Nappe"

State of New Hampshire Licensed Professional Geologist No. 3

EXPERIENCE

Keene State College, Keene, NH: Professor of Geology & Environmental Studies (2002-present); Associate Professor (1997–2002; tenured 1998); Assistant Professor (1992–1997):

- Teach introductory courses in the Earth Sciences and Environmental Studies, including Energy & the Environment and The Hydrologic Cycle, and upper level courses and laboratories in Environmental Geology, Hydrogeology, and Geochemistry; lead seminars in the geology of the Northern Appalachians, and for seniors in Environmental Studies.
- Conduct research in hydrology and hydrogeology, geochemistry, and the bedrock geology of New Hampshire; supervise student Independent Study projects.
- Chair, Environmental Studies Program Steering Committee (2001–present; 1995–1999): led program through KSC's Academic Program Review process, overhauled program curriculum, helped hire two faculty (co-chair of one search), organized the Environmental House living-learning program, and participated in planning for future construction of a new science facility.
- Chair, Instruction & Scholarship subcommittee of the College Information Technology Committee, 1994–1997, lead author of College's initial 5-year technology plan (1996);
- Member, Search Committee for Vice President of Academic Affairs, 1994–1995.
- Service on many "Discipline Peer Evaluation Committees," evaluating individual faculty in Geology, Chemistry, Biology and Geography, both in regular performance reviews of un-tenured and tenured faculty, as well as for promotion and tenure reviews.

Kennecott Exploration, Camden, SC (June-November, 1989):
- Geological Field Technician, minerals exploration project in northern New Hampshire, including grid-scale mapping and outcrop sampling; geological, structural, geophysical and geochemical data analysis and interpretation; and drafting.

Dartmouth College, Hanover, NH (1987–1992):
- Teaching Assistant in the Department of Earth Sciences: introductory and upper level courses and laboratories in all areas of geology, including Hydrogeology, Structural Geology (3 years), Exploration Geophysics (3 years), Physical Geology (2 years), Remote Sensing, Earth History, and Marine Geology.
- Research Assistant: geologic mapping in the White Mountains of New Hampshire, and in the Karakorum Mountains of Baltistan, Pakistan.
- Research Assistant, Stable Isotope Geochemistry Laboratory: operated silicate-oxygen extraction line apparatus and gas-source isotope-ratio mass-spectrometer; designed and built new reaction-vessel manifold and cooling jacket.

OTHER EMPLOYMENT

Keene State College, Keene, NH (1986–1987): Head Ski Coach.

Kearsarge Regional High School, North Sutton, NH (1984-1986):
- Mathematics Teacher
- Coach of Nordic Skiing, Assistant Coach for Cross-Country Running and Track teams.

QC Data Collectors, Denver, CO. (1984): Digitizer of oil well logs.

1985, 1989, 1993: Independent Computer Consultant: projects for various clients.

1979-1987: Farm Carpenter, Ski Trail Groomer, Audio-Visual Technician, Bicycle Mechanic.

PUBLICATIONS (* indicates undergraduate co-authors)

Refereed Journals

Allen, T. and C. P. Chamberlain, 1991, "Metamorphic evidence for an inverted crustal section, with constraints on the Main Karakorum Thrust, Baltistan, northern Pakistan," *Journal of Metamorphic Geology,* v. 9, pp. 403-418.

Allen, T., and C. P. Chamberlain, 1989, "Thermal Consequences of Mantled Gneiss Dome Emplacement," *Earth and Planetary Science Letters,* v. 93, pp. 392-404.

Proceedings

Allen, T., Creasy, J., Davis, P.T., Eusden, J.D., Fowler, B., and Thompson, W.B., 2001, "The Notches: Bedrock and Surficial Geology of New Hampshire's White Mountains," in *Guidebook for Field Trips for the Geological Society of America's 2001 Annual Meeting, Boston,* Richard Bailey and David West, editors, Geological Society of America, Boulder, Colorado. pp. C1-C33. in press.

Allen, T., 1997, "Nappes, Gneiss Domes and Intrusive Sheets of West-Central New Hampshire," in *Guidebook to Field Trips in Vermont and Adjacent New Hampshire and New York,* Timothy W. Grover, Helen N. Mango,and Edward J. Hasenohr editors, New England Intercollegiate Geologic Conference 89th Annual Meeting. pp. A2.1–A2.19.

Allen, T., 1996, "A Stratigraphic and Structural Traverse of Mount Moriah, New Hampshire," in *Guidebook to Field Trips in Northern New Hampshire and Adjacent Regions of Maine and Vermont,* Mark Van Baalen, editor, New England Intercollegiate Geologic Conference 88th Annual Meeting, pp. 155–169.

Allen, T., 1996, "Petrology and Stable Isotope Systematics of Migmatites in Pinkham Notch, New Hampshire," in *Guidebook to Field Trips in Northern New Hampshire and Adjacent Regions of Maine and Vermont,* Mark Van Baalen, editor, New England Intercollegiate Geologic Conference 88th Annual Meeting, pp. 279–298.

Allen, T. (editor), 1993, *Mount Washington, White Mountains of New Hampshire: Guidebook for the New Hampshire Geological Society's 3rd Annual Field Trip & Picnic,* New Hampshire Geological Society, Concord, NH.

Chamberlain, C. P., J. B. Thompson, and T. Allen, 1988, "Stratigraphic and Structural Relationships of the Fall Mountain Nappe," in: *Guidebook for Field Trips in Southwestern New Hampshire, Southeastern Vermont and North-Central Massachusetts,* W. A. Bothner, editor, New England Intercollegiate Geologic Conference 80th Annual Meeting, pp. 32-39.

Abstracts (papers presented at meetings)

*Burt, C., *Saxon, D., and Allen, T.T., 2002, "Bedrock Geology of the Lake Sunapee Area, New Hampshire," (abstract), Geological Society of America Abstracts with Programs, 34(1):A-68

*Saxon, D., Allen, T., *Burt, C., *King, J, and *Lindberg, J., 2001, "Geology of the Lake Sunapee Area, New Hampshire," *Geological Society of America Abstracts with Programs* v. 33, n. 1, p. A12 (Northeast Section Meeting, Burlington, Vermont)

Allen, T., 1998, "Field Laboratories in Hydrogeology and Environmental Geology," *Geological Society of America Abstracts with Programs,* v. 30, n. 7, p. A306. (Annual Meeting, Toronto, Ontario; co-convener of theme session)

Allen, T., 1998, "Structure and Stratigraphy in Migmatite Gneisses, Gorham NH-ME Quadrangle," (invited) *Geological Society of America Abstracts with Programs,* v. 30, n. 1, p. 1. (Billings Symposium, Northeast Section Meeting, Portland, Maine)

*O'Rourke, J.; *Ravella, M.; *Lance, D.; *Smith, M.; *Grunneaur, A.; *Stiles, T.; *Martin, J.; Allen, T. T.; *Villanova, J.; and *Drobat, P., 1998, "Field Studies of Sub-Surface Hydrologic Dynamics," *Geological Society of America Abstracts with Programs,* v. 30, n. 1, p. 64. (Northeast Section Meeting, Portland, Maine)

Allen, T., 1997, "Geophysics in an Environmental Geology Context," *Geological Society of America Abstracts with Programs,* v. 29, n. 6, p. A368. (Annual Meeting, Salt Lake City, Utah)

Allen, T., 1994, "New Hampshire Migmatites: Oxygen Isotope Fractionation During Partial Melting, and Suggestions of Structurally Enhanced Magma Migration," (invited) *EOS, Transactions of the American Geophysical Unions,* v. 75 n. 16, p. 360–361. (Spring Meeting, Baltimore, Maryland)

Allen, T., 1994, "Outcrop Modal Analysis: A Petrographic Application of Digital Image Processing Techniques," *Geological Society of America Abstracts with Programs,* v 26, n. 1, p. 2. (Northeast Section Meeting, Binghamton, New York)

Allen, T., 1993, "Stable Isotope Fractionation During Partial Melting in Migmatites," *Geological Society of America Abstracts with Programs,* v. 25, n. 6, p. A448. (Annual Meeting, Boston, Massachusetts)

Smith, H.A., Chamberlain, C.P., Allen, T., and Zeitler P.K., 1993, "Relationship Between Deformation and Monazite Ages: Two Counter-Examples from the Himalaya." *EOS, Transactions of the American Geophysical Unions,* v. 74, n. 16, p. 123.

Allen, T., and Chamberlain, C.P., 1992, "Pluton Migration Through Crust Leaves Migmatites Behind," *Geological Society of America Abstracts with Programs,* v. 24, p. A338. (Annual Meeting, Cinncinati, Ohio)

Allen, T., and Chamberlain, C.P., 1989, "Petrologic Constraints on the Tectonic History of the Northern-Shyok Suture in Baltistan, Northern Pakistan," *Geological Society of America Abstracts with Programs,* v. 21, n. 6, p. A181. (Annual Meeting, St. Louis, Missouri)

Allen, T., and Chamberlain, C.P., 1988, "Thermal Consequences of Gneiss Dome Formation," *Eos: Transactions of the American Geophysical Union,* v. 69, n. 16, p. 509. (Spring Meeting, Baltimore, Maryland)

Allen, T., 1985, "A Reinterpretation of the Fall Mountain Nappe, as seen from Fall Mountain, North Walpole, New Hampshire," *Geological Society of America Abstracts with Programs,* v. 17, n. 1, p. 2. (Northeast Section Meeting, Lancaster, Pennsylvania)

Reports

Allen, T., 2002, Keene State College Environmental Studies Program Self-Study Report, 34 pages.

Allen, T., 2000, Keene State College Geology Program Self-Study Report, 82 pages.

Allen, T., 1999, Preliminary Report on the Hydrogeology of the Harrisville Spring, for the Conservation Commission, Town of Harrisville, NH. 6 pages.

Allen, T., 1997, Third Annual Report, Test Wells off Krif Road, for Planning Director, City of Keene, NH. 2 pages.

*Ravella, M., *Lance, D., and Allen, T., 1996, Potential Aquifer Recharge Locations in the Keene Area (URL: http://kilburn.keene.edu/TimAllen/Papers/Recharge/RLA.html), included with: Allen, T. 1996. Second Annual Report, Test Wells off Krif Road.

Allen, T., 1996, Second Annual Report, Test Wells off Krif Road, for Planning Director, City of Keene, NH. 1 page.

Allen, T., 1995, Keene State College Environmental Studies Program Self Study Report, 33 pages.

Allen, T., 1995, First Annual Report, Test Wells off Krif Road, for Planning Director, City of Keene, NH. 11 pages.

Invited Presentations

"Past and Current Work in the Karakorum Mountains of Northern Pakistan," *New Hampshire Geological Society Spring Meeting,* Bedford, NH, April 13, 2000.

"Finite Difference Modeling and Mantled Gneiss Dome Emplacement," Keene State College Mathematics Department Colloquium, October 22, 1999.

"Aquifers: what they are and how they work," joint meeting of the Town of Swanzey, NH, Planning Board and Conservation Committee, September 17, 1998.

"Migmatites from Pinkham Notch, New Hampshire: observations on migmatization processes and relationships to orogeny" Boston University Department of Geology, March 30, 1998.

"Migmatites in the White Mountains: Implications for Mountain-Building Processes," *New Hampshire Geological Society Annual Meeting,* Concord, NH, October 8, 1992.

"Thermal Consequences of Mantled Gneiss Dome Emplacement," Geological Society of America Penrose Conference, *Determining Criteria for Establishing the Relative Timing of Pluton Emplacement and Regional Deformation,* Mariposa, CA, September 1988.

CURRENT RESEARCH

Geochemical analysis of earth materials by X-ray fluorescence spectrometry and by stable isotope ratio mass spectrometry.

Bedrock geologic mapping in the vicinity of Lake Sunapee, west-central New Hampshire, to help improve our understanding of the relationships between structural development and magmatism during the Acadian Orogeny.

Tracing the flux of water in the sub-surface hydrologic cycle using natural variations in the stable isotope composition of water, in order to gain insights into ground water recharge rates and processes.

Evaluating monazite U-Pb geochronologic data from the Karakorum of northern Pakistan—could they be cooling ages resulting from recent rapid uplift of rocks that were held at depth for a long time?

GRANTS RECEIVED

National Science Foundation (CCLI-A&I) & Keene State College, 2001, "Integration of Stable Isotopes across the Sciences (ISIS):Instrumentation for BioGeoChemistry and Environmental Studies," Award No. 0126706: $180,737 (as Co-PI with Renate Gebauer, Principal Investigator, and Steve Bill).

National Science Foundation (CCLI-A&I) & Keene State College, 2001, "Geochemical Analysis Across the Geology Curriculum and in Related Courses in Chemistry and Environmental Studies," Award No. 0087860: $242,223 (Peter Nielsen and Steve Stepenuck, Co-PIs).

United States Geological Survey (EDMAP) & Keene State College, 2001, "Geologic Mapping of Lake Sunapee and Surrounding Area, NH," Award No. 01HQAG0153: $7328

United States Geological Survey (EDMAP) & Keene State College, 2000, "Geologic Mapping of Lake Sunapee and Surrounding Area, NH," Award No. 00HQAG0125: $5540

Keene State College, Faculty Development Fund, 2000, "Construction of a Multi-Purpose Vacuum Line Laboratory for Stable Isotope Biogeochemistry," $4994 (with Renate Gebauer).

Keene State College Faculty Development Fund, 1994, "Preliminary Investigation of Stable Isotope Fractionation as a Means of Quantifying Groundwater Recharge Rates," $1400.

Keene State College Instructional Innovation Center Mini-Grant, 1993, "Improving the Teaching of Large Lecture Classes," $500.

National Science Foundation (ILI) & Keene State College, 1993, "Teaching Lab for Remote Sensing and GIS for Geography," Award No. 9352679: $40,000 (as Co-PI with Klaus Bayr, Principal Investigator, and Albert Rydant).

Geological Society of America, Research Grant, 1990, "Controls on the Distribution of Heat Producing Elements in Metamorphic Terranes," $500.

Sigma Xi, The Scientific Research Society, Grant-in-Aid of Research, 1988 & 1989, "Petrologic and Cooling Age Constraints on the Tectonic and Uplift History of the Main Karakorum Thrust, Norther Pakistan," total $600.

Explorer's Club, Exploration Fund, 1988, "Petrologic Constraints on the Tectonic History of the Main Karakorum Thrust, Baltistan, Northern Pakistan," $1000.

Student Grants (all from the Keene State College Undergraduate Research Fund)

Christina Burt, and Destiny Saxon, 2000, "Geochemical Characterization of Rocks from Sunapee, NH," $750.

Josh King, 2000, "U-Pb Geochronology of a Granite from Sunapee, NH," $750.

Johanna Lindberg and Destiny Saxon, 2000, "Use of Stable Isotopes to Investigate Aquifer Recharge from the Ashuelot River," $500.

Dina Andretta, 1999, "Structural Geology of the Lake Sunapee Area," $600.

Jamie O'Rourke, 1997, "Variations in Ground Water Chemistry due to Ground Water Recharge and Plant Uptake," $629.

Mike Ravella and Don Lance, 1996, "Infiltration and Ground Water Recharge," $946.

PROFESSIONAL BOARDS, ASSOCIATIONS and service

State of New Hampshire Board of Professional Geologists

- Secretary, 2000–present; State of New Hampshire Licensed Professional Geologist No. 3

New Hampshire Geological Society

- Member-at-Large, Board of Directors, 1993–2001;
- Editor and Publisher of *The Granite State Geologist,* 1991–2001;
- Maintain NHGS web pages (http://nhgs.org/NHGS/);
- Regularly attend society meetings and field trips.

Mount Washington Observatory

- Assistant or Co-Leader, "EduTrip" on glacial geology and climate change, 1997, 1998, 1999, 2000, 2001, 2002.
- Member of Committee, Billings Fund for Geological Research in New England, 1996-present.

New England Intercollegiate Geologic Conference

- Field Trip Leader, 1996 & 1997 conferences;
- Maintain NEIGC web pages (http://neigc.org/NEIGC/);
- Regularly attend conference field trips.

Association of Ground Water Scientists and Engineers (National Ground Water Association)
American Geophysical Union (Hydrology Section)
Geological Society of America (Hydrogeology Division, and Structure & Tectonics Division)
Council on Undergraduate Research (Geology Division)
Geological Society of Maine
Vermont Geological Society

Reviewer of grant proposals for the Hydrologic Sciences Program (1997) and for the Tectonics Program (1996) at the *National Science Foundation;* of hydrogeology textbooks for *Simon & Schuster/Prentice-Hall Publishers* (1996) and *McGraw-Hill* (2000); and of manuscripts for an *ASTM Symposium on Subsurface Fluid Flow Modeling* (1995) and for the *Journal of Structural Geology* (1992).

CURRICULUM VITAE

Thomas E. Duston, Ph.D.

I. Biographical, Educational, and Employment Information

HOME ADDRESS:

202 Stage Road
Chesterfield, NH 03443
(603) 256-6082

OFFICE ADDRESS:

266 Rhodes Hall
Keene State College
Keene, NH 03435-3400
(603) 358-2625
tduston@keene.edu

Age: 61
Married: Paula L. Stamps, Ph.D.
Children: Ages 38, 37, 35, 21, 19

EDUCATION:

1972	Ph.D., Economics, Brown University Dissertation: "The Present and Future Supply of Registered Nurses"; Stuart Altman, Chair
1965	MA, Economics, SUNY Binghamton
1963	Graduate Certificate, Paper Mill Management, University of Maine/Orono
1962	BS, Engineering Physics, University of Maine/Orono

SIGNIFICANT EMPLOYMENT:

1984-present	Assistant/Associate Professor, Economics Division of Sciences Keene State College Keene, New Hampshire
1982-84	Self-employed farmer growing and marketing berries, sheep, and sheep products, Tully Brook Farm, Orange, MA
1978-82	Assistant/Associate Professor, Economics Business Department Plymouth State College Plymouth, New Hampshire
1970-77	Instructor/Assistant Professor, Economics Economics Department University of Massachusetts Amherst, Massachusetts

II. Professional Activities

A. Publications

1997 "Technophobia: Counterpoint," Chapter 11 in *Technology and Higher Education: Approaching the 21st Century,* NEA, Washington.

Publications (cont'd.)

1993 *Solid Waste Disposal for the 1990's: Recycling as the First Option,* Quorum/Praeger, 1993, 204 pages.

1990 "Economic Development in New Hampshire: Past Performance and Concern for the Future," in *Studies in New England Geography,* 1990.

1989 "The Role of Quality of Worklife in the Strategic Human Resource Management Model" (with P. Stamps), Chapter 8 in *Human Resource Management in the Health Care Sector,* edited by Settri, A.S., and Randall Schuler, Quorum Books, 1989.

1988 "Teaching Students about Poverty -- A Class Exercise," *Great Ideas in Teaching Economics,* Scott Foresman & Company, 1988.

1987 "Financial Analysis in the Health Administration Curriculum: A Survey of ACEHSA Programs" (with P. Stamps), *Journal of Health Administration Education,* Spring 1987.

1979 "How Consumers Exercise Control Through Their Bill-Paying Patterns" (co-authors, see below). Reprinted in *Financing of Health Care,* Weeks, Berman and Bisbee (Eds.), Health Administration Press, 1979.

1979 "Insurer and Provider . . .: Author's Reply," *Journal of Risk and Insurance,* September 1979.

1978 "Insurer and Provider as the Same Firm: Health Maintenance Organizations and Moral Hazard," *Journal of Risk and Insurance,* March 1978.

1978 "How Consumers Exercise Control Through Their Bill-Paying Patterns" (with P. Stamps, E. Rising, D. Allen, and M. Bondy), *Inquiry,* Spring 1978.

1971 "The Choice of Nursing as an Occupation," Chapter III in Altman, Stuart, *The Present and Future Supply of Registered Nurses,* H.E.W., 1971.

B. Presentations

2002 "Beyond Demonstration Forests: Large-Scale Sustainable Open-Space Planning," Northeast Regional Conference on Sustainable Community Development (Society for Human Ecology), Antioch-New England Graduate School, April 19, 2002.

1995 "Recycling as a Production Process: Linkage Problems when Upgrading Recycling Equipment," Atlantic Economics Society Annual Conference, Williamsburg, VA, October 1995.

1995 "Land Protection as ENVIRONMENTAL ENHANCEMENT THROUGH AGRICULTURE," Conference on Environmental Enhancement through Agriculture, Tufts University, Boston, November 1995.

1991 "A Recycling Case Study: Two-Year Follow-up," American Public Health Association Annual Meeting, Atlanta, November 1991.

1991 "The Microeconomics of Recycling," Eastern Economics Association, Pittsburgh, March 1991.

1989 "Cost-Benefit Analysis Applied to Recycling," American Public Health Association, Chicago, November 1989.

1989 "The Economics of Local Area Recycling," Eastern Economics Association, Baltimore, March

1989.

Presentations (cont'd.)

1988 "Recycling in Solid Waste Planning," USNH 25th Anniversary Symposium III, April 1988.

1987 "The Sources of Economic Growth in New Hampshire over the Past Twenty-five Years," USNH 25th Anniversary Symposium I, November 1987.

1985 "A Forgotten Cost of New Medical Technologies: The Resolution of Ethical Issues," Forum on Bioethics, American Public Health Association, Washington, DC, November 1985.

1985 "The Government's Role in Minimizing Adverse Selection in Hospital Admissions," presented to the Medical Care Section of the American Public Health Association, Washington, DC, November 1985.

1985 "Finance and Economics in Health Administration Programs: How Much is Enough?" presented to Health Administration Section of the American Public Health Association, Washington, DC, November 1985.

1985 "Modernizing the Macro Introduction: Beyond Unemployment and Inflation," presented at the Eastern Economics Association, Pittsburgh, PA, March 1985.

1985 "The Case for Re-Selling "Free" Textbooks," presented at the Eastern Economics Association, Pittsburgh, PA, March 1985.

1981 "Will Decontrol Lead to an Increased Output of Crude Oil?" presented at the New England Business and Economic Conference, Woburn, MA, Fall 1981.

1980 "Preventive Care and Moral Hazard," presented to Health Administration Section of American Public Health Association, Detroit, MI, November 1980.

C. Work in Process

- Book on the economics of land protection
- "The Third Generation of Recycling"

III. <u>Specific Teaching Experience</u>

Major areas of teaching responsibility have been economic theory, both micro and macro; public and private finance, environmental economics, and undergraduate research projects. Specific courses taught have included all of the following:

Economic Theory, Introductory and Intermediate
Financial Management
Public Finance
Money and Banking
Risk and Insurance
Urban Economics
Human Resource Economics
Health Economics/Technology and Health Care
Environmental Economics
Introduction to Environmental Studies
Environmental Studies Senior Seminar
Senior Research Project in Economics

IV. Service Activities

- Recipient, First Annual Keene State College Community Service Award (for conservation work), October 20, 2002.

- Among numerous service activities at Keene State College are member and chair of Sabbatical Committee (2), USNH Benefit Task Force, Science Division Scholarship Committee (3), Science Division Building Committee, Honors Program Committee of Focus on Quality, the President's Commission on the Status of Women, Economics/Political Science Coordinator (6), Environmental Studies Steering Committee (continuing) 1, and practically continuous service on the KSCEA Board, recently serving as treasurer.

- Wantastiquet-Monadnock Greenway Committee (1988-present).

- Town of Chesterfield Conservation Commission (1995-present), currently chair.

- Town of Chesterfield, NH, Recycling Committee (Chair), 1988-90.

- Have given talks on recycling and on tax issues to various public and private groups in New Hampshire.

- Among service activities at Plymouth State College were member of Honors Council, Faculty Search Committee, Promotion and Tenure Committee, and Long-Range Planning Committee.

- Town of Rumney, NH, Land-Use Planning Committee, 1980-81.

- During the years 1972-74 and 1975-76 I served as Director of Undergraduate Studies for the Department of Economics at the University of Massachusetts/Amherst. The position required staff administration, course scheduling and extensive student counseling. While at the University of Massachusetts, I also served as a CASIAC counselor, as coordinator for the Outreach and Honors programs, as Chairman of the Economics Department Head Search Committee (1973-74), and as a faculty fellow at Orchard Hill.

- Nominated to State of Massachusetts Public Health Council (1975).

- Nominated and selected to the Amherst Health Advisory Council, a committee charged with health planning for the town of Amherst, Massachusetts (1975-77).

Patrick M. Eggleston
Biology and Environmental Studies
Keene State College, Keene, NH 03435

Teaching
1. Teaches now: ENST 100 Introduction to Environmental Studies, Biology 101 Evolution and Biodiversity, Biology 101 Freshwater Biology.
2. Taught in the past: All of the above plus Ecology, Plant Physiology, and Invertebrate Zoology.

Appointment to **Keene State College** September 1975. Tenure September 1981. Full professor September 1987.

Educational Preparation

Institution	**Degree**	**Field of Study**	**Date of Award**
Ohio State University	PhD	Zoology and Ecology	1975
Cornell University	MS	Pomology and Plant Physiology	1966
Michigan State University	BS	Horticulture	1963

Professional memberships
Phycological Society of America -- life member
Freshwater Ecology
Northeastern Naturalist
Natural Resources Defense Council
Environmental Defense
Nature Conservancy
Monadnock Conservancy
Sierra Club
Audubon
Northeast Sustainable Energy Association

Patrick M. Eggleston

Presentations:

Eggleston, P. M., Schlette, D. P. and Skalny, M. S. 1991. The effect of nitric and sulfuric acids on the growth rate of *Nitzschia palea* (Kutz.). Presented at the Fourth International Phycological Congress at Duke University, Durham, North Carolina. Paper presented by Patrick M. Eggleston. August 1991.

Schlette, D. P., Skalny, M. S., and Eggleston, P. M. 1990 The effect of nitric and sulfuric acids on the growth rate of *Nitzschia palea* (Kutz.). Presented at the Beta Beta Beta Northeastern Convention, at Hartwick College, Oneonta, New York on 21 April 1990. Research directed by Patrick M. Eggleston. Paper presented by Deb Schlette.

Eggleston, P. M. 1986. The acid tolerance of *Nitzschia palea*. Paper presented June 1986 to the combined meetings of the American Society of Limnology and Oceanography and the Phycological Society of America at the University of Rhode Island.

Eggleston, P. M. 1986. The acid tolerance of *Nitzschia palea*. Poster presentation at the Northeast Algal Symposium, Woods Hole, Mass.

Eggleston, P. M. 1981. The assimilation of nutrients from the algae by the crayfish, *Orconectes rusticus*. Paper presented at Northeast Algal Symposium, Wood Hole, Mass.

Lee, T. F. and Eggleston, P. M. 1980. Airborne algae of the New England coast collected on marine media. Paper presented at Botany 80 in Vancouver, British Columbia to the Phycological Society of America.

Patrick M. Eggleston

Publications:

Eggleston, P. M., Loiselle, D. S. and Skalny, M. S. 1991. The effects of nitric and sulfuric acids on the diatom *Nitzschia palea* (Kutz.) W. Smith. **Journal of Freshwater Ecology** 6(4): 451-453.

Lee, T. F. and Eggleston, P. M. 1989. Airborne algae and Cyanobacteria. **Grana** 28: 63-66.

Eggleston, P. M. Wilson, R. T., and Harrington, C. B. 1987. The effect of two buffers on cell yield of *Nitzschia palea* (Kutz.) W. Smith. **Journal of Freshwater Ecology** 4(1): 33-38.

Eggleston, P. M. and Lustick, S. I. 1981. The oxygen requirements of the crayfish, *Orconectes rusticus*. **Ohio Journal of Science** 81(2): 92-94.

Photos published:

The Botanical World. Wm. C. Brown Inc. Photo of diatoms Used in two editions.

Flower and Garden Magazine June 1998 issue

CURRICULUM VITAE

Renate L. E. Gebauer
Biology Department and Environmental Studies Department
Keene State College
Keene, NH 03435-2001
Phone: (603) 358-2577 Fax: (603) 358-2897
E-mail: rgebauer@keene.edu

Education

1994 Ph.D. in Ecology, University of California, Davis and San Diego State University

1986 M.S. (Diplom) in Biology, Christian Albrechts Universität, Kiel, Germany

1981 B.S. (Vordiplom) in Biology, Eberhardt Karls Universität, Tübingen, Germany

Research Interests

- Linking whole plant responses to natural and anthropogenic stresses to ecosystem function and community structure.
- Belowground plant function (water and nutrient uptake, storage, and defense) and its effects on species interactions such as competition and herbivory
- Utilization of natural abundance of stable isotopes to elucidate ecosystems dynamics and plant functional mechanisms.

Teaching Experience

1998-present: *Assistant Professor,* Depts. of Biology and Environ. Studies, Keene State College
Courses: Introduction to Environmental Studies, Ecology and Evolution, Community and Ecosystems Ecology, Experimental Ecology, Ecological Physiology, Life Processes Lab, Senior Seminar in Environmental Studies.

1996-97: *Guest Lecturer*, Department of Biology, University of Utah.
Course: Plant Ecology

1995: *Guest Lecturer*, University of North Carolina, Chapel Hill.
Course: Atmosphere-biosphere interactions and global climate change

1990-1991: *Instructor*, Department of Biology, San Diego State University.
Course: Experimental Ecology and Evolution.

1989: *Teaching Assistant,* Department of Biology, San Diego State University.
Course: Quantitative Biology Laboratory.

1987: *Teaching Assistant* Department of Biology, Arizona State University.
Course: General Biology Laboratory.

Research Experience

1998- present: *Assistant Professor,* Departments of Biology and Environmental Studies, Keene State College. Ecology of spring ephemeral in the understory of deciduous forests, Physiological controls of oak tree regeneration, Isotopes in rainwater and soils.

1996-1998: *Postdoctoral Research Associate,* Department of Biology, University of Utah
Sensitivity of functional plant groups in a desert ecosystems to changes in summer soil moisture and N availability associated with changes in climate and anthropogenic land use.

1994-1996: *Postdoctoral Research Associate*, Department of Botany, Duke University. Carbon allocation to chemical defense, respiration, and growth responses of conifers to elevated CO_2 and changing N availability associated with global climate change.

1988-1994: *Graduate Study*, Systems Ecology Research Group, San Diego State Univ. Changes in soil oxygen and nutrient availability in Arctic tundra and their interactive effects on physiology and growth of two dominant sedges.

1990: *Research Associate*, Department of Botany, University of California, Davis. Mathematical models predicting changes in carbon balance and growth of tropical understory shrub in response to differing light conditions.

1986 - 1988. *Research Assistant* Department of Botany, Arizona State University, Tempe. Physiological and morphological differentiation between the coastal and inland form of the lichen *Ramalina menziesii* growing in California blue oak woodland.

1983-1986 *Research Assistant,* Dept, of Ecophysiology, Universität Kiel, Germany. Physiological characteristics of succulents shifting between the C3 and CAM pathways.

Grants

Research Grant (2002-04) Integration of Stable Isotopes across the Sciences (ISIS): Instrumentation for BioGeoChemistry and Environmental Studies. (Total $ 180 737) NSF-CCLI 0126706.

Research Grant (2000-01) Construction of a Multi-PurposeVaccuum Line Laboratory for Stable Isotope BioGeoChemistry ($ 5000) Faculty Developments Funds Keene State College

Research Grant (1997-98) Controls of tree regeneration in *Quercus lobata* and *Q agrifolia* ($ 5000). Southwest Parks and Monuments Association

Research Grant (1990) Doctoral research support grant ($ 1200). San Diego State University

Professional Memberships

Sigma Xi
Ecological Society of America

Professional Services

Reviewer of manuscripts for *Ecology*, *Oikos*, *Arctic Alpine and Antarctic research*, *Tree Physiology*, *Physiologia Plantarum*

Served on grant review panel for NSF-CCLI/EMD-ND track

Publications

Gebauer, Renate L.E., Susan Schwinning, James R. Ehleringer (2002). Interspecific competition and resource pulse utilization in a cold desert community. Accepted in Ecology.

Gebauer, R.L.E., J.R. Ehleringer (2000) Water and nitrogen uptake patterns following moisture pulses in a cold desert community. Ecology 81(5): 1415-1425.

Ehleringer, J.R., S. Schwinning, and R.L. Gebauer (1999) Water use in arid land ecosystems, pages 347-365. In M. C. Press (ed.), Advances in Plant Physiological Ecology, Blackwell Science, Oxford.

Gebauer, R.L.E., B.R. Strain and J.F. Reynolds (1998) The effect of elevated CO_2 and changing N availability on tissue concentrations and whole plant pools of carbon based secondary compounds in loblolly pine (*Pinus taeda*). Oecologia 113: 29-36

Gebauer, R.L.E., J.D. Tenhunen and J.F. Reynolds (1998) *In situ* leaf gas exchange measurements of the two arctic sedges *Eriophorum vaginatum* and *E. angustifolium*. American Journal of Botany 85 (4): 592-599.

Gebauer, R.L.E., J.F. Reynolds and B.R. Strain (1996) Allometric relations and growth in *Pinus taeda* - the effect of elevated CO2 and changing N availability. New Phytologist 134 (1): 85-93.

Gebauer, R.L.E., J.D. Tenhunen and J.F. Reynolds (1996) Soil aeration in relation to soil physical properties, nutrient availability, and root characteristics within an arctic watershed. Plant and Soil 178 (1): 37-48.

Oberbauer, S.F., C.T. Gillespie, W. Cheng, A. Sala, R. Gebauer and J.D. Tenhunen (1996) Diurnal and seasonal patterns of ecosystem CO2 efflux from upland tundra in the foothills of the Brooks Range, Alaska, U.S.A. Arctic and Alpine Research 28 (3): 328-338.

Hahn, S.C., S.F. Oberbauer, R. Gebauer, N.E. Grulke, O.L. Lange and J.D.Tenhunen (1996) Vegetation structure and aboveground carbon and nutrient pools in the Imnavait Creek watershed. *In* Reynolds, J.F. and J.D. Tenhunen (eds.). Landscape function and disturbance in arctic tundra, Ecol. Studies 120. New York: Springer-Verlag, 109-128.

Oberbauer, S.F., W. Cheng, B. Ostendorf, A. Sala, R. Gebauer, C.T. Gillespie, R.A. Virginia and J.D. Tenhunen (1996) Landscape patterns of carbon dioxide exchange in tundra ecosystems. *In* Reynolds, J.F. and J.D. Tenhunen (eds.). Landscape function and disturbance in arctic tundra, Ecol. Studies 120. New York: Springer-Verlag, 223-256.

Gebauer, R.L.E., J.F. Reynolds and J.D. Tenhunen (1995) Growth and allocation of the arctic sedges *Eriophorum angustifolium* and *E. vaginatum*: Effects of variable soil oxygen and nutrient availability. Oecologia 104 (3): 330-339.

Sims, D., R.L.E. Gebauer and R.W. Pearcy (1994) Scaling sun and shade photosynthetic acclimation of *Alocasia macrorhiza* (L.) G. Don to whole-plant performance. 2. Simulation of carbon balance and growth in different photon flux densities. Plant, Cell and Environment 17(8): 889-900.

Oberbauer, S.F., C.T. Gillespie, W. Cheng, R. Gebauer, A. Sala Serra and J.D.Tenhunen (1992) Environmental effects on CO_2 efflux from riparian tundra in the northern foothills of the Brooks Range, Alaska, USA. Oecologia 92(4): 568-577.

Nash, T.H. III, V.L. Boucher, R. Gebauer and D.W. Larson (1990) Morphological and physiological plasticity in *Ramalina menziesii*: Studies with reciprocal transplants between a coastal and inland site. *In* Jahns, H.M. (ed.). Contributions to Lichenology. In honour of A. Henssen. Bibliotheca Lichenologica 38: 357-365.

Gebauer, R., L. Lösch and L. Kappen (1987) Wassergehalt und CO_2-Gaswechsel des poikilohydren Kormophyten *Ramonda myconi* (L.) Schltz. während der Austrocknung und Wiederaufsättigung. Verhandlungen der Gesellschaft für Ökologie 16: 231-236.

Publications in preparation

Gebauer, R.L.E and J. Tiszler (2003) Controls of oak tree regeneration in *Quercus lobat*a *and Q. agrifolia* in Southern California. To be submitted to Oecologia

Gebauer, R.L.E, D. Goldberg, P. Chesson and others (2003). Competition for pulsed resources. Review article to be submitted to Oecologia.

Schwinning, S. and R. L. E. Gebauer (2003). Water input and functional organization in desert plant communities. in Smith R. and M. Price (eds). Species Interactions in Desert Communities: Dynamics of Resource Supply and Utilization

Presentations:

Gebauer, R.L.E. (2002). Is there competition for water and N pulses in a cold desert community?

Invited speaker in a workshop on resource pulse use in arid ecosystems, Tucson Arizona

Gebauer, R.L.E. (2000). Plant response patterns to moisture pulses in a cold desert community.

Invited seminar speaker at the Wellesley College, Wellesley, Massachusetts.

Gebauer, R.L.E. (2000). Plant response patterns to moisture pulses in a cold desert community. Invited seminar speaker at Boston University University, Boston, Massachusetts.

Gebauer, R.L.E. (1999). Plant response patterns to moisture pulses in a cold desert community. Invited seminar speaker at the Ecosystems Center of the Marine Biological Laboratory, Woods Hole, Massachusetts.

Gebauer, R.L.E. (1999). Plant response patterns to moisture pulses in a cold desert community. Invited seminar speaker at Harvard Forest, Harvard University, Petersham, Massachusetts.

Gebauer, R.L.E., S. Schwinning, and J.R. Ehleringer (1998) The responses of desert plant functional types to rainfall events at different times of the year - a mechanism for community change? Invited symposium speaker at the Annual meeting of the Ecological Society of America, Baltimore, Maryland

Gebauer, R.L.E., J.R. Ehleringer (1997) Nitrogen and water uptake patterns of cold desert species on the Colorado plateau. Annual meeting of the Ecological Society of America, Albuquerque, New Mexico

Gebauer, R.L.E. and J. Ehleringer (1996) Sensitivity of arid land ecosystems (SCALE). Terrestrial ecology and global change (TECO) Workshop, Washington DC.

Gebauer, R.L.E., J.F. Reynolds and B.R. Strain (1995) Interactive effects of carbon dioxide and nitrogen supply on above- and belowground chemical composition of loblolly pine (*Pinus taeda* L.) seedlings. Annual meeting of the Ecological Society of America, Snowbird, Utah.

Gebauer, R.L.E., J.D. Tenhunen and J.F. Reynolds (1993) Poster. The effect of flooding on gas exchange in two Arctic tundra sedges. Annual meeting of the Ecological Society of America, Madison, Wisconsin.

Gebauer, R.L.E. and J.D. Tenhunen (1992) Effect of waterlogging on growth and nutrient status of two arctic tundra sedges. Annual meeting of the Ecological Society of America, Honolulu, Hawaii.

Gebauer, R.L.E., J.D. Tenhunen, and S. Oberbauer (1989) Poster. Diurnal patterns in leaf gas exchange of tundra plants growing in the foothills of the Philip Smith Mountains, Alaska. Annual meeting of the Ecological Society of America, Toronto, Canada.

Gebauer, R., V. Boucher and T.H. Nash, III and D.W. Larson (1988) Evidence for ecotypic variation of the lichen *Ramalina menziesii*. Annual meeting of the American Institute of Biological Science, Davis, California.

Participation in Workshops and Conferences on Pedagogy

Science Education for New Civic Engagement and Responsibility, San Jose, CA (Aug. 3-6, 2001)
New approaches and techniques in teaching Science, Farmington, ME (Jun. 25-29, 2001)

Case studies in science workshop, Buffalo NY (May 21-25, 2001)

Annual conference on case study teaching in science, Buffalo NY (Oct. 6-7, 2000)

NHCUC conference, Nashua NH (Oct 1998)

CURRICULUM VITAE

JO BETH MULLENS, Ph.D.

Departments of Geography and
Environmental Studies
Keene State College
229 Main St.
Keene, NH 03435
(603) 358-2547
e-mail: jmullens@keene.edu

EDUCATION:

Ph.D. **Department of Geoscience, Oregon State University, Corvallis, OR.**
Major: **Environmental/Natural Resources Geography**
Minors: **Geographical Techniques and Political Science**
Specialization: **Water Resources**
Dissertation Title: **Implementation of Regional Plans in the Pacific Northwest: An Analysis of the Northwest Power Planning Council's Water Budget and Model Conservation Standards 1984 - 1993.**
Completed: **1995.**

M.S. **Department of Geography, Southern Illinois University, Carbondale, IL**
***Thesis Title*: Perception of Recreational Lake Quality.**
***Complete*: 1989.**

B.S. **Department of Geography, University of Central Arkansas, Conway, AR.**
***Major*: Physical Geography**
***Minor*: Computer Science**
***Completed*: 1986.**

ACADEMIC AND RESEARCH APPOINTMENTS:

Associate Professor (Present Position) **Departments of Environmental Studies and Geography (8/95 to Present) Keene State College**

Faculty Research Assistant **Western Watershed Studies (10/92-7/95) Oregon Water Resources Research Institute Oregon State University**

Graduate Instructor	**Department of Geosciences (9/89-5/95)** **Oregon State University** **Courses: Environmental Conservation** **Geography of Europe** **World Regional Geography** **Cartography Lab**
Graduate Lab Instructor	**Department of Geography (8/87-8/89)** **Southern Illinois University** **Course: Weather and Climate**
Intern	**Arkansas Land Stewardship Project (7/86-6/87)** **Soil and Water Conservation** **University of Arkansas, Little Rock.**

COLLEGE COURSES TAUGHT:

Keene State College

- **Water Resources Geography**
- **Soils and Vegetation**
- **Environmental Assessment and Monitoring**
- **Introduction to Environmental Studies**
- **Senior Seminar in Environmental Studies**
- **Environmental Literacy and Community Action**
- **Introduction to Geography**
- **Map Reading and Interpretation**
- **Geography of the U.S.**
- **Recreation Geography**
- **Field Study Course in Mexico City**
- **Junior Seminar in Geography**
- **Senior Seminar in Geography**

Oregon State University (Graduate Instructor)

- **Environmental Conservation**
- **Geography of Europe**
- **World Regional Geography**

HONORS AND AWARDS:

2002 Fulbright Senior Scholar Award to the Czech Republic. Spring Semester at Masaryk University in Brno, CZ.

1999 Faculty Supervisor for Undergraduate Research Grant ($400) on Public Perception of the Connecticut River's Quality and Suitability as a Recreational Resource.

1997 Principal Investigator for Nonpoint Source Local Initiative Grant - Connecticut River Erosion Inventory ($8,430) from the EPA 319 Funds administered by New Hampshire Department of Environmental Services.

1997 Keene State College Alumni Grant for Ashuelot River Watershed Project ($1500)

1995 Parenzin Award for Ph.D. Dissertation, Department of Geoscience, Oregon State University

1992 Travel Grant Recipient to present research at the Association of American Geographers' Annual Meeting, San Diego, California Department of Geoscience, Oregon State University

1991 Award Winner, Illinois Parks and Recreation: recognition for article "Perceptions of Water Quality in Illinois Recreational Lakes"

1989 Graduate Fellowship Recipient, Oregon State University.

1985 Undergraduate Scholarship Recipient, Department of Geography University of Central Arkansas.

PROFESSIONAL ORGANIZATION MEMBERSHIP:

International Water Resources Association
American Water Resources Association
New England Section of the American Water Resources Association
American Association of Geographers (AAG)
AAG Water Resources Specialty Group
New England - St. Lawrence Valley Geographical Society (NESTVAL)
New Hampshire State Representative to NESTVAL

COLLEGE AND COMMUNITY SERVICE:

Faculty Advisor for the Keene State College Campus Ecology Club
Connecticut River Local Advisory Council (Wantastiquet Region) (Putney, VT)

RESEARCH INTERESTS:

Water Resources Planning and Management, Environmental Policy, Management of Interstate and International Waters, Water Resources Institutional Arrangements, Natural Resources Planning and Management, and Nonpoint Source Water Quality Issues.

PUBLICATIONS:

**** refereed publications***

Mullens, J.B. 1999. Perceptions of the Connecticut River's River Quality and Suitability as a Recreational Resource. Proceedings of the 1999 Northeastern Recreation Research Symposium.

Mullens, J.B. 1998. Connecticut River Erosion Inventory for Sullivan and Cheshire Counties, New Hampshire and Windham and Windsor Counties, Vermont: Summary Report. Submitted to New Hampshire Department of Environmental Services.

***Mullens, J.B. 1998. Shifting Institutions and Priorities in the Columbia Basin. Association of Pacific Coast Geographers Yearbook 1997. Vol. 59, pp. 68-86.**

***Mullens, J.B. 1997. Riverbank Erosion in the Connecticut River: An Erosion Inventory. in the Proceedings of the New England - St. Lawrence Valley Geographical Society. Volume XXVII, November 7-8, 1997.**

***Mullens, J.B. 1995. Examining Regional River Basin Planning in the Pacific Northwest. in the Proceedings of the New England - St. Lawrence Valley Geographical Society. Volume XXV, November 3-4, 1995. pp. 154-163.**

***Bristow, R.S. and J.B. Mullens. 1995. Environmental Education: A Geographical Approach. in the Proceedings of the New England - St. Lawrence Valley Geographical Society. Volume XXV, November 3-4, 1995. pp. 53-60.**

Osmond, D.L., J.B. Mullens, D.E. Line, S.W. Coffey, J.A. Gale, and J. Spooner. 1995. 1995 Summary Report: Section 319 National Monitoring Program Projects, Nonpoint Source Watershed Project Studies, NCSU Water Quality Groups, Biological and Agricultural Engineering Department, North Carolina State University, Raleigh, NC.

Osmond, D.L., D.E. Line, J.B. Mullens, S.W. Coffey, J.A. Gale, and J. Spooner. 1994. 1994 Summary Report: Section 319 National Monitoring Program Projects, Nonpoint Source Watershed Project Studies, NCSU Water Quality Groups, Biological and Agricultural Engineering Department, North Carolina State University, Raleigh, NC.

Dressing, S.A., J. Spooner, and J.B. Mullens. 1993. Watershed Project Monitoring and Evaluation under Section 319 of the Clean Water Act. Watershed 93. pp. 521-528.

Osmond, D.L., J Spooner, J.B. Mullens, J.A. Gale, and D.E. Line. 1993. 1993 Summary Report: Section 319 National Monitoring Program Projects, Nonpoint Source Watershed Project Studies, NCSU Water Quality Groups, Biological and Agricultural Engineering Department, North Carolina State University, Raleigh, NC.

Osmond, D.L., J.A. Gale, D.E. Line, J.B. Mullens, J. Spooner and S.W. Coffey, 1992. 1992 Summary Report: Section 319 National Monitoring Program Projects, Nonpoint Source Watershed Project Studies, NCSU Water Quality Groups, Biological and Agricultural Engineering Department, North Carolina State University, Raleigh, NC.

Mullens, J.B. and C.L. Lant. 1991. Recreators' -vs- Managers' Perceptions of Water Quality in Illinois Recreational Lakes. Illinois Parks and Recreation. 22(6):33-34.

***Lant, C.L. and J.B. Mullens. 1991. Lake and River Quality for Recreation Management and Contingent Valuation. Water Resources Bulletin. 27(3):453-460.**

Mullens, J.B. 1991. Book Review of Anthony R. de Souza's A Geography of World Economy. Bulletin No. 165 pp. 46-47.

SUBMITTED PAPERS:

Mullens, J. B. and R.S. Bristow. (revised and submitted for second review). Overcoming the Nation's Best Landscaped Sewer: Recreators' Perception of the Connecticut River. Under review by *Journal of American Water Resource Association*.

PAPER IN PROGRESS

Mullens, J.B. Dam Removal in New England: A Comparison of State Policies. to be submitted to *Environmental Management during the late fall of 2002.*

PROFESSIONAL CONFERENCE PRESENTATIONS AND PUBLISHED ABSTRACTS:

Mullens, J.B. 2001. Developing a Dam Removal Evaluation Process: A look at McGoldrick and Homestead Dams in New Hampshire. Abstracts. Annual meeting of the Association of American Geographers. Feb. 27-28 New York, NY.

Mullens, J.B. and R.S. Bristow. 2000. Playing Along the Nation's Best Landscaped Sewer: A Study of Recreation on the Connecticut River. Abstracts. Annual meeting of the Association of American Geographers. April 5-8 Pittsburgh, PA.

Mullens, J.B. 1999. China's New Great Wall: A Look at the Three Gorges Dam Project. Thirteenth Annual meeting of the New England- St. Lawrence Valley Geographical Society. October 8-9 Farmington, ME.

Mullens, J.B. and M.B. McNally. 1999. Public Perception of the Connecticut River's Quality and Suitability as a Recreational Resource. paper presented at the 1999 Eleventh Northeastern Recreation Research Symposium. April 11-13 Bolton Landing, NY.

Mullens, J.B. 1998. Erosion in the Connecticut River. Poster presentation at the Twentieth Annual meeting of the New England- St. Lawrence Valley Geographical Society. October, Montreal, Canada.

Mullens, J.B. 1998. Invited Panelist on Geographers and Public Policy at the Annual meeting of the Association of American Geographers. March, Boston, MA.

Mullens, J. B. 1997. Riverbank Erosion on the Connecticut River: An Erosion Inventory. Paper presented at the 1997 Nineteenth Annual meeting of the New England - St. Lawrence Valley Geographical Society. November 9-10, Salem, MA.

Bristow, R.S. and Mullens, J.B. 1997. Recreation Geography: A New and Updated Approach. paper presented at the 1997 Northeastern Recreation Research Symposium. April 5, Bolton Landing, NY.

Mullens, J.B. 1997. Reexamining the Regional Approach to Natural Resource Management. paper presented at the 1997 International Symposium on Human Dimensions of Natural Resources Management in the Americas. February 25-March 1, Belize City, Belize.

Bristow, R.S. and Mullens, J.B. 1997. The New Ecology and Geographic Approaches to Environmental Analysis. paper at the 1997 International Symposium on Human Dimensions of Natural Resources Management in the Americas. February 25-March 1, Belize City, Belize.

Mullens, J.B. 1996. Sustainable Management of River Resources in New Hampshire. paper presented at the Eightieth Annual Meeting of the New England - St. Lawrence Valley Geographical Society. November 1 - 3, Worcester, Massachusetts.

Mullens, J.B. 1996. An Examination of Residential Energy Conservation in the Pacific Northwest: 1984 through 1993. Abstracts. p. 210. Association of American Geographers Annual Meeting. April 9-13, Charlotte, North Carolina.

Mullens, J.B. 1995. Examining Regional River Basin Planning in the Pacific Northwest. paper presented at the Seventieth Annual Meeting of the New England - St. Lawrence Valley Geographical Society. November 3-5. Burlington, Vermont.

Bristow, R.S. and J.B. Mullens. 1995. Environmental Education: A Geographical Approach. workshop presented at the Seventieth Annual Meeting of the New England - St. Lawrence Valley Geographical Society. November 3-5. Burlington, Vermont.

Mullens, J.B. 1995. Muddying the Waters: Shifting Values and Institutions in the Columbia River. Abstracts. p. 220. Association of American Geographers Annual Meeting March 14 - 18, Chicago, Illinois.

Mullens, J.B. 1994. Overcoming Implementation Failure in Regional Water Resources Planning: An Analysis of the Northwest Power Planning Council's Water Budget. Abstracts. p. 267 Association of American Geographers Annual Meeting March 29 - April 2, San Francisco, California.

Mullens, J.B. 1992. An Assessment of the Northwest Power Planning Council's Integrated Planning Efforts in the Columbia River. Association of Pacific Coast Geographers 1992 Yearbook. Abstracts of papers presented at the Annual Meeting September 10 - 13. Bellingham, Washington. Vol. 55, p. 174.

Mullens, J.B. 1990. Lake and River Quality not Water Quality in Recreational Settings. Abstracts. The Association of American Geographers Annual Meeting, May, Toronto, Canada.

CONFERENCES ORGANIZED:

Ashuelot River Symposium held at Keene State College June 1998.

Annual Conference of the American Water Resources Association New England Section titled Balancing Conflicting Demands in Water Resources. Held at Keene State College on November 15, 1996.

PROFESSIONAL DEVELOPMENT TRAVEL ACTIVITY:

Fulbright Scholar to the Czech Republic, Jan. – May 2002.

Selected participant of the Council on International Education Exchange's Faculty Development Seminar to China's Three Gorges Dam Project (TGP) in June of 1999.

CURRICULUM VITAE **October 2002**

Joan Roelofs
Keene State College
Keene NH 03435-3400
69 Beaver Street
Keene NH 03431-3215

Telephone: (603) 357-4410 (h)
(603) 358-2634 (w)
Fax: (603) 358-2184
Home Page: http://wcb.keene.edu/~jroelofs/home.html Internet

EXPERIENCE:

1992- Professor of Political Science, Keene State College, Keene, NH
1985-1992 Associate Professor of Political Science, Keene State College
1979-1985 Assistant Professor of Political Science, Keene State College
1975-1979 Lecturer in Political Science, Mercy College, Dobbs Ferry, NY
1974-1979 Instructor in Political Science, Empire State College, White Plains, NY
1964-1967 Instructor in Political Science, New York University, NY
1961-1964 Teaching Fellow, New York University

EDUCATION:

Ph. D. 1968 New York University. Major: Political Science; Minor: Philosophy.
Dissertation: "The Theory and Non-Practice of British Socialism."
Awarded with Distinction.
M.A. 1961 New York University. Thesis: "The Political Philosophy of Jean-Paul Sartre."
B.A. 1957 Barnard College. Cum Laude, Honors in Government, Phi Beta Kappa.
B.A. Thesis: "The Constitutional Status of the Right to Travel."

PUBLICATIONS:

Foundations and Public Policy: The Mask of Pluralism. State University of New York Press (Forthcoming January 2003).

Review of Mark Dowie, *American Foundations*. Cambridge: MIT Press, 2001. Forthcoming, *New Political Science*.

Review of Jonathan Beecher, *Victor Considerant and the Rise and Fall of French Romantic Socialism.* Berkeley: University of California Press, 2001. *New Political Science* 23 (4) (2001): 565-569.

"Eco-Cities and Red Green Politics," Review of Mark Roseland, ed., *Eco-City Dimensions: Healthy Communities, Healthy Planet*, Gabriola Island, BC: New Society Publishers, 1997. *Capitalism, Nature Socialism* 11 (1) (March 2000): 139-148.

"Building and Designing with Nature: Urban Design," Ch. 11 of *Sustainable Cities*., David Satterthwaite (ed.), London: Earthscan, 1999.

"British Ecosocialism: A Note," *Capitalism, Nature, Socialism* 10(1) (March 1999): 133- 136

Review of *Universities and Empire: Money and Politics in the Social Sciences During the Cold War*. Ed. and Intro. by Christopher Simpson, New York: The New Press, 1998. *New Political Science* 20 (1998): 499-503.

Review of Gerard Colby and Charlotte Dennett, *Thy Will Be Done. The Conquest of the Amazon: Nelson Rockefeller and Evangelism in the Age of Oil,* New York: HarperCollins, 1995.
Capitalism, Nature, Socialism 8 (4) (December 1997): 153-155.

Greening Cities. New York: Apex Press, 1996.

"The Third Sector as a Protective Layer of Capitalism," *Monthly Review* (September 1995). Hungarian translation in *Eszmélet* 27 (1995): 200-217.

"Charles Fourier: Proto-red-green," In D. Macauley (ed.), *Minding Nature: The Philosophers of Ecology.* New York: Guilford, 1996.

"Foundations, Social Scientists, and Eastern Europe," (with Erkki Berndtson). In S. Brooks and A.-G. Gagnon (eds.), *The Political Influence of Ideas*. Westport: Praeger, 1994.

"Market Economy: Deep Roots of Dysfunction," *Synthesis/Regeneration* 6 (Spring 1993): 43-45. Reprinted in *Alternative Press Review* 1 (1) (Fall 1993): 17-18.

"Charles Fourier: Proto-red-green," *Capitalism, Nature, Socialism* 4(3) (Sept 1993): 69-88.

"Foundations and Political Science," *New Political Science* (Fall 1992): 3-28.

"Changes in Eastern Europe and USSR: Are they Good for the Greens? *Left Green Notes* (July-Aug. 1990): 40-42.

Review of Teresa Odendahl. *Charity Begins at Home*. *New Political Science* (Fall-Winter 1990): 209-212

"Foundations and Social Change Organizations: The Mask of Pluralism." *Insurgent Sociologist* 14 (Fall 1987): 31-72.

Review of *The Golden Donors* by Waldemar Nielsen, and *Philanthropy and Cultural Imperialism* ed. by Robert Arnove. *Telos* (Summer 1986): 178-182.

"Fourier and Computer Dating." *Telos* (Fall 1985): 127-136.

"Foundations and the Supreme Court." *Telos* (Winter 1984-85): 59-87. (Also abstracted in *International Political Science Abstracts*).

Review of *Liberalism and the Limits of Justice* by Michael Sandel. *Journal of Politics* 46 (1984): 991-993.

"Symposium on Religion and Politics." *Telos* (Winter 1983-84): 146.

"Judicial Activism as 'Social Engineering.'" In *Supreme Court Activism and Restraint,* ed. Steven Halpern and Charles Lamb, 249-270. Lexington Books, 1982.

"Symposium on Role of Intellectuals in the 1980's." *Telos* (Winter 1981-82): 148-9.

Review of *Economic Democracy* by Martin Conroy & Derek Shearer. *Telos* (Fall 1981) 218-223.

Review of *Urban Self-Management* by Simona Ganassi-Agger. *Telos* (Winter 1980-81): 222-4.

"The Supreme Court as a Superlegislature: Taking into Account Brown and Bakke." In *Research in Law and Sociology: Vol. 3*, 257-278. Greenwich: JAI Press, 1980.

"The Warren Court and Corporate Capitalism." *Telos* (Spring 1979): 94-112.

"On Transcending Marx." *New Political Science* (Summer 1978): 3-6.

"Manipulation and Influence: A Comment." *American Political Science Review* LVII (December 1963): 953.

"Freedom and Occupational Choice in the Soviet Union." *Social Research* XXX (Spring 1963) 53-76.

"Business and Politics." *American Psychologist* XVI (March 1961): 142.

PRESENTATIONS:

"Transformation of Civil Society: Inspiration from Charles Fourier," Plenary Speaker, Association for Research on Nonprofit Organizations and Voluntary Action, Miami, November 2001.

"What is a Sustainable City?" Bicentennial Conference of Middlebury College, October 2000.
"Marxism and Ecology," Rethinking Marxism Conference, Amherst, September 2000.
"The Third Sector and Capitalism," Rethinking Marxism Conference, Amherst, September 2000.
“Foundations and the Construction of Knowledge,” Conference on Reorganizing Knowledge: Transforming Institutions, Amherst, September 1999.
“Fourier and Communitarian Socialism,” APSA, Boston, September 1998.
“Marxist Contributions to Ecological Theory,” Socialist Scholars Conference, New York, March 1998.
“Greening Cities,” The Other Economic Summit, Denver, June 1997.
“Our World Grows from the Foundations,” Socialist Scholars Conference, New York, March 1997.
“Greening Cities,” Poster Session, APSA, San Francisco, August 1996.
“Greening Cities,” Visual Presentation, New England Environmental Conference, Medford, MA, March 1996.
“Greening Cities,” Institute for Social Ecology, Plainfield, VT, July 1995.
"The Third Sector as a Protective Layer for Capitalism," IPSA, Berlin, August 1994.
"From Red to Green" Socialist Scholars Conference, New York, April 1993.
"Charles Fourier & Red-green Theory," Rethinking Marxism Conf., Amherst, November 1992.
"Judicial Activism as Social Engineering," IPSA Roundtable on Comparative Judicial Studies, Forlí, Italy, June 1992.
"Fourier and Red-Green Theory," Centro Interdipartimentale di Ricerca Sull'Utopia, Bologna, Italy, June 1992.
"Greenhousing and Alternatives to the Family," Sacramento Ecocities Conference, May 1992.
"Foundations, Social Science and Eastern Europe," International Political Science Association, Buenos Aires, July 1991.
"Green Politics in the United States," Jyväskylä University, Finland, May 1991.
"Foundations and Public Policy," Helsinki University, May 1991.
"Social Movements in Eastern Europe," New England Green Alliance, Holyoke, November 1990.
"Foundations and Political Science" IPSA. Paris, May 1990.
"Women and Wars of National Liberation," TARS, Keene, NH, December 1989.
"Politics and Models," American Political Science Association, Chicago, Sept. 1987.
"Do Foundations Set the Agenda? From Social Protest to Social Service," Keynote address, The Philanthropy Project's concluding conference. Minneapolis, November 1986.
"Fourier's Alternatives to Marriage," National Historic Communal Societies Association, Canterbury Shaker Village, NH, October 1986.
"Foundations and Social Change Organizations: The Mask of Pluralism," APSA, Washington, September 1986.
"Can Green Politics Overcome the Fragmentation of Protest?" APSA, Washington, Sept. 1986
"Elite Money and Progressive Movements," World Fellowship, Conway, NH, August 1985.
"Nineteenth Century Utopian Communities of the United States," World Fellowship, Aug. 1985
"Fourier and Computer Dating," Critical Legal Studies Conference, Boston, June 1985.
"Women and Local Political Activism," NH Homemaker's Council, Keene, October 1984.
"Fourier and Computer Dating," APSA, Washington, September 1984.

"Foundations and the Supreme Court," Critical Legal Studies, Gloucester, June 1984.
"Foundations and the Judicial System," Harvard Law School (Graduate Program Speaker Series) March 1984.
"Foundation Influence on Supreme Court Decision-Making," APSA, Chicago, September 1983.
"Democratizing Local Government Structure," Union of Radical Political Economics, New England Conference, Burlington, VT, June 1982.
"The Supreme Court and Corporate Capitalism," Northeastern Political Science Association, Tarrytown, NY, November 1978.
"What is Political Science For?" (Chair of Workshop), APSA, NYC, September 1978.
"From Brown to Bakke: The Supreme Court as a Superlegislature," New York State Political Science Association, Albany, April 1978.

AWARDS:

Distinguished Career Award, 2002. American Political Science Association Organized Section on Transformational and Ecological Politics.

Middlebury College Bicentennial Medal, 2000 (For being a conference speaker and the author of *Greening Cities,* used in their Environmental Studies program.)

Fellow, 1993-94, Institute for Science and Technology Policy, Murdoch University, Australia (For research on *Greening Cities*)

NEH Summer Fellow, 1982. Seminar at University of Virginia led by Prof. William Harbaugh: "The Rise of the Centralized Society: From Progressivism to the New Deal." (Initiated research on foundations)

PROFESSIONAL AFFILIATIONS:

American Political Science Association, International Political Science Association, William Morris Society, Planner's Network

Editorial Board: *Capitalism, Nature, Socialism*

COMMUNITY AND SERVICE:

Greens/Green Party USA, national executive board, 1992-1993
Keene State College Education Association, board member and health and safety chair.
Monadnock Energy Project
Keene Community Kitchen
Keene Farmers' Market
Keene Unitarian-Universalist Church (social concerns chair)
Monadnock Greens
Monadnock Peace Action
Big Brothers-Big Sisters
Trailwalker, City of Keene
Cheshire Housing Trust (current board member)

Appendix VI: Environmental Programs at Comparator Institutions

USNH-KSCEA Comparator Institutions

Adams State College
Geology and Environmental Science
http://www.adams.edu/academics/science_math_tech/geology/geology.html

Armstrong State University
none
http://www.armstrong.edu

Austin Peay State University
Environmental Geography, Dept. of Geology and Geography
http://www.apsu.edu/records/bulletin/current/programs/Enviorn_Geography.htm

Bemidji State University
Center for Environmental, Earth and Space Studies
http://www.bemidjistate.edu/ceess/

California State University, Bakersfield
Environmental Resource Management, School of Humanities and Social Sciences
http://www.csubak.edu/ERM/ermmajor.htm

Clarion University of Pennsylvania
Environmental Geoscience, Dept. of Anthropology, Geography and Earth Sciences
http://www.clarion.edu/departments/ages/

Eastern Connecticut State University
Environmental Earth Science
http://www.easternct.edu/depts/eearthsci/index.htm

Fitchburg State College
Environmental Science
http://raven.fsc.edu/catalog/UndergradDay/envirosci.html

Framingham State College
Environmental Studies as a Concentration in Geography
http://www.framingham.edu/geography.html

Indiana University Northwest
School of Public & Environmental Affairs & Political Science
http://www.iun.edu/~speanw/

Indiana University South Bend
School of Public & Environmental Affairs
http://www.iusb.edu/%7Espea/

North Carolina Agricultural &Technical State University
Natural Resources and Environmental Design, School of Agriculture and Environmental Sciences
http://www.ag.ncat.edu/academics/natres/index.html

Rhode Island College
none
http://www.ric.edu

Shippensberg State University
Geoenvironmental Studies, Dept. of Geography and Earth Science
http://www.ship.edu/~geog

Slippery Rock University
Geography, Geology and the Environment, College of Health, Environment and Science
http://www1.sru.edu/gge/index.htm

Sonoma State University
Environmental Studies & Planning, School of Social Sciences
http://www.sonoma.edu/ensp/

SUNY College Fredonia
Environmental Sciences
http://www.fredonia.edu/academicaffairs/environmental.htm

SUNY College Oneonta
Environmental Sciences
http://www.oneonta.edu/academics/envsci/

SUNY College Plattsburgh
Earth and Environmental Science
http://www.plattsburgh.edu/cees/

Trenton State University The College of New Jersey
none
http://www.tcnj.edu

University of Colorado, Colorado Springs
Environmental History, Dept. of History
http://web.uccs.edu/~history/index/environhist.html

University of Southern Maine
Environmental Science and Policy
http://www.usm.maine.edu/~esd

University of Tennessee, Martin
Center for Environmental and Conservation Education
http://www.utm.edu/departments/ed/cece/cece.html

Univsersity of Wisconsin, Platteville
Environmental Engineering
http://www.uwplatt.edu/~enve

University of Wisconsin, Stevens Point
Environmental Studies
http://www.uwsp.edu/news/uwspcatalog/envstudies.htm

Western Carolina University
Geosicence and Natural Resource Management, College of Arts and Sciences
http://www.wcu.edu/as/GeosciencesNRM/GEOSCIENCES/GEOSCIhome/GEOSCIhome.htm

William Paterson College
Environmental Science and Geography
http://www.wpunj.edu/cos/envsci-geo/

Winona State University
Environmental Science
http://www.winona.msus.edu/environmental_science/

Worcester State College
Environmental Studies as a Focus in Geography/Earth Sciences
http://wwwfac.worcester.edu/geography/geog.htm

CoPLAC Member Institutions

College of Charleston
Chemistry and Geology majors with Environmental Emphasis, Interdisciplinary Environmental Studies Minor
http://www.cofc.edu/envminor/

Evergreen State College
none; all interdisciplinary programs
http://www.evergreen.edu/

Fort Lewis College
Environmental Studies
http://www.fortlewis.edu/acad-aff/arts-sci/environ/envdegr.html

Georgia College & State University
Department of Biological and Environmental Sciences
http://www.uwsuper.edu/catalog/general/2002-04/prog_descrip/biol.html

Henderson State University
none
http://www.hsu.edu/

Mary Washington College
Environmental Science and Geology
http://departments.mwc.edu/eesg/www/

Massachusetts College of Liberal Arts
New Environmental Studies Major
http://www.mcla.edu/external/press/releases/20010326.html

New College of Florida
Environmental Studies
http://www.ncf.edu/Catalog/Documents/interdisciplinary_studies.htm#ENVIRONMENTAL STUDIES

Ramapo College of New Jersey
Environmental Science, School of Theoretical and Applied Sciences
http://www.ramapo.edu/catalog/academicPrograms/TAS/envscience.html
Environmental Studies, School of Theoretical and Applied Sciences
http://www.ramapo.edu/catalog/academicPrograms/TAS/envstudies.html
Environmental Studies, School of Social Science and Human Services,
http://www.ramapo.edu/catalog/academicPrograms/SSHS/envstudies.html

Sonoma State University
Environmental Studies and Planning, School of Social Sciences
http://www.sonoma.edu/ensp/

St. Mary's College of Maryland
Environmental Studies
http://www.smcm.edu/Academics/Inter/envstud/index.htm

SUNY College Geneseo
Environmental Studies Minor, Geography Department
http://www.geneseo.edu/~environ/

Truman State University
none
http://www.truman.edu/

University of Maine, Farmington
Environmental Planning and Policy, Dept. of Social Science and Business
http://www.umf.maine.edu/Academic/01_02/programs_2002/environmental_planning_policy.html
Environmental Science, Dept. of Natural Sciences
http://www.umf.maine.edu/Academic/01_02/programs_2002/environmental_science.html

University of Minnesota, Morris
none
http://www.mrs.umn.edu/

UUniversity of Montevallo
none
http://www.montevallo.edu/

University of North Carolina, Asheville
Environmental Studies
http://www.unca.edu/envr_studies/

University of Wisconsin-Superior
Physical Environmental Sciences minor in Biology
http://www.uwsuper.edu/catalog/general/2002-04/prog_descrip/biol.html

Appendix VII: Courses to consider for cross-listing as ENST courses

The following are courses selected from the KSC Catalog as possible candidates to consider for cross-listing as ENST courses. This list is not meant to be exclusive. Course descriptions have been omitted if they are already listed in Appendix III.

BIO 101 TOPICS IN BIOLOGY An exploration of biological issues and methods for non-majors. Applying basic principles to modern problems, the course may focus on a theme such as Evolution and Conservation of Biodiversity; Plants and Society; or Ecology and Environmental Issues. Can be repeated for credit as topics change. Fall, Spring

For example:

BIO 101 TOPICS IN BIOLOGY: EVOL & CONSERVATION OF BIODIVERSITY This non-majors course explores the nature, origin, and conservation of biodiversity. Taxonomic, evolutionary, and ecological principles will be introduced as students investigate controversial issues arising when conservation biology intersects law and politics.

BIO 256 Experimental Ecology and Evolution

BIO 451 Population Ecology

BIO 452 Community & Ecosystem Ecology

BIO 454 Ecological Physiology

BIO 457 Research Methods: Ecology

CHEM 131 Chemistry and the Environment

CHEM 352 Chemical Analysis of the Environment

CHEM 356 Environmental Analysis Lab

CHEM 382 Occupational Safety and Health

CHEM 386 Industrial Hygiene Lab

ECON 340 Environmental Economics

ENG 290 SPECIAL TOPICS: ENVIRONMENTAL LITERATURE No description currently available.

ENG 240 READINGS IN AMER LIT: WOMEN AND NATURE This course seeks to cultivate an appreciation of the role women writers have played in the development of American literature. The course will explore the ways American women writers record nature, are inspired by nature, and serve as advocates for the natural world. It will examine the ways women have shaped our view of the landscape and our relationship to it. And it will introduce students to the concerns of feminism and ecology as they arise in and inform the discussion of selected literary works. Students will read traditionally defined nature writers such as Susan Fenimore Cooper, Mary Austin, Annie Dillard, Mary Oliver, and Terry Tempest Williams, as well as the contributions of such authors as Sarah Orne Jewett, Zora Neale Hurston, Willa Cather, Adrienne Rich, Gloria Anzaldua, and Leslie Marmon Silko. Same as AMST 290-01 and 290-02.

ENG 410 ECOCRITICISM AND THEORY This course has two related purposes; first, it seeks to introduce students to the range of critical approaches used in contemporary literary theory; second, it focuses on recent efforts to include attention to conceptions of the natural world in discussions of literature. We will read Terry Eagleton's Literary Theory: An Introduction (2nd ed), Cheryl Glotfelty's anthology The Ecocriticism Reader, and selections from the recent work of James McKusick, Jonathan Bate, Laurence Buell, Carol J. Adams, and many others. Students will develop a major paper developing an ecocritical reading of a primary text, including an annotated bibliography. Active participation and short presentations required. This course fulfills the English major's Theory requirement. Dr. Stroup.

GEOG 303 POLITICAL GEOGRAPHY Effects of the physical environment - size, location, resources, and political patterns - on the political development of selected nations. Spring, alternate years

GEOG 304 POPULATION GEOGRAPHY Global demographic analysis of birth rates, death rates, and migration rates. Provides a spatial, temporal, and structural investigation of the relationship between demographic and cultural, economic, and environmental factors. Prerequisite: GEOG 203 or GEOG 204. Spring, alternate years

GEOG 323 CARTOGRAPHY AND SURVEYING

GEOG 324 GIS: ARCVIEW

GEOG 325 CARTOGRAPHY AND COMPUTER MAPPING

GEOG 326 GIS: IDRISI

GEOG 327 Introduction to Remote Sensing

GEOG 328 METHODS OF SPATIAL ANALYSIS 4 credits Introduction to statistical analysis in Geography. Principles learned include the use of the map as a model for statistics prediction and hypothesis testing. SPSSx computing on the PC through simulation experiments conducted in the computer lab of the Geography department. 3 hours lecture; 2 hours lab. Prerequisites: MATH 141 or PSYC 251 or SOC 303 and GEOG 203 or GEOG 204. Spring, alternate years

GEOG 330 Natural Resource Management

GEOG 332 WATER RESOURCE GEOGRAPHY Includes a systematic analysis of the input, management, and output water resources subsystems. Special emphasis on problems of maldistribution of supply and demand and on the institutional policies developed to address allocation conflicts. Prerequisites: ENST 100 and GEOG 204. Alternate (odd) years

GEOG 405 INTRODUCTION TO LAND USE PLANNING Introduction to land use planning processes. Includes a seminar and a supervised internship. Prerequisite: permission of instructor. Fall, alternate years

GEOG 420 ENVIRONMENTAL ASSESSMENT Examines methodologies for evaluating natural resources and organizing data for decision-making applications. Includes key legislative policies driving environmental assessments, common assessment techniques, and how information generated flows back into the policy process. Prerequisites: ENST 100 and GEOG 330, or permission of instructor. Alternate (even) years

GEOL 206 Oceanography

GEOL 210 THE HYDROLOGIC CYCLE An introduction to the study of water and its flow through the global environment, from precipitation to ground water, rivers, lakes, the ocean and back. Occasionally

GEOL 315 Environmental Geology

GEOL 412 Geochemistry

GEOL 460 Hydrogeology

GEOL 309 Geomorphology

HIST 290 SPECIAL TOPICS: ENVIRONMENTAL HISTORY No description currently available.

HIST 358 HISTORY AND PHILOSOPHY OF SCIENCE: 1700 TO PRESENT Examines the development of scientific thought and philosophy of science from the Scientific Revolution to the present. Prerequisites: 6 credits of science coursework or permission of instructor. (Cross-listed as PHIL 358.) Spring

IDSS 150 TECHNOLOGY AND CIVILIZATION The development of technological literacy through an examination of the evolution, utilization, and significance of technology; the social and environmental issues associated with industrialization; and the contemporary technological alternatives that affect the nature of the human condition. Occasionally

IDSS 290 TWENTIETH-CENTURY WORLD PART 2, GLOBAL ISSUES 1945-PRESENT Description: This inquiry-based, multiple perspectives course draws from the Social Sciences disciplines to increase knowledge and understanding of the century's more momentous events and their effects on ordinary people. It is designed for students seeking to improve their awareness of pressing global issues, developing a more international context for their studies, or gaining a more global perspective on current events. The course is especially recommended for students interested in the new minor program in International Studies (see current catalogue, p.71), those seeking an interdisciplinary course for general ed. requirements in Soc. Sci., and future teachers.

MET 225 Meteorology

MGT 451 SOCIAL, LEGAL, AND POLITICAL ENVIRONMENT OF BUSINESS Advanced study of management philosophy and practice. Focus is upon the managerÆs role as influencing and influenced by organizational structures, organization goals, and social, legal, political, and ecological constraints. Students are encouraged to develop a personal management philosophy. Prerequisites: MGT 301, 345, and senior standing, or permission of instructor. Fall, Spring

POSC 231 PUBLIC ADMINISTRATION Emphasizes local government planning and administration techniques, taught through simulations, and field study. Comparison of public and private administration. Prerequisite: POSC 201 or 205, or permission of instructor. Fall

POSC 290 SPECIAL TOPICS: ENVIRONMENTAL POLITICS This course is an introduction to environmental political theories and United States environmental politics. It includes the roles of public opinion and interest groups, policy making, enforcement, local governments, and international agencies. Prereq: POSC 201 or POSC 205.

POSC 332 Public Policy Analysis

POSC 451 POLITICS OF DEVELOPING AREAS Economic and political manifestations of poverty, dependence, and development in the non-industrial world. Area foci may include Latin America, Africa, the Middle East, and Asia. Prerequisites: nine credits in POSC, or permission of instructor. Spring, odd years

SOC 290 SPECIAL TOPICS: ENVIRONMENTAL SOCIOLOGY No description currently available.

TDS 160 INTRODUCTION TO POWER AND ENERGY Development of concepts and skills related to mechanical, fluid, electrical, and thermal systems. Includes an overview of energy sources and conversion processes. 2-hour lecture, 2-hour lab. Spring

TDS 265 ENERGY AND SUSTAINABLE DESIGN Study of energy issues and sustainable building design. Primary focus on energy efficient buildings, solar energy systems, and related environmental issues. Projects involve energy analysis of buildings, evaluation of renewable energy options, and world energy issues. Fall

TDS 365 SOLAR DESIGN The design of passive and active solar systems for buildings. Study of basic principles, performance calculations, design optimization, and architectural integration of solar heating, cooling, and photovoltaic systems. Students design buildings using coordinated solar energy systems. 2-hour lecture, 2-hour lab. Prerequisite: TDS 265. Spring, alternate years

TDS 399 ENVIRONMENTAL REGULATION This course will explore various environmental regulations of importance to the environmental, safety, and health professional. This course will provide an overview of several major environmental statutes such as the Emergency Planning and Community Right-to-Know Act, the Resource Conservation and Recovery Act, the Clean Air Act, the Clean Water Act, and the Toxic Substances Control Act. Historic examples of adverse environmental impact and contemporary challenges to environmental and public health protection will be used to integrate these concepts. Federal/state rulemaking processes, regulatory requirements, and likely future trends will be examined, as will the expectations and responsibilities for environmental, safety, and health professional in today's industrial world. Same as ENST 399.

TDS 480 SAFETY AND HEALTH STANDARDS Compliance with OSHA in the workplace, including rights and responsibilities under OSHA, inspections, citations, appeals, and record keeping. The course will also cover the more frequently referenced standards in general industry. Prerequisite: TDS 284, or permission of the instructor. Fall, Spring

TDS 481 HAZARDOUS MATERIALS The safe handling, storage, and use of hazardous materials for industrial, commercial, transportation, and public service operations are covered in detail. Accident prevention measures, training, emergency procedures and response, public safety, and regulatory requirements will be studied. Prerequisites: TDS 281 and 284, or permission of instructor. Fall, Spring

TDS 482 INDUSTRIAL HYGIENE Study of the various techniques and procedures involved in the practice of Industrial Hygiene. Examines the anticipation, recognition, and control of occupational health hazards in the workplace that can cause illness among workers or citizens of the surrounding community. Prerequisite: TDS 284. Fall, Spring

TDS 490 ADVANCED EXPOSURE ASSESSMENT This advanced special topics course will provide advanced safety majors with an opportunity to critically evaluate occupational exposure data for nonroad construction equipment operators in the Northeast region. These data were collected under a grant funded by the United States Environmental Protections Agency during the summer of 2002 and may be used to direct future occupational and environmental exposure analyses and federal rulemaking activities. Students will combine class lecture content with self-directed data analyses, relevant occupational/environmental exposure risk characterization, and report development. Prerequisites include: TDS 284, TDS 482, and permission of instructor.