

REPORT OF AD HOC WORKING GROUP ON CURRICULUM REVISION (November 2002- March 2003)

<u>Table of Contents</u>	Pg.
1. Summary.....	i
2. Introduction.....	1
3. Chronology of Working Group Activities.....	2
4. Number of Curricula.....	3
5. Structure and Requirements of Curricula.....	3
• Environmental Science and Resource Management.....	3
• Paper Science and Engineering.....	6
6. Survey Courses.....	8
7. Connections to University of Washington and Outside Institutions.....	9
8. Advising.....	10
APPENDICES	
(1) Learning Objectives for College Curricula.....	11
(2) Charge to Ad Hoc Working Group on Curriculum.....	12
(3) Materials for faculty meeting November 19, 2002.....	13
(4) Materials for faculty meeting December 17, 2002.....	17
(5) Responses to USDA proposal and BLM Advisory Board Statement.....	20
(6) Materials for faculty meeting February 18, 2003.....	39
(7) Materials for faculty meeting March 18, 2003.....	43
(8) Class Numbers and Student Credit Hours.....	47
(9) Minority Statement.....	49
(10) Survey Courses.....	48
(11) Center for Instructional Development and Research.....	51

Working Group members:

James Agee	Morgan Nichols
David Briggs	Cecilia Paul
Linda Brubaker, Chair	Sarah Reichard (Kern Ewing, Al Wagar alternates)
James Fridley	Clare Ryan
Andrew Hill	Michelle Trudeau
Dawn Maurer	

SUMMARY

Curriculum transformation at the College of Forest Resources (CFR) is a response both to society's need for citizens and professionals broadly educated in natural resource and environmental sciences and to University of Washington (UW) expectations for increased educational efficiency. An Ad Hoc Curriculum Working Group, appointed by Dean Bare and approved by CFR faculty, was charged with undergraduate curriculum revision in November 2002. Recommendations by the Working Group were guided by faculty discussions and by learning objectives identified in previous meetings between faculty and panels of educators, professional groups and former students. Decisions on curriculum structure and content were made by faculty votes in a series of meetings from November 2002 through March 2003.

Because a major goal of curriculum transformation was to integrate areas of fundamental knowledge that underpin environmental and resource science and management, the faculty approved a merger of existing CFR curricula. Specifically, seven curricula were merged into two:

- A new Environmental Science and Resource Management (ESRM)
- A revised Paper Science and Engineering (PSE)

Because of extensive PSE prerequisite and major requirements in chemistry, physics and engineering, further merger was not possible under the UW requirement of 50% credits in common.

The overall goal of the new ESRM curriculum is to present fundamental knowledge and problem-solving experiences that enable students to understand the interdisciplinary dimensions of natural resource and environmental sciences and management. The structure of this curriculum provides great flexibility for students to pursue specialized fields such as previous CFR majors or to construct a much broader educational package. This curriculum is also transfer-friendly to students from community colleges and allows creative linkages to other UW programs.

The goal of the revised PSE curriculum is to provide students with the training, tools, and experiences needed to be successful professionals in the pulp, paper, and allied industries. At the same time, it provides a comprehensive education so that graduates can effectively work and live in the world's complex society. Curriculum revision has reduced the number of required credits, eliminated redundancy, incorporated a capstone design course, and changed the emphasis from a chemical-processing perspective to a products orientation.

CFR's transformed curricula will help meet today's educational challenge in natural resource and land stewardship: providing the integration, breadth and rigor needed for interdisciplinary analysis and problem solving of complex environmental problems. It will produce broadly educated students, offer multiple options for in-depth disciplinary learning, provide a flexible framework for transfer students, and contribute survey courses and enhanced linkages across the UW campuses.

INTRODUCTION

The goal of curriculum transformation at the College of Forest Resources (CFR) is to create a model Bachelor of Science program in which students learn fundamental knowledge and problem-solving skills to meet the complex challenges of natural resource and environmental stewardship. The contentious nature and local-to-national dimension of land-use issues clearly indicates the urgent need for citizens and professionals who understand the interactions of social, biological and physical systems across a spectrum of human impacts. Though virtually all of CFR's existing curricula have taken an interdisciplinary approach to education, they have focused on specialized components of the natural resource and environmental system (e.g., wildlife, forestry, horticulture). The revised curriculum structure fosters integration across systems and is thus better attuned to real-world problems where these systems intersect.

The Context of Curriculum Transformation

Natural Resources and Higher Education: The controversial nature and complexity of resource and environmental stewardship have always generated debate-- even to the most fundamental question of whether definitions of nature should include or exclude the activities of humans. In the Pacific Northwest, as in other regions, this debate is heightened by the extremes of ecosystem function and human impacts between urban centers and wilderness. Maintaining healthy and sustainable biotic systems across the land-use gradient between these extremes is clearly a societal need. However, despite intense interest, society is not well equipped to meet this need. Public agencies and academic programs that address land-use issues are faced with reduced budgets. Public land-management agencies have emphasized the increasing need for broadly educated employees who can manage a wide spectrum of environmental resources. Yet, financial constraints and increasing enrollments challenge the ability of university programs to provide the integration, breadth and rigor needed to develop tools of interdisciplinary analysis and problem solving. Thus, the educational challenge in natural resource and land stewardship is enormous.

UW Niche: The CFR curricula emphasize interactions between biotic and human systems at landscape to regional scales, using the Pacific Northwest as a laboratory. As a result, the College fills a major gap in the offerings of other UW units, which are less focused on the PNW and emphasize smaller scales of biotic function (e.g., biology, health science) or broader scales of societal behavior (e.g., anthropology, sociology, policy). We provide a knowledge base to answer critical questions about how individual organisms and biotic systems respond to perturbations and stresses imposed by human activities, as well as how the environment affects human behavior and institutions. This knowledge enables the design of methods for the conservation, restoration and sustainable use of biotic systems, and is critical for environmental decision making. Thus we provide a unique and essential bridge among diverse elements of the UW community (e.g., engineering, biology, aquatic and fisheries sciences, landscape architecture, public affairs, political science, business).

Curriculum Revision

The proposed curriculum structure has numerous advantages. It will produce broadly educated students with problem-solving skills needed to meet a wide spectrum of natural resource and environmental policy, research and management challenges. The new structure also provides opportunities for individual students to gain in-depth disciplinary specialization through intensive use of elective credits. Furthermore, the structure allows greater administrative efficiency and meets UW expectations for increased teaching efficiency and improved time-to-graduation. It also encourages linkages to a wide range of basic and applied sciences on the UW campuses through connections with current and emerging UW programs.

The Ad Hoc Curriculum Working Group was guided by learning objectives identified in previous discussions between faculty and panels of educators, professional groups and former students (Appendix 1). Within the charge given by Dean Bare (Appendix 2), the group focused on five major areas:

1. Number and focus of undergraduate curricula
2. Structure and requirements of each undergraduate curriculum
3. Survey course needs and approaches to course identification
4. Linkages to other UW programs
5. Approaches to undergraduate advising

CHRONOLOGY OF WORKING GROUP ACTIVITIES, 2002-2003

November 1, 2002, Charge from dean (Appendix 2)

November 19, 2002, Faculty Meeting (Appendix 3)

Motion to approve Ad Hoc Working Group

Motions to establish committees on graduate programs, UW connections

Faculty vote

December 17, 2002, Faculty meeting (Appendix 4)

(approve-oppose-abstain)

Approve two curricula

28-4-2

Approve general structure of ESRM curriculum

27-4-2

Approve integrated, innovative approach to topics of ESRM junior core

21-5-3

February 5 and 13, 2003

Submit USDA Higher Education Challenge Grant proposal (Appendix 5)

Submit Funding for International Post Secondary Education (FIPSE) pre-proposal

February 18, 2003, Faculty meeting (Appendix 6)

Approve major prerequisites and UW graduation requirements for ESRM

22-3-3

Approve content and organization of junior core for ESRM

21-1-6

March 18, 2003, Faculty meeting (Appendix 7)

Approve revised PSE curriculum

23-0-2

Approve name of ESRM curriculum

16-4-5

NUMBER OF CURRICULA

Because a major aim of curricular restructuring was to integrate areas of fundamental knowledge that underpin environmental and resource science, we first asked whether all current curricula could be merged into one that would integrate across the complete range of College disciplines (but see minority statement regarding the Environmental Horticulture and Urban Forestry curriculum, Appendix 6). This was not possible under the UW definition of a curriculum, which requires that programs within the same major must share at least 50% of their required credits. Given these constraints, the working group concluded that it was possible to merge the current seven curricula into two:

- Environmental Science and Resource Management
- Paper Science and Engineering

The extensive PSE prerequisites and major requirements in chemistry, physics, and engineering prevent its merger with other College programs. Though not addressed in this report, integration between curricula is encouraged through the development of courses and seminars/capstones that serve students in both curricula. Both curricula are required to meet similar standards of “teaching efficiency” and productivity, as set by College policy (e.g., student credit hours (SCH)/faculty & number of courses/faculty).

As secondary component of this discussion, the committee examined the number of classes with enrollment above the UW minimum (11) and the average SCH/faculty for the group mainly associated with a given major. These metrics are generally similar across majors (Forest and Ecological Engineering and Sustainable Resource Science were not considered. Appendix 8).

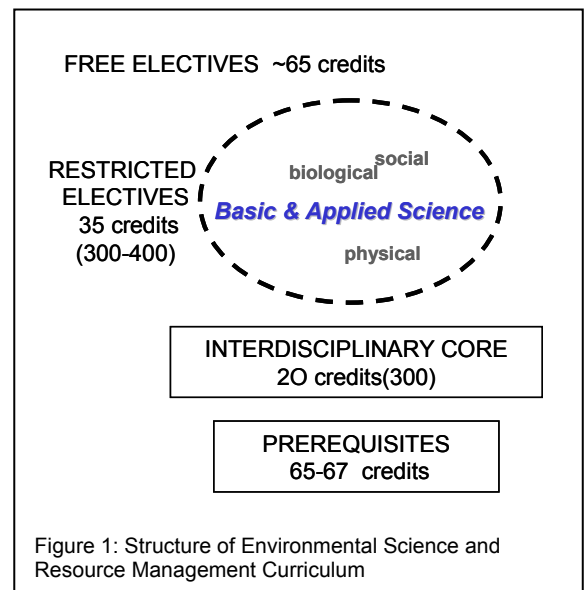
STRUCTURE AND REQUIREMENTS OF CURRICULA

Environmental Science and Resource Management

The overall goal of this curriculum is to present fundamental knowledge and problem-solving experiences that enable students to understand the interdisciplinary dimensions of natural resource and environmental sciences and issues.

This curriculum consists of:

- Prerequisites: 65-67 credits, mainly at 100-200 level
- Common set of interdisciplinary core courses, 20 credits, 300 level
- Restricted electives from within CFR, 35 credits, 300-400 level
- Free electives, ~65 credits



Curriculum Revision

Rationale: This curriculum structure provides maximum flexibility for students to pursue specialized or broadly integrated fields of education. It also encourages new educational connections between the College and other UW or outside programs. Letters of support for a USDA Higher Education Challenge Grant proposal to assist development of the junior-level core indicate a great deal of enthusiasm this curriculum structure (Appendix 5).

The *prerequisites* and UW graduation requirements (Table 1) are broadly specified to provide essential foundation knowledge and to allow students to easily transfer from other UW majors and from community colleges.

The *junior core* (Table 2) embodies our commitment to an integrated, innovative approach to environmental and natural resource education. Instead of starting with disciplinary courses in physical, biological and social sciences, the curriculum begins with real-world problems that integrate these knowledge areas. Fundamental processes

PRE CORE	CORE	POST CORE
Personal interest→	Interdisciplinary case study	→Specialized focus
Foundation knowledge (prereqs) →	Add-on fundamental knowledge	→Specialized knowledge
Writing and math skills→	Measurement/Analysis/Interpretation	→Continued specialization

that structure biotic and social systems and feedbacks between them will be presented through problem-based learning experiences centered on current issues in the Pacific Northwest. The remarkable array of biological-social interactions in this region represents a world-class set of learning opportunities. By starting with integration, students will immediately participate in the aspects of their education that most motivate their learning. Thus the core coursework links student interests and lower-division prerequisites with in-depth upper-division courses that bear on natural resource and environmental problems. The Center for Instructional Development and Research (CIDR) will play an integral role in the development and assessment of the problem-based learning approaches used in the core courses.

The *restricted electives* allow students to choose specialized coursework in basic and applied disciplines that currently exist within CFR, or to build a broader educational experience across environmental and natural resource sciences (Figure 2). Restricted electives include existing and new “magnet courses” that fill instructional gaps on the UW campus. The large pool of restricted electives allows new connections with other UW programs and represents our disciplinary and interdisciplinary contribution to education at the UW.

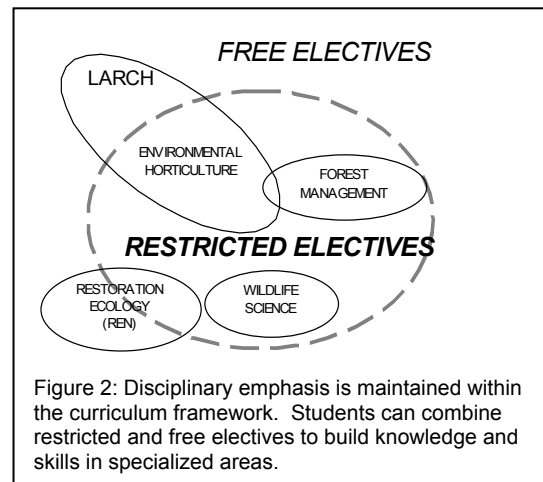


Figure 2: Disciplinary emphasis is maintained within the curriculum framework. Students can combine restricted and free electives to build knowledge and skills in specialized areas.

Curriculum Revision

The large number of *free electives* increases opportunities for students to build individualized programs, transfer from other UW majors, double major and participate in off-campus programs.

Table 1: PREREQUISITES AND UW GRADUATION REQUIREMENTS	
<p><i>Written Communication (12 credits)</i> 5 Credits of Composition (English 131 or equivalent) 3 Credits of Technical Writing (TC 231 or equivalent) 4 Additional Writing Credits (TC 333 or another W course)</p> <p><i>Visual Literary & Performing Arts (10 credits VLPA)</i> 5 Credits COM 220 Public Speaking 5 Credits VLPA (from VLPA list)</p> <p><i>Individuals & Society (10 credits)</i> Core courses meet this requirement.</p>	<p><i>Biology & Soils (13-15 credits)</i> 10 Credits Biology 101 and 102 3-5 Credits of either ESC 210, or ESC 311</p> <p><i>Chemistry (10 credits)</i> 5 Credits Chemistry 120 5 Credits Chemistry 220</p> <p><i>Quantitative & Symbolic Reasoning (20 credits)</i> 10 Credits QSci 291 and 292 or other Calculus Series 5 Credits Statistics (QSci 381 or equivalent) 5 credits CFR 250 GIS</p>

Table 2: JUNIOR CORE COURSES Course Catalog Descriptions
<p><u>Maintaining Nature in an Urban World</u> From the small plant or colony of ants at the junction of a sidewalk and a skyscraper to backyard bird sanctuaries to large, urban green spaces, the preservation, restoration and management of “nature” in urban environments present unique challenges and opportunities. These are explored in the context of problem-based learning where teams of students work with stakeholders, experts and society’s decision making systems to understand patterns, structure, processes and drivers.</p> <p><u>Society at Nature’s Front Door</u> Increasing land use pressures are rapidly changing the interface between developed areas and wildlands. Such interfaces are areas of transition, tension and often great conflict. Much of the tension and conflict revolves around competing demands for the land resource. These are explored in the context of problem-based learning where teams of students work with stakeholders, experts and society’s decision making systems to understand patterns, structure, processes and drivers.</p> <p><u>Ecosystem and Social Dynamics: Preservation, Use</u> Course Catalog Description: The stewardship of comparatively “pristine” terrestrial environments, whether they are embedded in an urban setting, a military base or a distant wilderness area often involves tradeoffs and competing demands. Pollution, invasive organisms, mining, burning, grazing, logging, hunting, skiing, hiking and bird watching are just a sample of the many conflicting and increasing pressures on land use. These are explored in the context of problem-based learning where teams of students work with stakeholders, experts and society’s decision making systems to understand patterns, structure, processes and drivers.</p> <p><u>Quantifying and Qualifying Ecosystem Dynamics</u> Course Catalog Description: Plants, animals and humans coexist in many environments, interacting in manifold, complex ways across the landscape. Stewardship of natural resources involves balancing the management of preservation, recreation and renewable resources within, around and through society. Understanding this balance demands timely knowledge of the location, extent and condition of resources in nature. Scientific method, hypothesis testing and monitoring are key to processing this information. These are explored in the context of problem-based learning where teams of students work with stakeholders, experts and data to understand monitoring, detecting change and analyzing, interpreting and using information.</p>

Paper Science and Engineering Curriculum

The overall goal of this curriculum is to provide students with the training, tools, and experience needed to be successful professionals in the pulp, paper, and allied industries. In addition, the curriculum provides a comprehensive education enabling graduates to live and work effectively in the world's complex society.

This curriculum consists of:

- Prerequisites: 99 credits, 100 - 300 level
- Major Requirements: 45 credits
- Restricted electives: 12 credits, 300-400 level
- Free electives: ~24 credits

Rationale: The PSE curriculum provides graduates the skills they need to function as professional engineers as well as the breadth that is required of well educated citizens in a complex society. To ensure that this curriculum meets the standards set for engineers it has been accredited by ABET, the national engineering accreditation agency. As part of the accreditation (and to ensure that the program meets the needs of constituents), the curriculum has been reviewed by the PSE advisory board, alumni of the PSE program, and by the PSE curriculum committee, which consists of faculty, industry representatives, undergraduate students and graduate students.

The *prerequisites* for the PSE program are extensive and provide considerable scientific and engineering depth. Included in these prerequisites are math, physics, and chemistry courses as well as the junior year chemical engineering sequence. PSE courses draw heavily from all these prerequisites. Most of the lower division prerequisites are available from community colleges and should have been taken by students interested in pursuing an engineering degree. Through careful advising, the PSE program has been able to accommodate community college and UW transfer students into the program without having them take a significant number of extra courses.

The *major core* (Table 3) provides students with fundamental knowledge of pulp and paper products and processes. In addition, these courses develop and sharpen the skills needed to be successful practicing engineers and technical specialists. The revised PSE curriculum reduces the number of required credits, eliminates redundancy in the program, includes a capstone design course, and – most importantly- changes the emphasis from a strictly chemical processing prospective to a products orientation. These changes were made as a result of an outcome-assessment process, feedback from students and alumni, and input from industry representatives who participated on the industrial curriculum advisory board. The freshman and sophomore PSE courses provide an introduction to the paper industry and some basic product, product-testing, and product-development instruction. These courses also give students valuable skills that they can use in internships and summer employment. The junior and senior year classes make up the heart of the curriculum. In these classes students learn in depth about pulp and paper products and process and are given a wide array of tools for designing, producing and operating those processes and products. The core has been carefully reviewed by PSE

Curriculum Revision

faculty to stream line it as much as possible, thus minimizing the number of required courses and eliminating redundancies that would waste valuable credit hours. In addition, some PSE core courses have been re-formulated such that they can be taken by Environmental Science and Resource Management students and by Chemical Engineering students. Specifically, the freshman PSE course is designed to allow non-PSE students to get a broad overview of the industry and the issues, especially environmental issues, the paper industry faces. Depth is provided for PSE students in a required laboratory that accompanies the introductory course. The junior year wood chemistry course has been changed to wood and natural products chemistry. Pulping and bleaching chemistry will be covered in other PSE courses so that this course can take an in-depth look at the chemistry of wood, trees, and plants. Finally, we are working with Chemical Engineering to have three PSE courses (papermaking laboratory, process control, and the capstone design course) listed as approved substitutions for required chemical engineering courses. These courses, and the survey courses offered by the PSE program, represent a unique disciplinary and interdisciplinary contribution to education at CFR and the UW.

Table 3: REQUIREMENTS FOR PSE CURRICULUM*

<u>Freshman Year:</u>		
PSE 201 (3 credits)	<i>Introduction to Pulp and Paper Technology</i>	Autumn
PSE 202 (1 credit)	<i>Pulp and Paper Lab and Field Studies</i>	Autumn
PSE 450 (1 credit)**	<i>Current Topics in the Pulp and Paper Industry</i>	Spring
<u>Sophomore Year:</u>		
PSE 248 (4 credits)	<i>Paper Structure and Properties</i>	Winter
PSE 450 (1 credit)	<i>Current Topics in the Pulp and Paper Industry</i>	Spring
<u>Junior Year:</u>		
PSE 406 (3 credits)	<i>Wood and Natural Products Chemistry</i>	Autumn
PSE 476 (3 credits)	<i>Pulping and Bleaching Processes</i>	Winter
PSE 450 (1 credit)	<i>Current Topics in the Pulp and Paper Industry</i>	Spring
PSE 478 (3 credits)	<i>Pulping and Bleaching Laboratory</i>	Spring
PSE 4XX (3 credits)	<i>Fiber Sources and Properties for Papermaking</i>	Spring
<u>Senior Year:</u>		
PSE 402 (3 credits)	<i>Paper Physics and Mechanics</i>	Autumn
PSE 477 (3 credits)	<i>Papermaking Processes and Chemistry</i>	Autumn
PSE 497 (1 credit)	<i>Pulp and Paper Internship</i>	Autumn
PSE 479 (3 credits)	<i>Papermaking Laboratory</i>	Winter
PSE 480 (3 credits)	<i>Pulp and Paper Process Control</i>	Winter
PSE 481 (3 credits)	<i>Pulp and Paper Unit Operations</i>	Winter
PSE 450 (1 credit)	<i>Current Topics in the Pulp and Paper Industry</i>	Spring
PSE 482 (3 credits)	<i>Engineering Economics</i>	Spring
PSE 487 (5 credits)	<i>Pulp and Paper Process Design</i>	Spring
Total Required PSE Course Credits: 48		
Number of Required PSE Courses: 19		
*not including prerequisites and UW graduation requirements		

Curriculum Revision

The *restricted electives* allow students to choose specialized UW coursework in basic and applied disciplines, relevant to paper science and engineering. Of special note is the PSE business option that gives students transcript recognition for taking a series of core business classes.

The number of *free electives*, while not large, is sufficient to provide opportunities for students to build individualized programs, transfer from other majors, double major and participate in off-campus programs.

SURVEY COURSES

The goals of survey courses are to: 1) provide general knowledge about natural resource and environmental science to UW students, 2) attract students to CFR as majors, and 3) increase student credit hours (SCH) to meet CFR targets. New survey courses should not be developed haphazardly (one by one), but should be identified with an awareness of CFR undergraduate and graduate enrollments, the total array of survey-course topics and the realization that survey-course teaching requires ample time for preparation and exchange of experiences and ideas among instructors. We have used a model that takes into account current and future CFR enrollment (Appendix 7) to estimate SCH targets for survey courses. This information guides our recommendation.

Given the need for coordination in survey course teaching, the Committee on Large Class Teaching should be renamed the Survey Course Committee with responsibility for coordination, development and oversight of teaching CFR survey courses. This committee should be charged with the following immediate tasks:

- Survey courses should total 18,000 SCH for the 2003-2004 and following academic years (Appendix 5)
- Survey course offerings should be developed with coordination, to include:
 - a range of course topics that reflects the breadth and depth of the College of Forest Resources,
 - mechanisms for communication and exchange of experiences among instructors,
 - other goals as identified by the committee.
- Course development should explore opportunities for distance learning and other remote-education venues (e.g., EDGE)
- Course development and assessment should take advantage of various UW centers for educational improvement (e.g., CIDR)
- The committee should identify barriers and strategies to overcome them (e.g., class rooms, TAs, release time for course preparation, teaching-practicum credit for graduate assistants)
- Course development and implementation must be done in the context of UW deadlines for 2003-2004 academic year.

Curriculum Revision

By June 1, 2003, the Survey Course Committee should provide documentation of the progress on survey course development for the 2003-2004 academic year, to include:

- Course titles and instructors
- Projected SCH/course
- Schedule of offering in Autumn, Winter, and Spring quarters

CONNECTIONS TO OTHER UW PROGRAMS

The variety of existing, emerging, and potential linkages between CFR and other UW curricula ranges from service teaching in courses listed in other departments to jointly-designed degree programs that build on cross-campus disciplinary expertise.

Existing Cross-Campus Linkages:

- CFR contribution to Biology Teaching Program (Professor Ford)
- CFR – School of Business Administration (Professor Paun)
 - Associate Director of the Business School's Retail Management Program (provides a Certificate in Retail Management)
 - PSE Business Option
- Dual MS-MPA between CFR (Environmental Horticulture, Social Sciences, Wildlife) and Evans School of Public Affairs
- Environmental Horticulture and Urban Forestry – Landscape Architecture (cross-department requirements for majors)
- Interdisciplinary Graduate Education, Research and Training (IGERT) Grant to Graduate Program in Urban Ecology (CFR), College of Architecture and Urban Planning and Department of Geography (Professors Bradley, Marzluff, Ryan, Alberti, ZumBrunnen). Support via National Science Foundation (NSF) IGERT and Biocomplexity Grants and UW Tools for Transformation (TFT) Grant.
- UW Restoration Ecology Network - three campus, undergraduate certificate program in restoration ecology with a very successful capstone series, supported originally by TFT. Administered by Program on the Environment (PoE). (Professors Gold (UWB) and Ewing (UWS)).
- Joint UW – Sichuan University Exchange Program – emerged from the China sub-group of the International Faculty Council, headed by Professor Kalonji (Material Sciences) and linked to CFR (Professor Hinckley), Biology (Professors Olmstead and Hall), Civil Engineering (Professor Brett) and Anthropology (Professors Harrell and Pena). Supported by TFT, FIPSE, NSF.

Emerging or Potential Cross-Campus Linkages:

- Schools of Marine Affairs & Fishery and Aquatic Sciences (Professors Leschine, Hershman, Gallucci, Parrish, Lee, Ryan, Hinckley, Chalker-Scott) (Appendix 9)
- Department of Landscape Architecture: (Professors Chalker-Scott, Reichard, Robertson, Hill, Winterbloom)
- PoE: (Professors Lee, Hinckley, Chalker-Scott, ZumBrunnen, Palka, Pena)
- Multi-campus effort in restoration ecology: (Professors Ewing and Hinckley)

Curriculum Revision

- Conservation Biology and Invasive Species (Professors Reichard, Boersma, Ruesink, Groom)

Other Linkages:

- College of Education - environmental education
- Various external units in Environmental Education such as
 - Camp Washowitz (Roberta MacFarlane)
 - Island Wood Learning Center
- Earth Corps
- International
 - International design/build program (Sustainable Resource Sciences and Department of Architecture)
 - National Chung Hsing University, Taiwan
 - Scholars exchange: Center for Urban Horticulture-Awaji Landscape Planning and Horticulture Academy (Japan)

ADVISING

For a flexible curriculum to be effective, there must be efficient advising tools to help students identify coursework leading to their career goals and personal interests. This is especially important for students interested in current majors that might suffer from lower visibility in the new ESRM curriculum. We envision four types of formal and informal advising to help students decide whether to major in CFR and identify course combinations to achieve their goals:

- 1) Student and Academic Services to provide general undergraduate academic advising relating to both CFR and UW requirements, process petitions and transfer courses, and assist students with graduation applications.
- 2) Faculty Advisors covering a range of specializations or interest areas within the College to help students identify educational and career directions.
- 3) Undergraduate and graduate student peer advisers to talk to students about their education and what it's really like to be a student at the College.
- 4) Web-based advising to help students via web tools. We are developing a series of "what if" scenarios for students to explore what they might learn and do with a degree from CFR. Students will find descriptions of real people (current students and graduates) across a range of careers and interests. They can surf various career fantasies or general interests and see what courses or groups of courses within CFR and UW would be suitable to allow them to follow various interests. Web pages would lead them to contact information for faculty and students with whom they can talk further.

APPENDIX 1: LEARNING OBJECTIVES

1998 College of Forest Resources Curricular Retreat at Camp Long

Graduates of the College will be able to:

KNOWLEDGE SETS:

- Understand social, ecological, and economic theory, concepts, and processes at multiple scales.
- Understand biological, physical, and chemical processes.
- Understand professional and environmental ethics.
- Understand application of ecosystem concepts at multiple scales along the urban to wildland gradient.
- Understand the processes of science, design, and management; the process models used to describe and communicate them; and their role in contemporary environmental issues.

SKILL SETS:

- Effectively work in interdisciplinary teams.
- Effectively communicate to a diversity of audiences using written, oral, and graphic methods.
- Effectively access, evaluate, and use information and information tools.
- Recognize research methods used by the social, natural, and design sciences.
- Effectively apply analytical skills, including basic measurement and monitoring skills
- Effectively and appropriately use computers.
- Effectively be able to do at least one of: devise and conduct a scientifically sound inquiry; design an environmental system or a component of an environmental system; or devise a rational management plan, including plans for its implementation.

DEVELOPING COMPREHENSION, INTEGRATION AND MEANING:

- Understand interactions among plant, animal, and abiotic features of ecosystems.
- Understand business, ecological, and social tradeoffs inherent in natural resource management and use.
- Understand and evaluate policy in context with cultural and historical heritage.
- Understand the expected consequences of implementing a research, design, or management plan and be able to explain them.

APPENDIX 2: CHARGE TO AD HOC WORKING GROUP

November 1, 2002

Dear Colleagues,

The following Ad Hoc Working Group is hereby established. It is composed of the following members:

Faculty: Brubaker (Chair), Ryan, Reichard, Briggs, Agee, Fridley; Staff: Trudeau and Paul; Students: Josh Taylor, Others (TBA)

The charge to the WG is based upon the principles enunciated in my [memo](#) of October 31, 2002 which reflect a reduced resource base for the College. Please follow these in developing your specific recommendations to the faculty. The Working Group is to design a curriculum structure to:

- provide high quality and high impact programs of study for graduate and undergraduate students;
- address educational goals for courses offered at both graduate and undergraduate levels;
- develop links and collaborative courses with other campus programs;
- recommend ways to consolidate and reduce the number of course offerings required to achieve learning outcomes;
- ensure that the common core and general education courses clearly and completely cover the ecological, economic and social building blocks of sustainability;
- ensure that service courses are established as a regular part of our educational identity and that instructional resources are committed as part of the annual instructional plan;
- explore and recommend the feasibility of 4-1 curricular structures to integrate graduate and undergraduate programs;
- identify all required and optional courses for the curriculum and outline the essential learning outcomes associated with each course

Integration, consolidation and interdisciplinarity are key markers of our new identity and must be solidly visible in our new programs.

Due to the critical nature of your work, I ask for a report at the all-college faculty meeting on November 19, 2002. This report must provide the structure and content (not all of the individual course details) of both the graduate and undergraduate programs. Especially important are the Masters-level graduate programs and how they build on the broadly-based undergraduate programs.

I greatly appreciate the Working Group's willingness to help with this important endeavor. If you need assistance or additional resources to complete your task, please let me know. Thanks and best wishes.

B. Bruce Bare, Dean

APPENDIX 3: FACULTY MEETING, NOVEMBER 19, 2002

Background material:

Vision of Curricular Revisions

Grand scheme:

Definitions of nature have always struggled with the role of humans: between those that include humans to those that see humans as apart from nature. This dualism is expressed on real scales. In the PNW, it is seen in the extremes of ecosystem function and societal impacts in biotic systems. We have a natural laboratory that spans a gradient from urban to wilderness and a public (students, citizens) interested in the environment. At the urban end of that gradient, the environment cannot be considered independent of human institutions and activities. At the other end of the gradient, there is much debate about the separation of nature and humans in wilderness. We play a major role in educating students and citizens about the function and management of terrestrial ecosystems and societal interactions with these systems. We have made strong links to disciplinary and interdisciplinary units on campus to achieve this vision.

University:

Our educational contribution to the UW is the understanding of interactions between the biotic and human systems that occur from individual to regional scales. We fill a major gap in the offerings of other UW units, which emphasize smaller scales of biotic function (biology, health science) or broader scales of societal behavior (anthropology, sociology, policy). We provide a knowledge base to answer critical questions about how individual organisms and biotic systems respond to perturbations and stresses imposed by human activities as well as effects of the environment on humans. This knowledge enables the design of methods for the conservation, restoration and sustainable use of biotic systems, and is critical for environmental decision making. We provide a unique and essential bridge among diverse elements of the university community (e.g., engineering, biology, aquatic and fisheries sciences, landscape architecture, public affairs, political science, business).

Guiding Principles for Curricular Revision

The immediate necessity is for the College to have a greater educational impact with fewer resources. Slight changes in the curricula will not accomplish this task. Major changes are needed to meet the immediate crisis as well as to reach our larger vision (described above).

In this context, the College's undergraduate curriculum(a) must:

- be attractive to a LARGE sector of the UW student body; be relevant to the University in its urban setting
- be complementary within the College: i.e., not compete for same students

Curriculum Revision

- be friendly to transfer students; flexible for diverse student interests and backgrounds
- increase teaching efficiency
- reduce fragmentation
- be strategically coupled with graduate programs

The committee is considering curricular goals, teaching efficiencies, and greater linkages to the University community. In preparation for the November 19th faculty meeting, discussions have centered on the following design of undergraduate curricula. The goal of the meeting is for the faculty as a whole to discuss these potential directions.

Proposed Curricular Structure

1) Curriculum A (Interdisciplinary):

Bachelor of Science Requirements (~60 credits): Basic math, biology, English, etc.

Cornerstone Requirements- required of all students (~20 credits, Junior/Senior):

- Urban-to-Wildland Ecology
- Society and the Terrestrial Environment/Resources
- Economic Aspects of Environmental/Resource Issues
- Multi-disciplinary Analysis Techniques

Restricted Electives (~35 credits): credits restricted to the College, with opportunity for certification. *Examples of topics* include:

- Urban, Forest, Restoration Ecology
- Wildlife/Conservation/Invasive species
- Insects/Pathogens/Fire
- Horticulture/Silviculture
- Soils/ Hydrology/ Watersheds
- Environmental Engineering, Design
- GIS/ Measurements
- Society/Culture
- Ethics/Policy/Conflict Resolution
- Economics/Business
- Land-use/landscape/resource Planning & management

Free Electives: (~65 credits)

2) Curriculum B (Paper Sciences):

This curriculum is currently under revision. The outcome assessment process, begun as a result of ABET accreditation, has identified areas where the PSE Curriculum needs to be

Curriculum Revision

improved. In addition, the PSE program is looking to cut and consolidate required courses to release faculty resources for service teaching and to expand the research program.

Motions proposed:

On Wed, 20 Nov 2002, John Perez-Garcia wrote:

> Hello Colleagues,

>

> This message is being sent to voting faculty of the College of Forest Resources. If you feel that you are not a voting faculty> please contact me at perjohm@u.washington.edu or Sally Morgan at slm@u.washington.edu.

We are on a fast track so please read the two statements below and vote.

The statements are:

Vote: Yes No Abstain

1. The Ad Hoc Committee appointed by Dean Bare should continue with its work.

Vote Yes No Abstain

2. The EFC should provide the leadership in appointing necessary committee(s) to move transition along in a timely fashion.

Regards,
John

Curriculum Revision

Result of Votes:

Date: Fri, 22 Nov 2002 08:06:36 -0800 (Pacific Standard Time)
From: John Perez-Garcia <perjohm@u.washington.edu>
To: Undisclosed recipients: ;

Hello Everyone,

32 out of 49 voting members have voted and the results are as follows:

- Q1. Ad Hoc committee continuance. Yes: 25 No: 6 Abstain: 1
Q2. EFC leadership in appointing committees. Yes: 25 No: 4 Abstain: 3

I would like to recommend that the Ad Hoc Committee continue with its work on the undergraduate curriculum and that the EFC act as a conduit for discussions with the faculty and the Ad Hoc committee. This discussion would be facilitated through email and lead to a vote by the faculty at the next all faculty meeting scheduled on December 17. That gives us about three weeks.

I would also like to recommend that the Ad Hoc Committee be supplemented with additional help in discussions on:

1. Graduate program linkages
2. University wide linkages
3. Other linkages we should be exploring.

Each one of the items listed above can be a subcommittee or not. Faculty members at large that want to participate to do so by letting the EFC know.

EFC Members are:

John Perez-Garcia (Chair)
Linda Chalker-Scott (Vice Chair)
Jim Agee
Darlene Zabowski
Tom Hinckley (alternate)
Peter Schiess (on leave)
Kevin Hodgson
Bob Lee (alternate)

Regards,

John

APPENDIX 4: FACULTY MEETING, DECEMBER 17, 2002:

Background materials distributed prior to meeting:

Proposed Motions for Faculty Vote (December 17, 2003)

Motion One:

The undergraduate program shall consist of 2 curricula:

- Revised PSE curriculum (structure to be determined)
- Interdisciplinary curriculum incorporating elements of the current non-PSE curricula.

Rationale: Two curricula are identified based on the commonality of prerequisites and core knowledge areas. UW requires that programs in the same major share at least 50% of their required credits. PSE's extensive math, physics, chemistry and engineering requirements make it impossible to combine that program with others into a single major. Both curricula must meet similar standards of "teaching efficiency." Criteria for evaluation will be developed with input from faculty.

Motion Two (see diagram):

The interdisciplinary curriculum shall consist of:

- UW graduation and curriculum prerequisites: ~60 credits, 100-200 level
- Common set of core courses: ~20 credits, 300 level
- Restricted electives from within the College: ~35 credits, 300-400 level
- Free electives: ~65 credits

Rationale:

Prerequisites: UW graduation requirements and other prerequisites similar to those of current curricula (more courses than in current structure to give greater flexibility to transfer students).

Core courses: The core courses embody our unique educational niche at UW. Collectively they ensure knowledge of fundamental principles and processes that explain the behavior and interaction of biotic and social systems along gradients from highly to minimally impacted terrestrial ecosystems. Courses will be offered twice yearly and are not intended to be taken in sequence.

Restricted electives:

Pool of courses that provide some breadth of training from within CFR and can be combined to create different educational and professional emphases (physical, biological, social, or cross-cutting these)

Students select coursework packages with carefully developed "guidance tools" and personal advising

This organization provides maximum flexibility: it allows specializations that have been strong in the past, as well as new designs; allows a broad environmental education;

Curriculum Revision

encourages new educational connections (classes/programs) with other UW units; attracts outside students to our unique UW niche. Electives should include “magnet courses” that fill instructional gaps on UW campus (thus popular to outside audience). Course offerings must be coordinated with in-house and cross-unit graduate programs (e.g., 3-2, 4-1 programs). Faculty may establish formal/informal groups to facilitate disciplinary or cross-disciplinary educational (and research) opportunities. These faculty groups should be flexible (i.e., entrepreneurial) over time to craft new directions in teaching and scholarship.

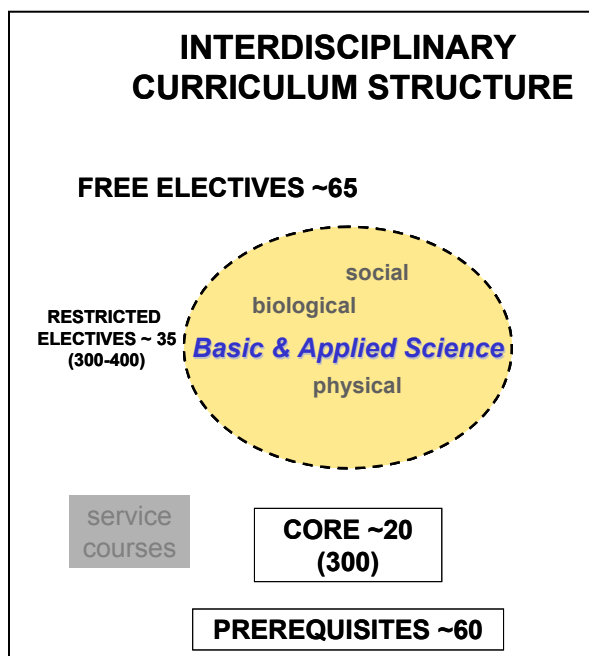
Free Electives: The free electives add further educational flexibility by increasing opportunities to take joint programs, build individualized programs, add to specialized interests, transfer from other majors, double major, participate in off-campus programs.

Motion Three:

The core course requirement shall consist of 4 courses (5 credits each) covering the following topics:

- Ecology
- Society/Culture
- Environmental/Resource Economics
- Field Analyses

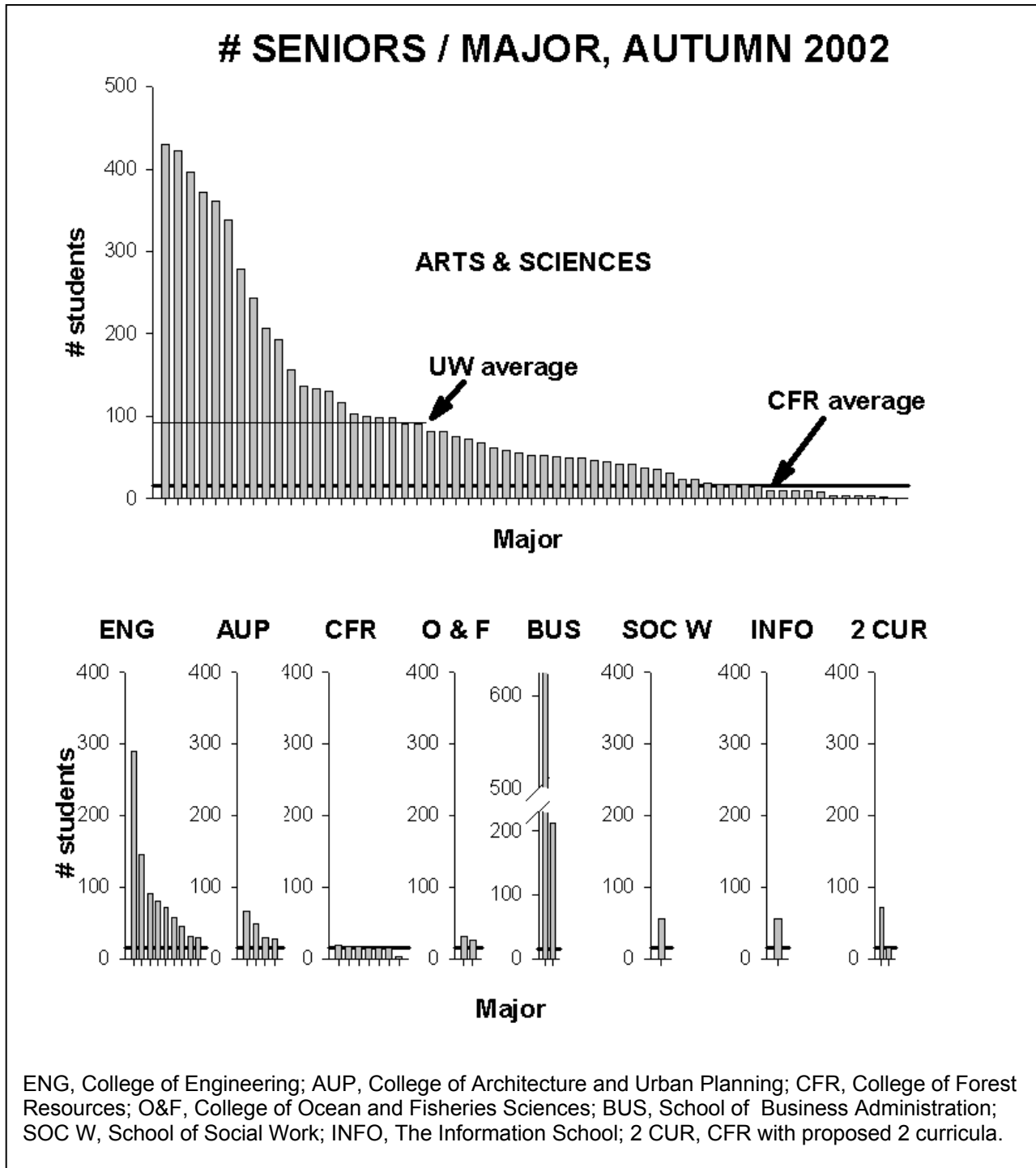
Rationale: The core coursework has 2 major objectives: provide 1) fundamental knowledge for understanding social-biotic interactions that impact terrestrial environments, and 2) a foundation for upper division courses. Although individual courses take a disciplinary perspective, they will be developed in the context of the total package to insure an interdisciplinary treatment of material and complementary of subject material and student experiences (without major overlap).



Curriculum Revision

Material presented during Faculty Meeting:

Enrollment Comparison among UW Colleges and Schools: The data illustrated below come from the “University of Washington Quarterly Enrollment Profile, Autumn Quarter 2002” (compiled by Linda Brubaker). The graph was presented show how the CFR student profile (measured as # seniors per major) compares to those of other UW Colleges and Schools.



APPENDIX 5: SUPPORT OF USDA PROPOSAL (AND STATEMENT TO BLM DIRECTOR)

CONTENTS

1) Letters of Support for USDA proposal:

Agencies, Universities, Corporations:

*Robert Alverts**: Regional Science Advisor, US Geological Survey

Brian Boyle: former Washington State Commissioner of Public Lands

*Renee Brooks**: Research Scientist, Director of the Integrated Stable Isotope Ratio Facility, Western Ecology Division, EPA

*James P. Lassoie**: International Professor of Natural Resources, Professor of Conservation Science and Management, Department of Natural Resources, Cornell University

*Mark Mead**: Senior Urban Forester, Citywide Urban Forestry Program, Seattle Department of Parks and Recreation

Dennis Meyer: Principal, The Portico Group; Architects, Landscape Architects, Interpretive Planners, Exhibit Designers

*Constance I Millar**: Senior Research Scientist, USDA Forest Service, Pacific Southwest Research Station, Sierra Nevada Research Center

Recent graduates

Mason Mckinley: Staff Forester, Charles L. Pack Experimental Forest (UW)

Angela Mallon: Former student in College of Forest Resources and College of Landscape Architecture and Urban Planning

Current Students

Mike Liquori: Graduate student, Forest Engineering

Edie Sonne Hall: Graduate student, Quantitative Resource Management Program

Morgan Nichols: Graduate student, Social Sciences Program

Brian Zwiebel: Graduate student, Social Sciences Program

Dawn Maurer, Andrew Larson, Mitchell Allgamauer-Bay: Undergraduate students, representing three of the curricula: Wildland Conservation, Forest Management, Environmental Horticulture and Urban Forestry.

Mitchell Almaguer-Bay: Senior, Environmental Horticulture and Urban Forestry

Dean, College of Forest Resource, University of Washington

B. Bruce Bare

2) Bureau of Land Management Science Advisory Board Statement on Natural Resource Management Curricula

* Former Student

1) Letters of Support for proposal to USDA Higher Education Challenge Grant Program:

Robert Alverts: Regional Science Advisor, US Geological Survey

As an active alumnus and member of the College Visiting Committee (Advisory Board), I reviewed with great interest your proposed curriculum change for the UW College of Forest Resources. I find the proposal well reasoned and thorough. It is refreshing to see a curriculum that focuses on real world problems and brings together integrated disciplines and interdisciplinary behavior and team solutions to complex issues. In my view most current curriculums do not yet follow this new approach, so UW appears to be on the front end of a new methodology for undergraduate forestry education.

Although the new curriculum incorporates a number of innovative ideas, a key strength of the curriculum change is the retention of historic core programs of the College of Forest Resources, including forest engineering and forest management. Coupling these rich traditional education requirements with key new education components in an interdisciplinary problem solving orientation, should provide a strong foundation for future forestry and related natural resource management education.

As one who spent 35 years as a natural resource manager with the Bureau of Land Management, and currently as a regional science advisor for a major federal research agency, the US Geological Survey, I can assure you the curriculum elements and course work planned in the new curriculum are a strong match with the kinds of skills needed in today's workforce. These same skills are important to all sector employers, so the new curriculum should be relevant to all sectors – a major strength.

Thanks for the opportunity to review the draft curriculum proposal. I wish you every success with it's adoption and implementation. I believe it will go along way to providing the technical foundation and associated tools that should equip the next generation of foresters and natural resource managers to effectively manage our nation's resources.

Brian Boyle: former Washington State Commissioner of Public Lands, Chair of the College Advisory Committee.

I have had the opportunity to review your proposal for USDA Challenge Grant funding and want you to know how appropriate and timely is this proposal for refreshing natural resources education.

In twelve years as Washington State Commissioner of Public Lands I constantly struggled with our need to increase the capabilities of our resource managers to propose and execute sound, facts-based resource allocation decisions, and also work within the complex standards set within a demanding civil society. It was not enough for a

Curriculum Revision

manager to have command of forest and engineering knowledge, as it had been for many years; nor was it sufficient to simply assemble a group of concerned citizens and ask them to impose their own standards on the management of our public lands.

More recently, I see the UW curriculum challenge from my position as Chair of the College of Forest Resources Visiting Committee (a volunteer citizen group), and realize how critical is the evolution to problem-based learning that you and the faculty are describing. This change is important not only for the College, to advance its teaching methods, but also for students, who need a new catalyst that will encourage natural resources degrees, and for resources agencies and companies, who need advanced and comprehensive skills.

You have correctly, I think and hope, characterized the emergent technical and social challenge facing natural resources managers today and tomorrow. I believe the curriculum proposals you are advancing can help produce a cadre of managers and policy makers who are capable of stepping into increasingly-complex positions and adding rapidly to their own knowledge on the job. In addition, as the need for wood and other commodity products increases and land management for these commodities becomes more critical, these same managers should be able to quickly adapt. And the public will gain, as natural resources will be put into the able hands of the people who emerge from your formidable program.

Dr. Renee Brooks: Research Scientist, Director of the Integrated Stable Isotope Ratio Facility, Western Ecology Division, EPA

I am writing a letter of support for the proposed undergraduate core courses by faculty members of the College of Forest Resources. I believe the focus on problem solving for a diverse array of environmental problems and leadership skills would provide an excellent foundation for a new graduate coming into a position at the Environmental Protection Agency. Our research is mission oriented, focused on solving today and tomorrow's environmental problems. As such, the focus our research can shift dramatically from project to project, and our research scientists need to have the skills to approach new and emerging environmental problems where they may not have expertise or experience. For example, research in my own group has shifted from extrapolating ozone effects from seedlings to mature forest, to salmon recovery and the role of salmon derived nutrients in salmon recover, stream and riparian productivity and clean water. We also focus on research that is policy-oriented, meaning that our research will provide the necessary science background for decision makers to decide on environmental issues. We need to be able to identify the policy questions and the science gaps in answering that question. Although an applicant to the EPA Office of Research and Development needs a strong science background, an applicant prepared and willing to tackle a broad array of problems, and work in large interdisciplinary groups would have a distinct advantage for a job to help solve the large-scale environmental problems the Agency needs to address.

T

Curriculum Revision

The proposed curriculum by CFR faculty would produce such students. The idea of focusing on problem-based education and teamwork is a very realistic approach to teaching students how to help solve today's natural resource and environmental problems. My own undergraduate education was from a traditional forestry school (UGA), but with a strong commitment to active involvement of students and project-oriented classes. Those group projects taught me many skills that traditional lectures would never have, thus I understand first hand the advantages of the proposed core courses. Active involvement of students in their education and allowing students to take leadership roles within classes focuses on the idea of leadership at all levels, a concept much valued by the Office of Research and Development at the EPA. The curriculum also focuses on hands-on work, intensive field work, data collection, analysis and interpretation, all essential skills in today's resource management and environmental protection. In my mind, an applicant with such a set of skills would have an advantage over students coming from the more traditional lecture-oriented program.

James P. Lassoie: International Professor of Natural Resources, Professor of Conservation Science and Management, Department of Natural Resources, Cornell University

Thank you for the opportunity to review your proposal to develop, conduct and evaluate a junior-level core to support your newly developed undergraduate major. I had heard that an innovative major was "in development" at the College, and you and your colleagues certainly have been busy to a good end!

Let me congratulate you on designing a new B.S. degree program that fits your strengths and locale extremely well. As you know I have been involved in various educational reforms here and elsewhere. and your focus on understanding the stewardship of natural and managed environments is unique and "right on target." First, the use of stewardship as a guiding principle is far superior to the more confining concepts underlining other land use approaches, such as "utilization", "protection" and even "conservation". Stewardship implies a long-term and

caring commitment to sound land uses and should rest well with the multiple stakeholders interested in The Pacific Northwest's natural resources and beyond. Second is the program's focus on "sustainability" which attempts to optimize social, economic, and environmental benefits rather than maximizing one or the other. Helping students to understand and appreciate the difficulties of do this in a pluralistic society is difficult, but absolutely necessary if they are to become effective environmental and natural resource professionals. Lastly, is the programs' consideration of a continuum of environments -- from the most wild to the most manipulated. This is absolutely the best perspective for a college so strategically located within a region facing so many urban-rural conflicts related to its natural resources. As other areas of the country are facing similar conflicts, I am sure your approach to educating professionals to addresses them will be of wide interest nationally. I also expect this major to be very appealing to undergraduates. It will

Curriculum Revision

also be both challenging and fun for the faculty. I wish we could do something similar here!

The proposal to have a junior-year core curriculum supporting this new B.S. is simply excellent. It will accomplish three very important, but often neglected, aspects of the educational process.

(1) It is based on integration of disciplines. The academe has spent much time discussing interdisciplinary studies, but rigorous programs are difficult to find. I believe you have a model for a successful one.

(2) Complex, interdisciplinary problems cannot be simply taught the way we learned tree physiology. Today's students are ready to engage in an active learning environment where interactions with students and faculty are the norm. This is a new learning process for many faculty and I applaud the commitment of the college faculty to building such a shared learning environment. Everyone learns a lot and students leave with an ability to work on teams to address complex problems.

(3) The core's focus on providing a "real-world" context for learning is a powerful attribute. I did a "senior practicum" two years ago that examine a local watershed and its various stakeholders. Students later commented that it was the first time in four years that they had actually done something useful to other people! We also received positive comments from many stakeholders outside the institution, which certainly helped to improve Cornell's sometimes problematic relationship with the community. I am sure this will be the same for your program.

In closing, we developed a similar approach to graduate education in the late 1980 in an attempt to educate the "new conservationist." This continued under the umbrella of "conservation and sustainable development" throughout the 1990s with NSF support, and remains active today. Successful within its limits, this effort developed courses but never a curriculum, and educated many graduate students, but no undergraduates. It also did not place management within a development continuum. I see your new major and its junior-year core providing a unique opportunity for undergraduates in preparing them for meaningful professions. I certainly will look for them in the future when searching for new graduate students!

Best of luck with your new major and your proposal. I am very optimistic about both. In fact, if you want any involvement from "out east" let me know!

Mark Mead: Senior Urban Forester, Citywide Urban Forestry Program, Seattle Department of Parks and Recreation

This is a letter of support for the proposed changes in the resource professional program at the College of Forest Resources. The rapid changes in the field of natural resource

Curriculum Revision

management should be mirrored in the curriculum and programs of our educational institutions. Today's forest professional has an ever increasing array of technological and scientific tools at their command, however they also have political and social pressures that increasingly shape management decisions. The College of Forest Resources will provide a great service to this City, and the field of natural resource management, if they can provide the tools to new natural resource professionals that will allow them to be technologically proficient leaders and decision makers.

As Senior Urban Forester for Seattle Department of Parks and Recreation (DPR), I am responsible for the forestry and resources protection for 5,000 acres of urban forest, over 10% of the landmass of a city of 500,000 people. This forest is small when compared to the millions of acres that most federal, state, or corporate entities manage. However, the issues a typical forest manager may deal with in terms of political realities, budgetary justification, and non-timber related use are exaggerated exponentially by urban pressures.

To manage effectively in this confusion of needs, a forester is forced to understand the political, the sociological, and physical needs of the community. Our Department has learned to manage its resources in this setting by combining the skills and efforts of a multitude of professions. I manage our forests by drawing from these skill resources. Where in some situations I provide detailed forestry content to decisions makers, in other situations, I rely on the input of professionals outside of my field to help guide my decisions. The most important ability I now have is the ability to understand the needs of other professionals and the ability to communicate my needs to them.

The successful integration of competing needs with resource limitations is not always settled by facts and figures. In many cases the content of a decision is overshadowed by the context. By understanding the fundamental needs of each other we are able to derive solutions that can satisfy these needs.

The planned outlined by the College will rely on the high level of expertise and energy of its instructors. We have found that hands-on learning is not effective unless it can be guided by knowledgeable experts that remain flexible and entrepreneurial in approaches. Teaching people how to think in the middle of the multitude of stresses and restrictions found in today's forestry can only be done through example and practice. It is my recommendation that the instructors of the College be practitioners of the same arts they are seeking to instill in their students.

I believe now is the correct time for the College of Forest Resources to create graduates with the confidence gained from technological expertise and social intuition based upon real world experiences. Direct involvement in the social, political and greater community can only build better decision makers.

Dennis Meyer: Principal, The Portico Group; Architects, Landscape Architects, Interpretive Planners, Exhibit Designers

Thank you for the opportunity to review the university's proposed new undergraduate curriculum in the College of Forestry. I commend your multi-disciplinary approach to creating new professionals trained in natural resource and open space stewardship. By emphasizing real life management issues in the surrounding communities and region, the university has identified a way to reinvigorate and make the college relevant in the 21st century.

As a landscape architect and principal at The Portico Group - a Seattle based multi-disciplinary firm of landscape architects, architects and exhibit designers – your proposed curriculum has many parallels to our design approach for zoos, botanic gardens, parks and interpretive centers. All of our work is content based and often seeks to present information on, or resolve, land management issues that may be contentious, have multiple perspectives and no simple answers. Your approach should find an appreciative response from students, employers and public officials.

If I was still a high school senior, I would find a program as you describe enticing. In fact a similar program in high school directly influenced my choice of college, profession and the type of design office I practice in. That experience combined instructors in social studies, math and English to create a student directed program in environmental studies. I wish you and the college success in your transformation.

Dr. Constance I Millar: Senior Research Scientist, USDA Forest Service, Pacific Southwest Research Station, Sierra Nevada Research Center

Thank you for the opportunity to write in support of the proposal by the University of Washington, College of Forest Resources (CFR) for a new upper-division core curriculum focused on complex resource problem-solving. I applaud the approach you and your colleagues have outlined and strongly recommend its implementation.

As you know, I received my B.S. from CFR in 1977, and, after completing graduate work, have served as a federal research scientist with the USDA Forest Service since 1985. In this capacity, I have been in the cauldron of numerous bioregional assessments and resource policy-making processes from local to national scales, where I have served executive and technical roles. These have involved the bewildering mix of interdisciplinary natural and social sciences, collaboration with competing stakeholders, integration of local to national interests, gridlocking institutional constraints, and interactions with policy, law, and economics that is aptly described in the CFR proposal.

As such, I have reflected often on the capacity of certain scientists to function well in these settings and others poorly, and wondered how university education could better prepare young scientists for such complex challenges. My four years at CFR and

Curriculum Revision

subsequent graduate degrees at the University of California, Berkeley were completed when forestry schools were still in the “commodity” era, as described in the CFR proposal. I received excellent training in the technical sciences, but as a young professional in a public agency, had to learn by immersion in real-world situations how to stay afloat in the interdisciplinary and science-policy contexts that quickly evolved during those years. I have watched forestry schools struggle to renovate curricula during this transition, some retaining dominant emphasis on focused disciplinary training, others attempting to retread curricula entirely centered on interdisciplinary approaches. I haven’t felt either has been successful, the former not breaking out of reductionist problems, the latter producing students comfortable in chaos but with insufficient rigor to solve problems.

By contrast, the model proposed by CFR strikes me as brilliant and promising. The emphasis on the *progression* of learning through the undergraduate years resonates with an intelligent understanding of needs in the post-college environment. Students must necessarily begin undergraduate work obtaining specialized and focused foundational knowledge and learning basic technical skills, which also supports development of personal maturity necessary to confront complex contexts. The subsequent “upside-down” approach is novel and creative, with the core interdisciplinary/case-study/problem-solving curriculum sandwiched between the early technical focus and a return to specialization post-core. This sequence has found success in non-forestry professional programs, where the penultimate year(s) are often spent in real-world internships. Although forestry schools may have tried to integrate internships as summer opportunities, or short stints squeezed into the curriculum, the CFR approach confronts the real needs by embracing the case-study context directly as the central curriculum. Pitting students and faculty together for the 3rd (junior) year with problem-solving opportunities from the region seems highly likely to result in a valuable, efficacious learning opportunity.

Without question, the Pacific Northwest is a fulcrum of natural resource science and policy activities, and at the cutting edge for problem-solving at the institutional level. We in the resource science communities look to the region as leading the nation and the world both in being a place where resource issues flare up and a locus for pioneering solutions that are applicable broadly. The CFR has always had a leadership role in this regard, with highly regarded faculty dedicated to the best science and committed to teaching and collaborating among each other. The legacy of supporting institutions and instructional resources at UW is testimony to the history of responsiveness and creativity on campus in the natural resource arena. The current proposal is one more example of how the CFR faculty is capable of developing educational solutions to challenges ahead of the curve. I have high hopes for this curriculum being implemented soon, and that other forestry schools will use CFR as a model.

Anela Mallon: Former student in College of Forest Resources and College of Landscape Architecture and Urban Planning

As a 2002 graduate of the College of Forest Resources and College of Architecture and Urban Planning at the University of Washington I am writing in support of the proposed curriculum revision for the CFR.

I have read a draft of the proposal and was very impressed by several elements contained within, most notably the goal of creating an interdisciplinary focus. As an alumna of the Community and Environmental Planning Program (College of Architecture and Urban Planning) I have witnessed the value of such interdisciplinary programs in teaching students how to look at the world from a slightly different angle than their peers from traditional disciplines. In adopting this proposal, the CFR could become a model for conventional technical programs wishing to give their students more practical, sophisticated tools for the increasingly complex world in which we live.

I am also very much in favor of making case studies a critical part of the new curriculum and taking advantage of the University of Washington's proximity to a variety of landscapes and natural resource issues to use as real world "teaching-tools." From what I saw as a student, many faculty members within the College are already using these types of tools very effectively. I am confident that this proposal would serve to support and encourage their admirable efforts.

I wish to stress that I also believe this proposal seeks to give students more practical skills without sacrificing certain types of specialization which are inherent to the management of our natural resources. There is no denying that forestry and forest related issues require some degree of technical knowledge and skill (such as and understanding of plant physiology, landscape dynamics, wildlife biology, soil science, etc) and I could only support a program which did not ignore the importance of these subjects.

The UW College of Forest Resources has a reputation for excellence around the nation. I am proud to be a graduate of this college, and believe that with such innovative ideas as those presented in the proposal for curriculum revision, it will uphold its position as a leader in the study of forestry in the years to come.

I have read the draft proposal for undergraduate reform, and would like to provide some input from my current vantage as a resource professional. Though the draft is still in a rough form, and many of the specifics have yet to be spelled out, it is my belief that your proposal is heading in a good direction.

The proposed curriculum proposes to provide a real-world and multi-disciplinary foundation that is strong in field skills, collaborative learning, problem solving and current technologies. Opportunities to specialize in a number of disciplines will enable students to design an education well suited to a professional career in natural resources.

Curriculum Revision

This is especially true for students wishing to further their education with the five-year B.S./MFR option.

I believe that the college is developing a curriculum that expresses what natural resources professionals have known for some time. All natural resource professionals must demonstrate a core set of skills irrespective of traditional disciplinary boundaries and value systems. An article in the September 1999 *Journal of Forestry* (*Forestry education: adapting to the changing demands on professionals*) describes the results of a survey of traditional and non-traditional natural resource employers regarding hiring preferences:

“In all sectors the importance of traditional field forestry competencies, such as silviculture, forest ecology, forest inventory and tree and plant identification was rated relatively high. However, the competencies given the highest ratings were ethics, communication skills, collaborative problem solving, managerial leadership and resource management planning.”

As long as the curriculum covers the basic multi-disciplinary competencies and provides ample opportunity for further specialization, the proposed curriculum should be a success. It has the potential to balance the wide range of needs and constraints that face the college.

Eddie Sonne Hall: Graduate student, Quantitative Resource Management Program

As a Ph.D. student at the University of Washington College of Forest Resources I write in support of this progressive approach to undergraduate natural resource education. The challenges faced by managing natural resources locally, regionally, and globally are complex, contentious, and all encompassing. They not only span across multi-disciplines but they lie at the intersection between disciplines. Traditional discipline oriented teaching can no longer “cover all the bases” nor can it teach the skills that are needed in the natural resource professional world- that of teamwork and interdisciplinary thinking. By learning through real world case studies, students will learn to work in a group, examine the problem holistically, and build the confidence of student learning instead of book memorizing and regurgitation. Most importantly, this core course proposal intends to hook students into natural resource management by teaching through local case studies that students are aware of and can relate to.

As described in the proposal, the University of Washington and in particular the College of Forest Resources, is highly suited to undertake this task. The university’s location allows for easy access to real world issues, the University of Washington has strong library, technology, and educational resources, and the College of Forest Resources faculty have the dedication that is needed to create a successful program.

Morgan Nichols: Graduate student, Social Sciences Program, former CFR undergraduate

I am writing in regards to the proposed curriculum for the Bachelor of Science program at the University of Washington's College of Forest Resources. As a point of reference, I received a BS in Conservation of Wildland Resources from the College of Forest Resources in 1999. In the winter of 2002 I returned from the professional world to the College to pursue an MS in Social Sciences. As such, I am now in the unique position of being able to assess what the new generation of resource professionals are seeking to gain from educational programs such as this one. Throughout my experiences, I have been repeatedly struck by the inherent challenge in applying disciplinary knowledge and training to the real-world where situations require a complex interdisciplinary understanding. The College has clearly identified this challenge and has created a unique approach to address it. I entirely support the proposed curriculum and am incredibly excited by the potential role it will play in advancing the quality of education and of future colleagues.

There are three points I find most valuable to this innovative approach. First, although most undergraduates generally learn about the social, economic, and natural science aspects of systems, these concepts are rarely, if ever, integrated in a dynamic manner. The use of accessible hands-on case studies within the core would put the program at the leading edge of current learning and research, requiring both students and instructors to continually reinvent their thought processes and not become trapped within a rigid perspective. Second, this curriculum would expose students to exciting and interesting real-world problems early in their education, rather than later, which is so often the case in traditional programs. This approach would give them the information needed to really identify those aspects that most inspire them. Third, students would have the potential to interact with individuals and organizations outside of the University who are currently working on these problems and defining the field. This helps to bridge the gap between academia and the outside world, ensuring that both students and teachers change and grow with the patterns actually existent in the world, rather than stagnating as the world changes around them.

I applaud the College of Forest Resources for being leaders within society, pioneering into uncharted educational territory. As one of the new resource professionals who are helping to shape the future, I am delighted to know that innovative program's such as this one are being developed. If this curriculum is to be funded, it would be an important step towards shaping a better tomorrow. I look forward to watching the progress and participating in the transformation.

Mike Liquori: Graduate Student, Forest Engineering

The following ideas and thoughts may be useful to those designing the curriculum transformation process. Please feel free to contact me to discuss any of these in more detail.

Curriculum Revision

Background & Caveats.

For the record, most of my academic background is from geology departments, and have trended toward more rigorous scientific approaches to problems. My primary motivation for coming to CFR was due to my desire to get more interdisciplinary experiences and credentials. Also, my experiences working with regulatory reform, as a consultant, and as a representative for large forest landowners provides me several unique perspectives that may be useful.

New Approach

I applaud the excellent ideas associated with the revolutionary, interdisciplinary & integrated approach to learning. I think the opportunities this approach provides could result in truly astounding progress in natural resource management.

I believe you have correctly diagnosed the problem of students coming out of universities without the breadth in economics, social and management processes that is necessary to be good land stewards. I've even experienced this with UW professors (mostly from other departments) who advocate for an issue; yet fail to consider the economic, social, operational or legal considerations that may constrain their ideal science-based solution.

Scientific Rigor

It has also been my experience that an equally critical failure is the lack of rigor associated with many scientific and land management "professionals". While many professionals are truly excellent, too many consultants and regulators are insufficiently trained in good scientific analysis. Therefore, I think it is essential to also offer a rigorous, science-based curriculum, perhaps as part of a MS/PhD program.

Specialization

I believe that there would be value in formalizing some areas of specialization within the broad interdisciplinary degree. Here too, I would stay away from classic disciplines, but seek integrative groupings from which students could select a concentration by focusing their electives in pre-ordained groupings. Examples might include:

- Water & Watershed Systems (linked to CWWS)
- Terrestrial Land Use Interactions
- Resource Management
- Socio-Economic Process Management

Course 'Catalog' Reform

Curriculum Revision

One huge complaint I have as a graduate student in CFR has been the tendency toward “graduate” classes that are little more than undergraduate lectures with additional homework or course project requirements. These classes have generally been of very limited value, and I believe they tend to drive grad students from other colleges away from CFR. By contrast, some of the 500 level classes in CFR that are true graduate-level classes have been excellent. I recommend that more effort be made to distinguish graduate level courses.

Team Taught Courses

In other colleges, I’ve participated in classes that have been taught by more than one professor, sometimes from different specialties. Developing core courses that draw from such a team could expose students to different approaches and perspectives for the same problem. For example, the way a hydrologist or geomorphologist might approach a problem of cumulative watershed affects might be considerably different than the approach taken by a fisheries biologist or aquatic ecologist. Yet each perspective offers great value, and can result in excellent synergies.

Virtual Lecture Tours

Teachers can take advantage of new technologies by integrating GIS, digital photos, internet sites and site specific data into the lectures for case studies assumed by students in Core Courses. Such an approach could make discussions much more interesting and compelling, and could make the issues much more relevant. Additional GIS support may be necessary, but could be leveraged across many courses. It will also likely result in greater overall technology facility by students, which will make them better land stewards upon departure from CFR.

Gradient of Land-Use Objectives

In addition to the Urban to Wildland gradient that CFR promotes, I think there is value in also addressing various land-use objective gradients. Within each land type (e.g. wildland), there also exists a gradient of land-use objectives that ranges from fully extractive/manipulative to fully restorative.

Search for New Land-Use Management Models

A unifying theme that may benefit both CFR’s curriculum as well as research opportunities could include a search for new ideas for land-use regulation and management. Modern prescriptive regulatory approaches can often result in homogenization of many ecosystems. By seeking new solutions that cross boundaries between regulatory, socio-political and economic constraints, CFR could establish itself as truly ‘cutting edge’.

Brian Zwiebel: Graduate student, Social Sciences Program, former CFR undergraduate

I have recently reviewed the new College of Forest Resources Curriculum Proposal, and I strongly support it. I am impressed with its true interdisciplinary structure, and focus on student-based learning in the core classes. As a both a current and former (graduated 1998) student of CFR, I can see the true value of these approaches. The best classes I have taken within the College have utilized this approach already. Moreover, I agree that the College can capitalize on this new curriculum because of our unique and valuable attributes: our proximity to urban and forested areas, excellent research facilities, outstanding faculty, and previous interdisciplinary teaching experience. These characteristics suggest we can succeed with this new curriculum. I particularly agree with the distinction between *interdisciplinary* and *multidisciplinary* teaching, and the integration required for true interdisciplinary teaching. I know the College can succeed with this approach.

I support this new curriculum 100%, and will do anything I can to assist in its development and implementation.

Dawn Maurer, Andrew Larson, Mitchell Allgamauer-Bay: Current undergraduate students, representing three of the curricula: Wildland Conservation, Forest Management, Environmental Horticulture and Urban Forestry.

We agreed that our top reasons for supporting these core classes are:

1. The core format will bring together the students from all the diverse interest areas at the college and provide a shared experience that can strengthen inter-student ties. We value that possibility for connection with each other.
2. The real world is never "just politics" or "just science" or "just economics." The real world demands that we address multiple aspects of a problem when confronting natural resource issues and a course that integrates disciplines better simulates the kinds of scenarios we may find in our professional lives.
3. Case study learning makes theory come alive. We learn well (or at least are excited by learning) from field examples.

Mitchell Almaguer-Bay: Senior, Environmental Horticulture and Urban Forestry

Thank you for asking me to discuss my views on the contemplated changes to the undergraduate curricula at the University of Washington (UW), College of Forest Resources (CFR). Having worked with the 2002 CFR Undergraduate Curriculum Transformation Committee to conceptualize alternative structures for an integrated natural resources degree, I am familiar with the background and circumstances giving

rise to the Cooperative State Research, Education and Extension Service (CSREES) grant proposal seeking support to develop the innovative, integrated curriculum we need.

As you know, I am a 35-year-old student in the CFR undergraduate program Environmental Horticulture and Urban Forestry. As an older student—and a transfer student with community college credits—I have a somewhat broader perspective than a typical undergraduate. I also have a wealth of professional experience, having worked for public and private corporations, a regulated utility, a regulated bank, and a non-profit social services organization. I therefore understand the importance and value of higher education in the non-academic world. These experiences have given me insight into the skills and background CFR undergraduates need in order to succeed in their chosen fields after graduation. I hope that my comments will contribute to providing world-class environmental education to undergraduates at CFR by facilitating this important and necessary curriculum transformation.

In section (A)(1) of the project description, under the subheading Developing and nurturing innovation in education, the authors note that the integrated natural resources science curriculum should produce graduates “poised to design and implement best management practices” in the face of “vexing land stewardship issues”. I think these statements effectively describe the fundamental objective of CFR and what distinguishes it from other environmental science programs at the University of Washington.

The proposal’s innovative and intentional inversion of the traditional approach to natural resource education is most laudable. I support the intention to introduce complex, real-world problems as the basis for developing fundamental concepts in natural and human-altered systems at the junior or even sophomore level, earlier than the usual capstone. This will immediately challenge students to think critically, understand how ecological processes interact with human activity, and learn to place environmental decisions within a social context. I believe that having this exposure to specific regional problems and landscapes will enhance their ability to understand and apply the specialized knowledge acquired in courses subsequent to the core. That is, as students learn more about their field of inquiry, that new knowledge will be informed by an understanding of how social and economic factors affect that field. Equally important, students will learn that for management responses (“solutions”) to natural resource problems to actual be applied, they must be socially-acceptable.

An undergraduate curriculum in natural resource science that successfully integrates many disciplines can provide students with other key benefits. In addition to learning strategies for direct resource management (Boyer’s “scholarship of application”), students will be offered the opportunity to synthesize many disciplinary perspectives (“integration”) and will be exposed to the wide array of disciplinary or reductionist pursuits that they may wish to explore in greater depth at a graduate level (“discovery”). In fact, having such exposure within the context of a problem-based learning environment may identify the fields of inquiry most important to the particular problems in which the students are interested. This may be especially well-suited to the many non-

Curriculum Revision

traditional students who arrive at CFR as transfers committed to environmental stewardship and already having some fundamental knowledge of biological and social systems.

The benefits of problem-based and group learning are substantial and particularly important for natural resource management. By applying these educational paradigms to large class settings, CFR will improve the preparation of undergraduates for their almost certain future participation in team projects, consensus decision-making, and joint stewardship arrangements between institutions. In addition, a more cohesive and supportive undergraduate community is likely to emerge, one which promotes respect for all backgrounds, fields of inquiry, and learning styles. Ultimately, the integrated curriculum can be offered as a model for other environmental science programs around the country that confront the challenges for natural resource researchers and educators described in the proposal.

It is critical that the rigorous scholarship and detailed, specialized knowledge of contributory disciplines are preserved at CFR. (For example, the EHUF faculty has already developed a successful undergraduate program that follows many the paradigms embraced in the CSREES proposal at a smaller scale.) Fortunately, organizing undergraduate education around a problem-based, integrated core does not preclude achieving this goal. I believe that an innovative reworking of the curriculum will enhance the post-graduate opportunities of students and their contributions addressing regional, national and global natural resource problems.

Dean B. Bruce Bare: Dean and Rachel Woods Professor, College of Forest Resources:

I am extremely pleased to write a letter of support for the USDA Challenge Grant that you and other College faculty prepared for submission.

The College of Forest Resources is undergoing a transformation of its academic mission and vision. This difficult process requires that we completely rethink what we will teach and how we will prepare our students for careers and enlightened understanding of natural resources and environmental issues. By consolidating our disparate undergraduate programs into a single major dealing with these issues we have taken a bold and innovative step.

The new curriculum our faculty envision requires that an integrated interdisciplinary set of four core courses be designed and developed. Success of this effort requires that a new process of faculty cooperation and integration be devised. With the help of the USDA Challenge Grant, I am confident that you will be successful in this design process. Indeed, the future of the College depends upon the success of this effort.

I believe that our faculty has identified the best curriculum model for meeting the challenges we face. It is the right model for our College and University as well as the many clients and stakeholders our graduates serve.

2) Bureau of Land Management Science Advisory Board Statement on Natural Resource Management Curricula. February 28, 2003

The Bureau of Land Management, (BLM) and the nation's universities are undergoing great change in the new century. Just as the BLM and other public land agencies find a growing need for new employees, reduced budgets and a growing emphasis on broad, large-enrollment majors challenge the abilities of Universities to educate professional resource managers. We seek ways that the transformation undertaken by educational institutions and the agency can benefit both.

The skills and knowledge needed by public lands resource managers have changed. There is a critical need for broadly educated, teamwork-oriented professionals who can manage the full spectrum of environmental resources. They require strong skills in communications and problem-solving. Because resource management has become participatory, working with stakeholders and communities, and understanding social dynamics and decision-making processes are crucial. Increasing knowledge of the interconnections between different resources and processes means that interdisciplinary, integrative knowledge is essential. Yet there is also a continuing need for strong technical and field skills, some of which are specific to particular resource management problems or disciplines. Examples of specific skills include forest measurements, local histories, knowledge of the plants of a certain location, production practices, and surveying.

Concurrently, an on-going process of curricular change at Universities is driven by changes in the capacity of these institutions to provide narrowly-focused, technical expertise. The trend toward interdisciplinary environmental education is coincident with agency needs for a more interdisciplinary approach to resource management. However, Universities today are pressured to support larger-enrollment programs, serving a broader spectrum of students, than is characteristic of traditional resource management programs in forestry, range, wildlife, and so on. University faculty are increasingly research-oriented, and the capacity for educational institutions to employ technical specialists for teaching is declining. At the same time, enrollments in professional natural resource programs have declined or held steady—even though overall University enrollments have increase dramatically throughout the Nation.

The challenge, then, is to overcome the difficulties of providing technical skills, yet take advantage of University capacity to provide broad, interdisciplinary education programs that emphasize critical and analytic thinking, as well as the knowledge of ecological and social systems needed by resource managers. The solution will likely require restructuring of traditional approaches to natural resource education and training. There is a particular need to identify educational components that are best provided at

universities and which are more efficiently and effectively taught in partnerships among universities and public agencies or by other new approaches.

Taking some of the technical skills out of the general curriculum would loosen the typically tightly-bound schedules of undergraduates in resource management programs, giving them more opportunity to take broad advantage of University resources, inside and outside the resource management curriculum. The goal would be to create a well-rounded individual who is a self-motivated learner that can learn the technical skills required for particular specialties and geographic locations. The student's education in science would be more analytic and deeply developed, emphasizing ecological processes and functions common to forests, rangelands, and wildlife habitat, as well as the influences of forces like fire, grazing, hunting, and timber harvest. Similarly, the curriculum would emphasize how social, policy, and economic systems interact with ecological systems to impact the sustainability and health of the Nation's diverse public lands. Decision-making, with emphasis on the use of science, local and traditional knowledge, and equity, is of particular importance today. One element in poor decisions is a lack of understanding of resource-dependent communities, individuals, and enterprises. A "communication gap" between highly educated, urban-based resource professionals and the people whose livelihoods they influence has played a role in resource conflicts. As a result, knowledge of the history, traditions, and cultural mores of rural communities must be included. Natural resource curricula with these elements would produce professionals better able to meet complex needs of the Nation's lands and would be attractive to a broader spectrum of students interested in environmental education.

New approaches are needed to insure that natural resource professionals can be trained in the full range of technical skills needed for land management. It is possible that many skills are best learned in intensive situations using practitioner or extension instructors, and funded through fees or other means. Several approaches might be taken. For example, specific training might constitute a "fifth year," resulting in some sort of certification or higher degree. It could be part of a summer program, offered in the field, at the home institution or at another. Universities might form partnerships to offer joint summer programs. Internships, short courses, and workshops, as part of continued education, might fill some needs. Internships could also be a more regular part of the educational curriculum. At some institutions, graduate programs that are small and focused fit the campus organization. A graduate degree that accepts students of diverse educational backgrounds results in well-rounded students with an integrative outlook.

We recognize that each institutional setting is different, and that there is not a "one-size fits all" solution. Significant changes in the curriculum will require the participation of several major groups, including professional certification and accreditation programs, state certification programs, universities and schools, natural resource agencies, non-governmental organizations, conservation organizations, and resource user groups.

Curriculum Revision

The BLM Science Advisory Board has developed ideas for key educational components of resource management curricula. The next step is to revise and refine our ideas, and then to extend the process to the stakeholders described above. We recommend the establishment of a consortium for collaborative development of a plan for the resource management curriculum of the future. We are pleased that Director Clarke asked us to examine the curricula issue, and we support her effort to convene a group of land managers and others to begin this discussion.

Science Advisory Board

Bureau of Land Management

APPENDIX 6: FACULTY MEETING, FEBRUARY 18, 2003

Background materials distributed prior to the meeting:

Motion One:

The prerequisite and UW requirements for the nonPSE major shall consist of 65-67 credits:

Written Communication (12 credits)

5 Credits of Composition (English 131 or equivalent)

3 Credits of Technical Writing (TC 231 or equivalent)

4 Additional Writing Credits (TC 333 or another W course)

Visual Literary & Performing Arts (10 credits)

5 Credits COM 220 Public Speaking

5 Credits VLPA (from VLPA list)

Biology & Soils (13-15 credits)

10 Credits Biology 101 and 102

3-5 Credits of either ESC 210, or ESC 311

Chemistry (10 credits)

5 Credits Chemistry 120

5 Credits Chemistry 220

Quantitative & Symbolic Reasoning (20 credits)

10 Credits QSci 291 and 292 or other Calculus Series

5 Credits Statistics (QSci 381 or Stat 220)

5 credits CFR 250 GIS

Individuals & Society (10 credits):

Core courses will fulfill this requirement

Motion Two: (Background materials)

Core Course Proposal to College of Forest Resources Faculty

Endorsed by the Ad hoc Faculty Committee on Curriculum

Proposed by Hinckley, Fridley, Brubaker, Paun, Reichard, Manuwal, Bradley and Turnblom

Curriculum Revision

Background

The core provides a foundational link between student interests and lower-division prerequisites and in-depth upper-division courses that bear on broader environmental and societal problems. The core coursework builds an appreciation of inquiry, the interdisciplinary nature of real-world problems, the scales of learning and understanding, and the need to value and understand the multiple approaches brought to a problem by different members of a team.

PRE-CORE	CORE	POST-CORE
Personal interest	Interdisciplinary case studies, problem-based learning	Specialized focus
Foundation knowledge (prerequisites) including soils	Add-on fundamental knowledge	Specialized knowledge
Writing and math skills	Measurement/Analysis/ Interpretation	Continued specialization

As a result of two recent efforts, first, the submission on February 4th of a proposal to the USDA Higher Education Challenge Grants Program entitled “*An innovative introductory core for natural resource and ecology undergraduate education* (pdf file attached for background)” and, second, an open and deliberate consideration of six models for teaching the core series of courses, we offer the following four core courses to the faculty for your consideration at the February 18th faculty meeting.

The following model (courses CXX 301, 302, and 303) was chosen over the five other models (recognizing that all of the proposed models had strengths and weaknesses and that as faculty begin to develop the actual course material, via adaptive management, theme and content may change dramatically). The major strengths we identified for the proposed model are: (1) it provides significant opportunity for service learning, (2) all stakeholders are present, (3) it provides the most even coverage of biophysical, social and business content, (4) the content of individual courses would be readily perceived as having curricular value and, therefore, be utilized by other programs on campus, (5) the three courses build on college strengths in interdisciplinary enquiry, hands-on learning with an innovative, non-traditional approach, (6) the three courses build on a regional strength of a real world laboratory encompassing the urban to wildland gradient; and (7) the general course approach and content have been tested in a number of different formats.

CXX 301: Course A: Ecosystem Dynamics: Maintaining Nature in an Urban World

Course Catalog Description: From the small plant or colony of ants at the junction of a sidewalk and a skyscraper to backyard bird sanctuaries to large, urban greenspaces, the preservation, restoration and management of “nature” in urban environment presents unique challenges and opportunities. These are explored in the context of problem-based learning where teams of students work with stakeholders, and experts to understand patterns, structure, processes and drivers.

CXX 302: Course B: Ecosystem Dynamics: Society at Nature’s Front Door

Course Catalog Description: Increasing land use pressures are rapidly changing the interface between developed areas and wildlands. Such interfaces are areas of transition, tension and often tremendous conflict. Much of the tension and conflict revolve around competing demands for the same piece of land. These are explored in the context of problem-based learning where teams of students work with stakeholders, and experts to understand patterns, structure, processes and drivers.

CXX 303: Course C: Ecosystem Dynamics: Preservation -- Use from Conservation to Exploitation

Course Catalog Description: The stewardship of apparently “pristine” terrestrial environments, whether embedded in an urban area or a military base or a distant wilderness area, are often areas of great importance and, even greater, contention. Pollution, invasive organisms, mining, burning, grazing, logging, hunting, skiing, hiking and bird watching are just a sample of the many conflicting and increasing uses. These are explored in the context of problem-based learning where teams of students work with stakeholders, and experts to understand patterns, structure, processes and drivers.

CXX 304: Course D: Ecosystem Dynamics: Quantifying and Qualifying

Course Catalog Description: Plants, animals and humans coexist in many environments, interacting in manifold, complex ways across the landscape. Stewardship of natural resources, therefore, involves wisely mixing levels of preservation, recreation, and modification to the flow of renewable resources within, around, and through society. Understanding these mixtures demands timely knowledge regarding the location, extent, and condition of these resources in nature. The scientific method, hypothesis testing, and monitoring are key to processing this information. These are explored in the context of problem-based learning where teams of students work with stakeholders, experts and data to understand monitoring, detecting change, and analyzing, interpreting and using information.

Curriculum Revision

In addition, we would like to propose a potential CXX magnet course.

CXX 400: Ecosystem Dynamics: Trees and People

Course Catalog Description: Washington's ecosystems are examined from the recession of the Vashon Glacier through the immediate future. Ecosystem characteristics, function, relationship with society and the development of the ecological sciences are explored. How humans interacted with and perceived their environment is traced since the arrival of first people. Current challenges are examined in light of exploitation, stewardship, eco-terrorism and sustainability.

APPENDIX 7: FACULTY MEETING, MARCH 18, 2003**Background materials**Agenda item 1) PSE Curriculum:

Paper Science and Engineering (PSE) Curriculum Revision
March, 2003

**MOTION: THE PAPER SCIENCE AND ENGINEERING CURRICULUM
CONTENT SHALL BE CHANGED TO CONSIST OF THE FOLLOWING
REQUIRED COURSES¹:**

Freshman Year:

PSE 201 (3 credits)	<i>Introduction to Pulp and Paper Technology</i>	Autumn
PSE 202 (1 credit)	<i>Pulp and Paper Lab and Field Studies</i>	Autumn
PSE 450 ² (1 credit)	<i>Current Topics in the Pulp and Paper Industry</i>	Spring

Sophomore Year:

PSE 248 (4 credits)	<i>Paper Structure and Properties</i>	Winter
PSE 450 (1 credit)	<i>Current Topics in the Pulp and Paper Industry</i>	Spring

Junior Year:

PSE 406 (3 credits)	<i>Wood and Natural Products Chemistry</i>	Autumn
PSE 476 (3 credits)	<i>Pulping and Bleaching Processes</i>	Winter
PSE 450 (1 credit)	<i>Current Topics in the Pulp and Paper Industry</i>	Spring
PSE 478 (3 credits)	<i>Pulping and Bleaching Laboratory</i>	Spring
PSE 4XX (3 credits)	<i>Fiber Sources and Properties for Papermaking</i>	Spring

Senior Year:

PSE 402 (3 credits)	<i>Paper Physics and Mechanics</i>	Autumn
PSE 477 (3 credits)	<i>Papermaking Processes and Chemistry</i>	Autumn
PSE 497 (1 credit)	<i>Pulp and Paper Internship</i>	Autumn
PSE 479 (3 credits)	<i>Papermaking Laboratory</i>	Winter
PSE 480 (3 credits)	<i>Pulp and Paper Process Control</i>	Winter
PSE 481 (3 credits)	<i>Pulp and Paper Unit Operations</i>	Winter
PSE 450 (1 credit)	<i>Current Topics in the Pulp and Paper Industry</i>	Spring
PSE 482 (3 credits)	<i>Engineering Economics</i>	Spring
PSE 487 (5 credits)	<i>Pulp and Paper Process Design</i>	Spring

Total Required PSE Course Credits: 48

Number of Required PSE Courses: 19

¹ Prerequisite courses for the PSE degree will remain as they currently are. See full PSE undergraduate curriculum sheet for a listing of these courses.

² PSE 450 will also be required by graduate students in the PSE program.

Curriculum Revision

PSE Service Courses (not required for majors)

PSE 102 (5 credits)	<i>Paper, Society, and the Environment</i>	Autumn
PSE 104 (5 credits)	<i>Products and Energy from Renewable Resources</i>	Spring

Background for PSE Curriculum Revisions

1. The PSE program underwent an extensive review for accreditation by ABET (Accreditation Board for Engineering and Technology) during Autumn quarter 2001. One of the findings from this review was that there was not much flexibility in coursework choices due to the large number of required PSE courses. It was recommended that the faculty and Washington Pulp and Paper Foundation (WPPF) curriculum committees consider revising the curriculum to reduce the number of required courses, and thus allow the students more choices of technical electives.
2. Exit interviews with graduating seniors and surveys of PSE alumni indicated that redundancy and overlap existed in the content of PSE courses. Various suggestions were made as to how to address this redundancy by eliminating and/or combining required courses.
3. Discussions with the WPPF curriculum advisory committee suggested that we should change the curriculum to reflect more emphasis on paper product design and applications, and less on classical process engineering and optimization. This trend has been evident in the pulp and paper industry for the past few years.
4. The PSE faculty agreed that it was indeed time to consider changes in the curriculum, and held a 1/2-day retreat in June 2002 to begin discussions towards this end. A summary of these discussions was prepared, and 4 subgroups of faculty were formed to specifically review and make recommendations on each of the following 4 course categories:
 - Freshman/Sophomore courses
 - Pulping and Chemistry courses
 - Fiber Science/Papermaking courses
 - Engineering coursesThese four groups met during Autumn quarter 2002 and specific course change recommendations were made and documented.
5. The PSE faculty again held a 1/2-day retreat in December 2002 to consider specific recommendations of the various course subgroups. The course changes listed above were agreed upon by the faculty and documented in a written summary. This resulted in a reduction of 8 credits in required PSE courses.
6. Curriculum changes were reviewed and discussed with the WPPF curriculum advisory committee via a teleconference in early February. Their feedback was then considered by the PSE curriculum committee (which includes two student members). A key recommendation of the WPPF committee was to develop specific course lists for the elective credits now freed up by course consolidation.

Curriculum Revision

Name of Interdisciplinary Curriculum:

The college faculty was surveyed, through an email message sent to the list faccfr@u.washington.edu, to assess their preferences among five names that had been suggested for the newly proposed undergraduate major course of study. Each faculty member was asked to indicate, for each suggested program name, whether it was “acceptable” or “unacceptable” to them. They were then asked to rank their top three choices to indicate their preferences. Thirty one faculty members responded as summarized in the table. Looking at the table cells highlighted in yellow we see that the two names, “Environmental Science and Resource Management” (ESRM) and “Natural Resource Science and Management” (NRSM) were deemed “acceptable” by 26 (85%) and 24 (77%), respectively, of the 31 respondents. Twenty-two (71%) indicated that ESRM was either their first or second choice while 17 (55%) indicated that NRSM was either their first or second choice. Twenty-five of the 26 who indicated that ESRM was acceptable also listed among their top three. All 24 who indicated NRSM was acceptable also listed it among their top three. Looking at the table cells highlighted in pink and blue we see that only five of the 26 who indicated ESRM as acceptable indicated that NRSM was unacceptable and that only three of the 24 who indicated NRSM was acceptable found ESRM to be unacceptable. We concluded that a either a motion to name the new program ESRM or one to name it NRSM would likely be approved by the faculty. We also concluded that, at least among those who responded to our email questionnaire, that ESRM was likely to be preferred over the name NRSM. The name was proposed as a description of the content and goals of the curriculum, realizing that it will be reviewed at UW levels in the context of all undergraduate programs.

1) Email message informing faculty of results of faculty poll regarding name of the interdisciplinary curriculum:

Date: Thu, 13 Mar 2003 09:18:43 -0800 (PST)
From: Jim Fridley <fridley@u.washington.edu>
To: faccfr@u.washington.edu
Subject: [Faccfr] Motion to name the non-PSE undergraduate curriculum

Folks:

We received 31 faculty responses to our inquiry about the previously suggested names for the new non-PSE undergraduate program. A summary is attached.

Among the presented names there appears to be considerable (greatest?) faculty acceptance and preference for "Environmental Science and Resource Management."

Therefore, during agenda item #2 at the March 18 CFR Faculty Meeting, someone from the Ad Hoc Working Group on Curriculum will make the following motion: "The name of the nonPSE curriculum shall be 'Environmental Science and Resource Management.'"

Jim

APPENDIX 8: CLASS NUMBERS AND STUDENT CREDIT HOURS

Number of courses in current CFR majors (excluding FEE and SRS)* with enrollments above UW minimum (Autumn 2000-Spring 2002, compiled by Brubaker)

WS (3)**	EHUF (4)	PSE (7)	CWR (10)	FM (12)
Intro wildlife sci	Ecology urban environ	Paper soc and environ	Environmental sci	Human ecol for ecosyst
Wildlife and society	Intro urban hort	Biomass energy/prod	Sustainable res scie	For prod mrkt/mngmt
Wildlife habitat silv	Landscape plant recog	Creativity innovation	Trees and environment	For prod fin/acct
Wildlife hiol and cons	Urban plant protection	PSE seminar	Global chnge & for boil	For protection
Wild res techniques	Urban for landscape	Wood properties	Soils	For-fish interactions
Wild ecol conser	Intro Rest ecology	Wood and fiber ident	Dendro and Autecology	For land use plan
Boil and conserv birds	Restoration Ecology	Paper prod additive	Soils and land use	Ecosystem mgmt
Wildlife sem	Hort stress physiol	Wood chemistry 1	Nat resource issues	Econ of conserv
Mgmt endangered spp	Issues in urban hort	Wood chem. 1 lab	Forest ecosystems	For pol processes
Wildlife cons in PNW	Urban hort seminar	Wood extracvs chem.	Fore ecos field trips	Mgt wild rec amen
Sustain practices	Public pres urb hort	Pulping/bleaching	Landscape ecology	For mgt and econ 1
Field ornithology	Field practicum	Papermaking process	Spring comes	Env imp assmt-reg
Mammology	Select/manage plant	Pulp & paper lab	Community ecology	Fores and econ devel
Mammology lab/field	Restoration capstone	Pulp and paper lab 2	Ecosystem seminar	Int mktg for prods
Intro wildl toxicol		P&P proc and contri	Fire ecology	Forest stand dynamics
Wildlife seminar		Pulp&paper unit oper	Forest conserv biology	Forest entomology
		Pse design I	Adv soil microbial	Adv for res management
		Paper coat and convert	Biogeo cycles soil	Policy analysis design
		Undergraduate research	Adv soil.plant analys	Env res plan
		Pse design II	Streamside topics	Adv nat res soc
		Pulp and ppr intern		
		Microscopy photomic		

Note: this list does not include big CFR-listed classes (e.g., CFR 101, 250, 400) or big courses that we teach under non-CFR listings (e.g. Bio 101, Bio 476, QSCI courses)

* FEE was not considered due to low overall enrollment; SRS was not considered due to lack of state-funded faculty and uncertain future.

** number of faculty with main association in major

WS = Wildlife Science

EHUF = Environmental Horticulture and Urban Forestry

PSE = Paper Science and Engineering

CWR = Conservation of Wildland Resources

FM = Forest Management

FEE = Forest and Ecological Engineering

SRS = Sustainable Resource Science

Student Credit Hours by Division and Major (Autumn 2001-2002)

Ecosystem Science (compiled by Manuwal)

	Total SCH	% Total	No. Faculty	SCH/Fac
<i>Including Rob Harrison's teaching:</i>				
Conservation of Wildland Resources	14,587	72	10	1,459
Environmental Horticulture & Urban Forestry	3,332	16	4	833
Wildlife Science	2,440	12	4	610

	Total SCH	% Total	No. Faculty	SCH/Fac
<i>Without Rob Harrison's teaching:</i>				
Conservation of Wildland Resources	7,466	57	9	830
Environmental Horticulture & Urban Forestry	3,332	25	4	833
Wildlife Science	2,440	18	4	610

Forest Management (compiled by Gustafson)

	Total SCH	% Total	No. Faculty	SCH/Fac
Forest Engineering	923	9	4	231
Forest Management	5226	51	7	747
Paper Science & Engineering	4074	40	7	582

APPENDIX 9: MINORITY STATEMENT OF AD HOC GROUP

Dear Dr. Brubaker and ad hoc Curriculum Committee,

We do not disagree with the merit of creating a united undergraduate curriculum emphasizing environmental science. We do, however, think that it makes no sense to eliminate the EHUF undergraduate curriculum.

The EHUF undergraduate curriculum, established in 1992 and revised in 1999, has been successful. Numbers have continued to increase, especially since the recent revision. The program has good “brand recognition” and it is popular. We think it has the potential to be a large and stable program, if allowed to grow. We have seen no data that suggest otherwise. We can provide metrics that indicate that the program is growing and that the faculty are efficient. Our program is now considered a model, and other Universities (the Oregon State University Horticulture program, for example) are considering adapting to become more like us.

The Center for Urban Horticulture was set up as a horticulture program, with broad-based outside support. The Center has a greenhouse and a staff of people who are plant propagators and horticultural technicians and who support our teaching and research. We serve as a vital academic outlet for the Washington Park Arboretum. The Center facilities are of a size that will work well with the undergraduate student numbers that we are beginning to draw.

The faculty associated with the EHUF graduate and undergraduate curricula function as a unit on environmental horticulture and urban forestry issues. We are effectively an off-campus group, and we work efficiently as a unit while still maintaining a high degree of collaboration with faculty across campus and colleagues across the country and internationally. We are at this time making some of the most extensive external connections found in the College; these collaborations will allow us to work across disciplines in both graduate and undergraduate education at the University of Washington.

EHUF faculty are participating in the construction of the new environmental curriculum and will enthusiastically support it. We simply do not see any reason to jettison an effective curriculum that works well and will not detract from other efforts in the College.

Sincerely,

Kern Ewing
Sarah Reichard

APPENDIX 10: SURVEY COURSES**I. Survey Course Philosophy**

The philosophy of College survey courses is to (a) provide general teaching to increase environmental literacy of students across campus, and (b) generate student credit hours. These courses are intended for non-majors but could be attractive as recruiting tools for majors. Generally, they should be offered as 100- or 200-level courses.

II. Current Top Ten Survey Courses in CFR - Ranked by SCH/Yr.

Rank	Course	Cr	Title	Enroll. ave.	# Q /YR	SCH /Yr
1	ESC 110	5	Environmental Science	457	3	6855
2	CFR 101	5	Forests & Society	142	3	2130
3	PSE 102	5	Paper, Society, & the Environment	133	1	665
4	PSE 104	5	Products & Energy from Renewable Natural Resources	129*	1	645
5	ESC 250	5	Wildlife & Society	85	1	425
6	ESC 202**	3,5	Global Change & Forest Biology	51	1	204
7	EHUF 210	5	Urban Ecology	50	1	200
8	FM 320	3	Fundamentals of Marketing...	65	1	195
9	ESC 111	2	Sustainable Resource Science	94	1	188
10	PSE 309	2	Creativity and Innovation	78	1	156

*used only most recent enrollment as a new courses that is growing

** this is a majors class for CWR students but does attract non-majors

The SCH/Yr criterion seems to be the most relevant criterion, as it integrates the credits offered, enrollment per quarter, and number of times taught per year. We don't have to go very far down the list (#5) to see that returns diminish quite rapidly.

III. How Much Survey Teaching Do We Need?

The committee used a model (adapted from Fridley, no date) to estimate how many student credit hours (SCH) are needed from survey courses to meet College SCH targets (see VI below). We used 600 SCH/FTE because the CFR Elected Faculty Council has recommended to Dean Bare that this figure should be our College goal. Using an Excel spreadsheet, we calculated the average number of SCH that would be generated under different scenarios of B.S., professional (M.F.) and M.S./Ph.D. student numbers.

IV. What Courses Should We Teach?

Currently, our big courses (>500 SCH/Yr) are at the 100-level. We should concentrate on that level, and perhaps add a 200-level set. Five-credit courses seem to work best. It will be most effective to concentrate in a few survey courses that span the areas of expertise within the College. This approach will insure that the courses don't compete for students and that we reach a wide range of student interests (and potential future majors). Given our current faculty makeup and course offerings, one suggestion is that

Curriculum Revision

the top five current survey courses be retained, with possibilities of being offered more than once a year.

Additional survey course topics should be identified by polling the faculty about courses that they would like to teach (single or team teaching). Division chairs should make

Course	Cr	Title	Enroll. Target	# Q Taught	SCH/Yr
ESC 110	5	Environmental Science	400	3	6000
CFR 101	5	Forests & Society	200	3	3000
PSE 102	5	Paper, Society, & the Environment	200	2+	2000+
PSE 104	5	Products & Energy from Renewable Natural Resources	200	2+	2000+
ESC 250	5	Wildlife & Society	200	2+	2000+
Total					15,000

teaching assignments in the context of overall faculty loads and survey course needs. The College committee on Large Class Teaching should be charged to assist survey-course teaching by providing a forum to exchange teaching experiences and approaches and by evaluating the effectiveness of the College's overall survey course offerings.

Potential additional survey course topics include:

1. Wilderness Management (offered spring 2003 as CFR with 200-limit)
2. Forest Ecosystems of the Pacific Northwest?
3. Globalization and Resource Marketing?
4. Current Issues in Conservation?
5. other

V. How Do We Develop New Courses?

Because survey courses will be relatively large (200+ students) and for non-majors, course formats and content will differ from those faculty have previously taught. Thus it will not be possible to simply retool old classes to meet the needs of survey courses. Therefore, faculty must have sufficient opportunity to develop these courses prior to their first offering.

Course development includes:

1. review and preparation of course material (e.g., lecture content, web sites, PowerPoint presentation, slides, videos),
2. class learning activities: group exercises, out of class assignments, service learning experiences
3. instructor development in methods and assessment of large-class teaching, using UW support service (e.g., CIDR, OEA)
4. other

Curriculum Revision

To accomplish these tasks, faculty should be allowed one quarter of reduced teaching load. His/her faculty assignment during this quarter would be to produce the course materials and engage in other development activities for the new course.

VI. An Example of How the Spreadsheet Works:

We assumed that a B.S. student would take 20 core credits in CFR, another 35 restricted credits in CFR, and some extra free electives (we were conservative here). Similar assumptions were made for the other programs and are shown on the spreadsheet. We assumed that the M.S./Ph.D. load would remain constant over time, that the M.F. programs would grow from 20 per year to 50 per year in 1-yr Master's programs, and that graduates in the B.S. programs would grow from 60 to 150 per year over time (the time increment is not defined). We used 5 scenarios: the column labeled "1", the ideal stabilized program, and the columns labeled "2" to "5", growth from roughly where we are now to close to the ideal.

The lower portion of the spreadsheet shows the "deficit" in SCH that we will face under each scenario, and it is that deficit that defines the survey course load needed to bring the SCH/FTE up to 600. We made the simple assumption that each survey course would be 5 credits and would be taught to 200 students per quarter (1000 SCH/offering). Each offering in a quarter counts for 1 survey course. We estimated that when we start we will need 17.8 or 18 survey course offerings per year (a deficit of 17,800 SCH), and that would eventually drop to about 11 (SCH deficit of 11,200). The math is simple, so if all the courses grew to >200 students, then we would need less courses per year, etc. etc.

cc: Excel Spreadsheet output

APPENDIX 11: POTENTIAL CIDR CONTRIBUTIONS TO ESRM CORE COURSEWORK DEVELOPMENT

1. Consulting on Teaching, Learning, & Course Design

- identify facilitator(s), as needed, for faculty meetings and/or retreats
- participate in Curriculum Planning meeting(s) – define questions and tasks, consult on course development, recommend resources, problem-solving
- participate in PBL Faculty meetings as needed (see Assessment, Faculty Perception of Student Experience in the Core Curriculum)
 - troubleshooting
 - support ongoing development of courses – cases, assignments, learning assessment
 - identify research and literature drawn from others’ PBL experience
- synthesize assessment data from multiple sources and present to faculty

2. Developing and Helping Implement Program Assessment

<i>Data Needed</i>	Data Source	Data Collection	CIDR Contribution
Student Experience in the PBL Courses	Midterm Student Feedback (sample survey form attached)	2 PBL Courses per quarter	<u>CIDR facilitates, compiles data, presents to faculty</u>
	End-of-Quarter Assessment, adapted for PBL	2 PBL Courses per quarter	<i>CIDR helps devise additional questions for OEA forms, consults on integrating with data from other sources</i>
Student Experience in Quantitative Course	Midterm Student Feedback (sample survey form attached)	Quantitative Course(s)	<i>CIDR facilitates, compiles data, presents to faculty</i>
	End-of-Quarter Assessment, adapted for PBL	Quantitative Course(s)	<i>CIDR helps devise additional questions for OEA forms, consults on integrating with data from other sources</i>
Student Learning in PBL Course	Student Performance	Ongoing through PBL cases	<i>CIDR consults on articulating student learning outcomes, appropriate assessment instruments, integrating with data from other sources</i>
Student Learning in Quantitative Course	Student Performance	Ongoing through Quantitative Course	<i>CIDR consults on articulating student learning outcomes, appropriate assessment instruments, integrating with data from other sources</i>
Student Experience in Core Curriculum	Student Perceptions	Senior-year cohort interviews	<i>CIDR facilitates, compiles data, presents to faculty</i>
		Senior exit interviews	<i>CIDR consults on assessment questions, integrating with data from other sources</i>
		Graduate Surveys (two years out? five years out?)	<i>CIDR consults on assessment questions, integrating with data from other sources</i>

Curriculum Revision

Student Learning in Core Curriculum	Faculty Perceptions	Periodic meetings of PBL faculty	<i>CIDR consults on issues raised, resources needed</i>
		Survey of faculty teaching senior courses	<i>CIDR consults on survey development, integrating with data from other sources</i>
	Student Performance	Survey of faculty teaching senior courses (compared to previous cohorts)	<i>CIDR consults on survey development, integrating with data from other sources</i>