



MEMORANDUM

To: Donna E. Shalala, President

From: Mary Coombs *MC*
Chair, Faculty Senate

Date: September 29, 2003

Subject: Faculty Senate Legislation #2003-05(B) – Establishment of an Undergraduate Program in Ecosystem Science and Policy (ECS)

The Faculty Senate, at its September 24, 2003 meeting, voted unanimously to approve the establishment of an undergraduate program in Ecosystem Science and Policy (ECS) that will replace the Environmental Science major as of fall 2004. The proposal is enclosed for your reference.

This legislation is now forwarded to you for your action.

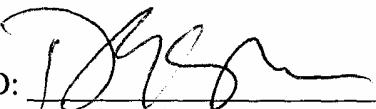
MC/kl

cc: Luis Glaser, Executive Vice President and Provost
James Wyche, Dean, College of Arts and Sciences
Jacqueline Dixon, Director of proposed Undergraduate Program in ECS
Mary Doyle, Co-Director of Center for Ecosystem Science and Policy

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CAPSULE: Faculty Senate Legislation #2003-05(B) – Establishment of an Undergraduate Program in Ecosystem Science and Policy (ECS)

PRESIDENT'S RESPONSE

APPROVED:  DATE: 10-1-03
(President's Signature)

OFFICE OR INDIVIDUAL TO IMPLEMENT: Provost

EFFECTIVE DATE OF LEGISLATION: _____
(if other than June 1 next following)

NOT APPROVED AND REFERRED TO: _____

REMARKS (IF NOT APPROVED): _____

9/24/03 Faculty Senate agenda item #B2

To: Faculty Senate
From: Jackie Dixon
Date: September 17, 2003
Subject: Changes made to the Ecosystem Science and Policy proposal

In the past few weeks, I have met with faculty from Biology, Chemistry, Marine Science, Physics, Environmental Engineering, and RSMAS. As a result of these discussions, the following changes have been made to the document since the version dated August 29, 2003:

- 1) BIO changed to BIL throughout.
- 2) Deleted the following biology environmentally-related science electives because they are no longer being taught:
 - BIL 332 Principles of Wildlife Management
 - BIL 336 Tropical Plant Biology
 - BIL 432 Ecotoxicology
 - BIL 538 Wetland Ecology
- 3) Added the following biology environmentally-related science electives:
 - BIL 233 Conservation Biology
 - BIL 241 Animal Behavior
 - BIL 531 Advanced Field Ecology
 - BIL 533 Advanced Conservation Biology
 - BIL 537 Ecosystem Ecology
 - BIL 540 Ethology and Behavioral Ecology
 - BIL 541 Lab and Field Ethology
- 4) BIL 311 has been added to list of acceptable statistics courses.
- 5) Requirement for B.S. degree:
 - (Science Core, page 10) Change “a choice of BIL 150/151 or PHY 101/205/106” to requiring one semester of physics (PHY 101/205/106).
 - (Env.-Related Science, page 11) Combine requirements for Environmental Chemistry and Environmental Pollution, such that students must take one of CAE 240, CAE 540, CHM 401, CHM 416, GSC 410, MSC 330, or MSC 416).
 - (Env.-Related Science, page 11) Add requirement for BIL 235 Ecology.

Note that we are replacing 3 credits of Environmental Chemistry or Pollution with 3 credits of Ecology, so that there is no net change in the number of required credits.

6) Increase minimum SAT score from 1150 to 1250.

**DRAFT PROPOSAL FOR A NEW
UNDERGRADUATE PROGRAM IN
ECOSYSTEM SCIENCE AND POLICY
AT THE UNIVERSITY OF MIAMI**

August 25, 2003

To the College of Arts and Sciences Senior Associate Deans, members of the Faculty Senate, and faculty of the College of Arts and Sciences,

This document presents the plan for a new undergraduate program in Ecosystem Science and Policy (ECS). The Ecosystem Science and Policy major is an interdisciplinary program that provides the student with a broad background in environmental issues from a variety of perspectives and in-depth education in an area of specialization. The goals of the program are to provide the student with both the theoretical background and technical skills for an environmental career.

The Ecosystem Science and Policy major will replace the Environmental Science major as of fall 2004. This academic year (2003-2004) will be a transition year between the two programs. In comparison to the existing Environmental Science program, the main foci of our changes are 1) to deepen the student's knowledge in their area of specialization by requiring a double major and 2) to integrate undergraduate education with resources and research opportunities available in the new Center for Ecosystem Science and Policy (CESP). Our program is more rigorous than the existing program. We are raising the bar and hope to use as a carrot to attract a higher caliber of student. We recognize that recruiting will play an important role in the success of our program.

Students will be able to choose a B.S., B.A. or minor in ECS within the College of Arts and Sciences. The second major (or primary major in the case of the ECS minor) may be within other schools (e.g., Communication, School of Business, College of Engineering, or Architecture).

Thank you for your time.

Sincerely yours,

Jacqueline Dixon
Director of Proposed Undergraduate Program
in Ecosystem Science and Policy
Professor of Geological Sciences/A&S and
Marine Geology and Geophysics/RSMAS

Mary Doyle
Co-Director of CESP
Professor of Law /University of Miami School of Law

Members of the ECS
Curriculum Committee
Kenny Broad
Linda Farmer
Lora Fleming
Don Olson
Helena Solo-Gabriele
Michael Sloat
Richard Weisskoff
Jonathan West

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Mission Statement

In this new century, we face unprecedented environmental challenges and opportunities. The goal of all our efforts must be to find ways to meet human needs while protecting and restoring the natural environment that sustains us. Sound environmental decisions will have to be made based on the best scientific knowledge and understanding available. As science increasingly demonstrates the complex interconnectedness of all the elements of natural systems, as well as the effects of land development and other human activity on natural areas, environmental decisions must take into account potential ecosystem-wide effects to be truly effective. Always present is the understanding that policy decisions will have to be made in the face of scientific uncertainty about key causal linkages in natural systems, often relying on untested technologies, and that subsequent scientific and technological advances may call for significant revisions in policy approaches.

In the future, environmental scientists and nonscientist policy-makers, managers, and planners must communicate with each other in new and better ways as development and environmental policy decisions are made. The ecosystem-wide approach will require planning and policy-making involving multiple political jurisdictions and agencies of government, as well as their constituencies, which are not accustomed, and often not well suited, to working together. Chronic disputation over strategies and approaches is to be expected, and avoidance and resolution of conflict are critical in modern environmental policy-making, management, and planning.

This document describes the proposed undergraduate program in Ecosystem Science and Policy (ECS). The goals of this new interdisciplinary undergraduate program are to provide students with a broad background in environmental issues from a variety of perspectives, along with in-depth education in an area of specialization. This preparation will give students both the theoretical background and technical skills to pursue an environmental career. Our proposed degree is a double major program. Students earning a B.S. in ECS must also complete a B.S. in science or engineering (e.g., biology, chemistry, geology, math, physics, engineering or health science). Students earning a B.A. in ECS must also complete a B.A. in social science (e.g., political science, geography, or economics). The Ecosystem Science and Policy major will offer a series of problem-based learning courses, culminating in a capstone course in the senior year team-taught by scientist and non-scientist faculty, emphasizing integration of science and policy approaches to real-world environmental issues. A seminar series, taken for credit in their sophomore year, will be offered by faculty and visitors in the Center for Ecosystem Science and Policy (CESP). Students will be required to complete either a research internship with local environmental organizations or a research project with CESP or other UM faculty.

The Ecosystem Science and Policy program will be administered by a full-time director (Professor Jacqueline Dixon) and a half-time assistant director (Terri Hood, Ph.D.) who will oversee student recruitment, curriculum and internships, and student placement. The program is overseen by the Advisory Board for the CESP.

**SECTION A: THE PROPOSED
UNDERGRADUATE CURRICULUM
FOR ECOSYSTEM SCIENCE AND
POLICY**

A1: Entrance Requirements

It is recommended that a student's high school curriculum include at least three years of English and mathematics, and one year each of biology, chemistry and physics. Freshman applicants must have an SAT score of 1250 or an ACT composite score of 24, be in the top 25% of their graduating class, and have a minimum grade point average of 3.0. Transfer applicants must have earned at least twelve (12) academic credits, and have a minimum grade point average of 2.5.

These requirements are similar to those of Marine Science, except that we have raised the minimum SAT score from 1100 to 1250.

A2) Overview of Degree Options

Students can choose from a B.S., B.A., and minor in Ecosystem Science and Policy (ECS). Detailed requirements are listed in sections A4, A5, and A6. Both B.S. and B.A. degrees are double majors. A student pursuing a B.S. in ECS must obtain a second degree in science, engineering or math (e.g., biology, chemistry, geology, math, physics, environmental engineering). A student pursuing a B.A. in ECS must obtain a second degree in a social science or humanities (e.g., architecture, communications, economics, geography, or political science).

Because ECS is an interdisciplinary degree, our core requirements are similar for both science and non-science students. The differences are highlighted below:

	Number of Credits		<u>Minor</u>
	B.S.	B.A.	
<i>Arts and Science Requirements</i>			
English	3-6	3-6	
Language	3-9	3-9	
History/Social Science	12	15	
Arts& Humanities	12	15	
Math	11-12	3	
Natural Science	4-8	11-12	
<i>ECS Requirements</i>			
Ecosystem Science and Policy Core	19	19	13
Env.-Related Social Science	12 (3 elective)	18 (9 elective)	3
Math	9	6 (includes statistics)	
Science Core	21	15	
Env.-Related Science	17 (6 elect.)	9 (3 elective)	3

Overall, the B.S. degree includes more science (14 credits more) and math (3 credits more) and less social science (6 credits less) than the B.A. degree. Also, the B.A. students will take a more general ecology course (BIL 103) rather than the ecology course with lab for science majors (BIL 160/161).

A3: Core Subjects for Ecosystem Science and Policy

This program seeks to provide:

- 1) a comprehensive background in basic science or policy with a second major in science, engineering, or math (BS); or in social science or humanities (BA).
- 2) a fundamental understanding of the environmental complexity of the ecosphere, the history of geochange, current challenges and future projections.
- 3) tools of environmental investigation and management; survey and quantitative, sociological and legal, economic and ethical,
- 4) an ability to conceptualize the multifaceted nature of environmental issues and the human framework for solution.

Courses are designed to foster the development of

- A) reading and communication skills
- B) quantitative analysis
- C) critical reasoning

on an incremental basis through 4 years of the degree program as described below:

A) Reading and Writing Exercises

Cornerstone Year

Goals:

- | | |
|--|-------------------------|
| Further development of basic writing skills | <i>English 105, 107</i> |
| Introduction to scientific writing and scientific literature | <i>ECS 111,112</i> |

Implementation:

- Short essays which present an opinion and express ideas clearly and logically
- Assignments which require students to dissect the structure of an assigned scientific paper and extract the hypothesis, methods and results and learn citation methods.
- Assignments which require reading a review of an environmental topic and identifying the central themes and concepts.

Sophomore/Junior Year

ECS 301,302

Goals: To be able to read, understand and summarize scientific concepts with clarity and precision.

Implementation:

- Review and discuss essential ideals and results contained in instructor selected literature.
- Write term papers which draw from a variety of literature sources. Summarize and synthesize ideas in a coherent paper.

Capstone Year

ECS 401/402/403

Goals: Evaluate scientific arguments

- Write a scientific paper starting from a set of raw data

Implementation:

- Compare, contrast and evaluate arguments presented by different factions on the same topic.
- Write well argued position papers on topical issues in environmental science, including the student's own ideas.
- Write a scientific paper using raw data.
- Framing legislation.

B) Quantitative Analysis Exercises

Cornerstone Year

ECS 101,102, Math 107

Goals: Understanding dimensional analysis and scaling, review of logs and exponential functions
Simple statistical analysis and graphical presentation skills

Implementation:

Students use instructor prepared data, or data collected in lab for analysis of trends and graphical representation.

Sophomore/Junior Years

*Math 111, 109, ECS 301,302, Statistics
Economics 211,212*

Goals: Conduct basic data quality control
Further development of statistical and time series analysis
Analyze a data set with a minimum of instructor input

Implementation:

Apply statistical analysis to published data sets from Everglades, DERM or Explorer of the Seas
Plan an environmental sampling regime on the distribution of a plant/animal group
collect and analyze the data
Plan a survey to solicit trends in public opinion, collect and analyze data
Develop a cost/ benefit of a legal change in the environment
Analyze special data using GIS formats

Capstone Year

Goals: Select and apply appropriate sampling methods and statistic analysis to support a hypothesis.
Extract relationships between variables and demonstrate essential results.

Implementation:

Capstone Project

A4: Overview of Requirements for B.S. in Ecosystem Science and Policy (ECS)

Education in Ecosystem Science and Policy involves both breadth (background in science, math, and policy) and depth (completion of a second major in biology, chemistry, engineering, geosciences, math, meteorology, physics). Many of the required introductory “breadth” courses will satisfy the general education requirements for the College of Arts and Sciences, though greater flexibility would be useful in order to allow upper division courses to count toward these requirements. These A & S general education courses are listed first, followed by the required ECS courses.

1) General Education requirements for the B.S Degree in the College of Arts and Sciences (57-71 credits):

- A. *English Comp.* **3-6 credits**; ENG 105 & 106 or 107.
- B. *Foreign Lang.* **3-9 credits**; at least 3 credits 200 level or >.
- C. *History/Social Sci.* **12 credits**; a minimum of 3 credits History; 9 credits in other disciplines with no more than 6 in any one department.
The ECS curriculum requires either POL 211 & 212 or ECO 211 & ECO 212. Both of these core sequences satisfy the History/Social Sciences requirement. Students will have to take two additional Social Sciences classes (6 credits) outside of ECS requirements. One class (3 credits) must be History. The other class can be any of the approved courses as long as there are no more than 2 classes (6 credits) in any one department.
- D. *Arts & Humanities* **12 credits**; At least 3 credits in each area of 1) Fine Arts; 2) Literature; 3) Philosophy/Religious Studies.
- E. *Mathematics* **11-12 credits**; two semesters of Calculus (MTH 110-112, 111-112, or 131-132) and either a) one semester computer course; or b) a statistics course.
These courses will be required for a degree in ECS. If students come into the program with AP calculus credits, then they should replace calculus with differential equations. ECS students are required to take a statistics course.
- F. *Natural Science* **4-8 credits**; at least 4 credits in one of the basic sciences other than your major or minor including BIL 150/151, CHM 111, and PHY 101-102-106-108 (10 credit College physics series) or PHY 205-206-207-208-209 (11 credit University physics series). The Natural Science requirement will be fulfilled by the ECS requirements.
- G. *Writing* Five writing-oriented courses (W) beyond ENG 105 & 106
- H. *Minor* Because the ECS program is a double major, no minor is required.

2) ECS Requirements for B.S. Degree (ECS = 41-52 credits; 78 credits total)
***indicates course currently fulfills A&S General Education Req.**

<u>Course Title</u>	<u>Course #</u>	<u>ECS</u>	<u>Credit Hours</u>	
			<u>Gen. Ed</u>	<u>2nd Major</u>
ECS Core Requirements (19 credits)				
Freshman Intro to Ecosys. Science and Policy I	ECS 111 (Fall)	3	-	-
Freshman Intro to Ecosys. Science and Policy II	ECS 112 (Spring)	2	-	-
Sophomore ECS Seminar.	ECS 201	1	-	-
Sophomore ECS Seminar	ECS 202	1	-	-
Tools for Env. Dec. Making	ECS 301	3	-	-
Tools for Env. Dec. Making	ECS 302	3	-	-
Senior Thesis or Internship	ECS 401/402	3	-	-
Senior Capstone (complex problem solving)	ECS 403	3	-	-

Environmental Related Social Science (12 credits total/6 credits beyond Gen. Ed.)

Students must take four 3-credit environmental-related social sciences:

	<u>ECS</u>	<u>Gen. Ed</u>	<u>2nd Major</u>
a. Students must select either: *ECO 211 & *ECO 212 (prereq. for all adv. econ. courses except ECO 345), or *POL 211 & *POL 212 (prereq. for all adv. political science courses)	-	6	-
b. PHI 330 (Ethics) or another ethics –related course (proposed PHI 500).	3	-	-
c. Students must take one additional enviro.-rel. social sci. elect. (level 300 or greater; <i>see section A8</i>).	3	-	-

Math (9 credits total/ 0 credits beyond Gen. Ed.)

*Calculus I	MTH 111	-	3	-
*Calculus II	MTH 112	-	3	-
*Probability and Statistics	MTH 224/PSY 204/BIL 311	-	3	-

Science Core (21 credits total/ 8-16 credits beyond Gen. Ed. and second major)

(any of these courses can fulfill A&S Gen. Ed. Req. up to 4 credits. If second major is BIL, CHM, PHY, or GSC, 4-8 credits apply to second major. If second major is math, 0 credits apply to second major. CHM is used as an example below.)

<u>Course Title</u>	<u>Course #</u>	<u>ECS</u>	<u>Gen. Ed</u>	<u>2nd Major</u>
Principles of Chemistry I	CHM 111	-	-	3
Chem I lab	CHM 113	-	-	1
Principles of Chemistry II	CHM 112	-	-	3
Chem II lab	CHM 114	-	-	1
Physics I	PHY 101 or 205	-	4 or 3	-
Physics Lab	PHY 106 or 208	-	1	-
The Earth System	GSC 110 or 120	3	-	-
Env. Geol. Lab	GSC 115	2	-	-
Intro. Marine Sci.	MSC 111	3	-	-

**Environmental-related Science (17 credits/ 8-11 credits beyond Second Major)
(These courses could also count toward second major)**

Course Title	Course #	ECS	Gen. Ed	2nd Major
Evolution and Biodiversity	BIL 160	4	-	-
Evol. and Biodiv. Lab	BIL 161	1	-	-
Environmental Pollution	CAE 240	3	-	-
Ecology	BIL 235	3	-	-
Environmental-related Science electives (<i>see section A7</i>)			-	6
Total Credits		ECS	Gen. Ed	2nd Major
For this example of ECS/Chemistry :		44	20	14

Total credit hours = 78

Fulfillment of many of the A&S General Education Requirements by the ECS/BS major:

<u>A&S B.S. REQUIREMENTS</u>	<u>ECS REQ.</u>	<u>A&S minus ECS</u>
A. <i>English Composition</i> 6 credits		6 (105+107)
B. <i>Foreign Languages</i> 3-9 credits.	0	3-9
C. <i>History/Social Sciences</i> 12 credits (no more than 6 in any one department)	6 ECO/POL	6 HIS
D. <i>Arts & Humanities</i> 12 credits Arts/Lit	0	12 Fine
E. <i>Mathematics</i> 11-12 credits	12	0
F. <i>Natural Science</i> 4-8 credits	20	0
G. <i>Writing</i>		0
Total A&S required courses in addition to <u>ECS</u> requirements		27-33 credits

A5: Overview of Requirements for the B.A. Degree in Ecosystem Science and Policy (ECS)

1) General Education requirements for the B.A. Degree (55-68 credits):

- A. *English Composition* **3-6 credits**; ENG 105 & 106 or 107
- B. *Foreign Languages* **3-9 credits**; at least 3 credits 200 or >
- C. *History/Social Sciences* **15 credits**; 6 credits History survey sequence (HIS 101-102, 121-122, 131-132, 161-162); 9 credits in other disciplines
- D. *Arts & Humanities* **15 credits**; at least 3 credits, but no more than 6 credits, in each of 1) Fine Arts, 2) Literature, and 3) Philosophy/Religious Studies
- E. *Mathematics* **3 credits**; one of the following: MTH 103, 108, 109, 111, 131= precalc, algebra & trig, calc I. **ECS/BA students required to take statistics.**
- F. *Natural Science* **11-12 credits**; in two or more of the following disciplines: biology, chemistry, Geological sciences, marine Sciences, Physics, and Physical Sciences. See Bulletin for list of courses.
- G. *Writing* Five writing-oriented courses (W) beyond ENG 105 & 106

(no minor required because it is a double major)

2) ECS Requirements for B.A. Degree (ECS = 37 credits; 67 credits total)

***indicates course currently fulfills A&S General Education Req.**

Course Title	Course #	ECS	Credit hours	
			A&S	2 nd Major
ECS Core Requirements (19 credits)				
Freshman Intro to Ecosys. Science and Policy	ECS 111 (Fall)	3	-	-
Freshman Intro to Ecosys. Science and Policy II	ECS 112 (Spring)	2	-	-
Sophomore ECS Seminar.	ECS 201	1	-	-
Sophomore ECS Seminar	ECS 202	1	-	-
Tools for Env. Dec. Making	ECS 301 (=statistics)	3	-	-
Tools for Env. Dec. Making	ECS 302	3	-	-
Senior Capstone (thesis or internship)	ECS 401/402	3	-	-
Senior Capstone (complex problem solving)	ECS 403	3	-	-

Environmental-related Social Science (18 credits/9 beyond Gen.Ed./can count toward 2nd major)

Course Title	Course #	ECS	A&S	2 nd Major
*Econ. or Pol. Sci. Core I	ECO 211/POL 211	-	3	-
*Econ. or Pol. Sci. Core II	ECO 212/POL 212	-	3	-
Ethics (3 cred. PHI prereq/poi)	PHI 330/PHI 500	3	-	-
Environmental-related social science elective (<i>see list A8</i>) (at least two courses must be 300 level or greater)				9
Math (6 credits):				
One of:	MTH 103, 108, 109, 111, 131	-	3	-
Prob. and Statistics	MTH 224/PSY 204/BIL 311	3	-	-

Science Core (15 credits/3 credits beyond Gen. Ed.)

<u>Course Title</u>	<u>Course #</u>	<u>ECS</u>	<u>A&S</u>	<u>2nd Major</u>
Principles of Chemistry I	CHM 111	-	3	-
Chem I lab	CHM 113	-	1	-
Principles of Chemistry II	CHM 112	-	3	-
Earth System	GSC 110 or 120	-	3	-
Earth System Lab	GSC 115	-	2	-
Intro to Marine Sci.	MSC 111	3	-	-

Environmental-related Science (9 credits beyond Gen. Ed.)

Elementary Ecology	BIL 103	3		
(proposed course, not currently in catalog)				
Environ. Pollution	CAE 240	3		
Environmentally-related Science Electives (<i>sect. A7</i>)		3		
		<u>ECS</u>	<u>Gen. Ed</u>	<u>2nd Major</u>
		37	21	9

Total credit hours = 67

A6: REQUIREMENTS FOR MINOR IN ECOSYSTEM SCIENCE AND POLICY (19 credits)

<u>Course Title</u>	<u>Course #</u>	<u>Credit hours</u>
ECS Core Requirements (16 credits)		
Freshman Intro to Ecosystem Science and Policy I	ECS 111 (Fall)	3
Freshman Intro to Ecosystem Science and Policy II	ECS 112 (Spring)	2
Sophomore ECS Seminar.	ECS 201	1
Sophomore ECS Seminar	ECS 202	1
Tools for Env. Dec. Making	ECS 301	3
Tools for Env. Dec. Making	ECS 302	3
<i>(Minors not required to do capstone course, thesis or internship)</i>		
Environmental-related Social Science Electives (3 credits)		
<i>choose 1 courses from elective list A8:</i>		
Environmental-related Science (3 credits)		
<i>choose 1 courses from elective list A7:</i>		
Total credits for minor in ECS		19

See Sections A7 and A8 for list of elective courses.

A7) ECS Environmentally-related Science Electives

(These courses may satisfy other major elective requirements. Additional courses may be added to list upon approval by director):

BIL 233	Conservation Biology	3
BIL 235	Ecology	3
BIL 236	Ecology Lab	1
BIL 241	Animal Behavior	3
BIL 335	Tropical Field Biology (BIL 150/160 + labs prereq)	3
BIL 531	Advanced Field Ecology	5
BIL 533	Advanced Conservation Biology	3
BIL 537	Ecosystem Ecology	3
BIL 540	Ethology and Behavioral Ecology	3
BIL 541	Laboratory and Field Ethology	3
CAE 330	Fluid Mechanics (CAE 210, PHY 206 prereq)	3
CAE 340	Introduction to Environmental Engineering (MTH 112, CHM 111)	3
CAE 345	Environmental Lab	3
CAE 430	Water-Resources Engineering (CAE 330 prereq)	3
CAE 530	Water-Quality Control in Natural Systems (CAE 430 prereq)	3
CAE 531	Surface-Water Hydrology (CAE 430 prereq)	3
CAE 540	Environmental Chemistry	3
CAE 541	Environmental Microbiology	3
CAE 542	Solid and Hazardous Waste Engineering (CAE 340 prereq)	3
CHM 201	Organic Chemistry I	3
CHM 205	Organic Chemistry I Lab	1
CHM 202	Organic Chemistry II	3
CHM 206	Organic Chemistry II Lab	1
CHM 360	Physical Chemistry I	3
CHM 364	Physical Chemistry I Lab	1
CHM 401	Environmental Chemistry	3
CHM 416	Environmental Analysis (also listed as MSC 416)	3
EPH 541	Environmental Health (proposed course)	3
GEG 391	Introduction to GIS	3
GEG 392	Remote Sensing of the Environment	3
GSC 260	Earth Materials	4
GSC 410	Environmental Geochemistry	3
GSC 550	Hydrogeology	3
GSC 555	Mathematical Methods for Geoscientists	3
GSC 580	Summer Field Geology	4
MEN 119	Energy and Environment	3
MEN 303	Thermodynamics I (PHY 206, MTH 112 or 132 prereq)	3
MEN 308	Thermodynamics II (MEN 303 prereq)	3
MEN 309	Fluid Mechanics (CAE 210, PHY 206 prereq)	3
MEN 310	Heat Transfer (MEN 303 prereq)	3
MEN 311	Mass Transfer I (MEN 303, 309 prereq)	3
MGG 525	Applied Environmental Geophysics	3
MGG 580	Geological and Environmental Remote Sensing	3
MSC 241	Atmospheric Chemistry	3
MSC 310	Living Resources of the Ocean	3
MSC 315	Coastal Processes	3
MSC 330	Marine Pollution	3
MSC 402	Introduction to Atmospheric Modeling	4
MSC 410	Marine Conservation Science	4
MSC 417	Global Change: Chemistry and Climate Modeling	4

A8) ECS Environmental-related Social Science Electives
 (*courses currently fulfill A&S general education requirements. Additional courses may be added upon approval by director.)

APY 398	Coastal Cultures	3
*ECO 211	Economic Principles and Problems I (microecon.)	3
*ECO 212	Economic Principles and Problems II (macroecon.)	3
ECO 345	Economics of Natural Resources and the Environment	3
ECO 351	Economics of Developing Countries (ECO 211/212 prereq.)	3
*GEG 105	World Regional Geography	3
*GEG 110	Introduction to Human Geography	3
GEG 371	Environmental Geography: Current Issues	3
INS 476	Science, the Environment, and Policy	3
MAF 501	Political Ecology of Resources Management	3
MAF 502	Economics of Natural Resources	3
MAF 510	Environmental Planning and the Envir. Impact Statement	3
MAF 518	Coastal Zone Management	3
MAF 520	Environmental Law	3
MSC 313	Coastal Law (cotaught with BSL 313 in Bus. School?)	3
MSC 314	Ocean Law (cotaught with BSL 314 in Bus. School?)	3
MSC 340	Ocean Policy	3
PHI 335	Professional Ethics (prereq as for 330)	3
*POL 211	American National Government	3
*POL 212	Comparative and International Politics	3
POL 321	Public Policy and Administration	3
POL 322	Environmental Politics and Policy	3
POL 545	Environmental Policymaking	3
POL 553	Environmental Movements	3

SECTION B: NEW COURSE DESCRIPTIONS

B1) Summary of New ECS Courses

- ECS 111: Introduction to the Earth's Ecosystem** J. Dixon / M. Doyle
Earth's ecosystem and the interactions of humans with it. Concepts in ecology, environmental science and policy. Two field trips. Team-taught. 3-credits.
- ECS 112: Problems in Ecosystem Science and Policy** D. Olson / J. Lombard / F. Miralles
Problem solving in ecology and environmental management. Class projects and case studies providing experience in identifying problems, quantifying scientific issues and considering management options and outcomes. Extensive field experience. Team-taught. 2-credits.
- ECS 201: Seminar Series in Contemporary Environmental Issues I** T. Hood
Current environmental topics involving interaction of science and policy. 1-credit.
- ECS 202: Seminar Series in Contemporary Environmental Issues II** T. Hood
Current environmental topics involving interaction of science and policy. 1-credit.
- ECS 301: Tools for Environmental Decision-Making: The Quantitative Perspective**
T. Dixon / L. McManus
Quantitative decision-making techniques and methodologies. 3-credits.
- ECS 302: Tools for Environmental Decision-Making: The Human Perspective**
R. Weiskoff / K. Broad
Analytical techniques to assess human impacts on the environment. Team-taught by faculty from law, ethics, anthropology and economics with experience in local, regional and global environmental management issues. 3-credits.
- ECS 401: Internship** M. Doyle
Students selecting the internship will be required to spend a minimum of 120 contact hours working in an outside firm or agency whose mission is to address environmental issues where science and policy intersect. 3 credits.
- ECS 402: Senior Thesis**
Individual, original research of independent study supervised by a UM faculty member and concluded by formal thesis preparation, public oral defense and submission of the thesis. 3 credits.
- ECS 403: Interdisciplinary Approaches to Complex Human-Environmental Problems (Capstone Course)**
D. Olson / K. Broad
Students with diverse disciplinary backgrounds will design an interdisciplinary study focused on an environmental problem with a major science component and significant societal implications. Students will apply quantitative and qualitative methods, formulate usable policy, and communicate their results.

B2) Ecosystem Science and Policy 111: Introduction to the Earth's Ecosystem

The purpose of this course is to introduce the student to the dynamics of our planet and the issues involved with its ability to support life and our civilization. The course includes a broad overview of topics in ecology, environmental science and the basic science and policy topics involved with these fields. Quantitative measures of the state of various components in the earth system are stressed along with the problems of making informed decisions based on available scientific knowledge.

Course grades will be based on three exams equally spaced throughout the semester and two writing assignments. The latter will involve the review of a science topic and a policy review. 10% of the grade will depend upon the grade for the discussion section. These will involve your participation in smaller discussion groups.

Text: Miller - Environmental Science
Kempton et al - Environment Values in American Culture. MIT Press.

Additional Readings: Specific articles from Science, Nature and the New York Times Science Section, will be assigned during the course. These are available online through the library.

Faculty: M. Doyle, J. Dixon / **Discussion:** D. DiResta, M. Doyle, K. Broad, D. Olson, J. Dixon, F. Miralles

Lectures:

- 1) Introduction to Planet Earth: A systems view
- 2) A history of mankind's use and view of the planet.
- 3) Structure of science: Cataloging information, hypothesis - proofs, reductionist views.
- 4) Mass action and energetics: Rates of change and accounting, measuring the earth and its function.
- 5) Interactions: Closed versus open cycles, systems with loss, nature of life.
- 6) Ecosystems: Components and their diversity, carrying capacity and niches.
- 7) Averages and extremes: Examples of ecosystems, biogeography, civilizations.
- 8) Geological settings: tectonic processes and provinces, terrains, soils.
- 9) Other abiotic influences: Weather and climate
- 10) The march of change: Variations in abiotic conditions past, present and future.
- 11) Biotic interactions: Community ecology, predators and prey, food chains and webs.
- 12) Population dynamics: Logistic systems, the problems of being rare - defining conservation.

- 13) Limits to growth: Governing factors, water, nutrients (food), space
- 14) Population shifts: Evolution, invasive species, humans.
- 15) Competition: Pests, maintenance of niche, monocultures
- 16) Human history: demography, civilizations, future
- 17) Food resources: Sustainable agriculture - history and future.
- 18) Water: Use and misuse, water management.
- 19) Other non-living resources: Mining and the environment, the quest for oil and coal.
- 20) The value of nature: Wildlife in parks and urban settings, our pets, the value of nature.
- 21) The problem of waste: Recycling vs. storage, the problem of conversion, byproducts.
- 22) Pollution: Controls versus conversion, historical views and future trends.
- 23) The nature of risk: Facing uncertainty, balancing risk vs. gains, rolling the dice.
- 24) Economics: The other human interaction, micro vs. macro, balancing economics vs. the environment.
- 25) Sustainability: An achievable goal?
- 26) Political issues: How do we govern ourselves? Are there choices? How do laws work?
- 27) Global vs. Local: Globalization versus the neighborhood.

The other three days of class will be used for the exams. Exams will be a mixture of multiple choice/ short answer and two to four essays.

B3) ECS 112: Problems in Ecosystem Science and Policy

The purpose of this course is to develop basic skills in ecosystem assessment and management including the use of charts and computer databases, simple statistics and demography and the interpretation of laws and policies. The course is organized around four theme areas: 1) Water resources including wetlands and water supplies; 2) Wildlife in both the natural preserve and developed environment; 3) Urban environments including aspects of design and development; 4) Resource usage and pollution.

The course work is centered on three case studies that will be completed by small working groups. Grades will be based on the working groups' final product in each case study and the individual student's participation in their working group. These will be judged based on written, joint reports and displays from the groups and two individual presentations made by each student during the semester. Students will be enrolled in co-temporal sections allowing inter-sectional debates and exhibitions as part of each of the case studies. Faculty will rotate between sections at the end of the first and second case studies to allow students to interact with the entire faculty.

Examples:

Water flow in Southeast Florida: Students are expected to put together a historical perspective of water management in the region. A chart of current water flow and its variation under short term climate change. Review of current law and policy pertaining to water management including current and pending litigation. The case study should review the current plans for Everglades restoration and make a set of recommendations for future policy.

Land use in Dade County: Groups will randomly select two zip codes in Miami-Dade County and then perform a quantitative analysis and comparison of them. This should include demographics, resources, commercial diversity, schools and other infrastructure issues. The historical and possible future developments in the regions should be discussed along with an analysis of the legal and policy issues that have lead to the organization of the two regions. An assessment of current risks and liabilities in each of the regions should be accompanied by a set of recommendations on the future development in the two regions.

B4) ECS 201: Seminar Series in Contemporary Environmental Issues

Course Number: ECS 201

Credit(s): 1

Course Title: Seminar Series in Contemporary Environmental Issues I

Prerequisites: None

Faculty: Terri Hood

Description: Students will attend one lecture each week delivered by a faculty member fellow in the Center for Ecosystem Science and Policy or a distinguished visitor to the Center from another academic institution or from practice. The lectures will address current environmental topics involving the interaction of science and policy. Students will be required to write a short critique of each lecture and to meet once a week to discuss the lecture topic. May only be taken once for credit.

Grades will be based on the student's written critiques.

B5) ECS 202: Seminar Series in Contemporary Environmental Issues II

Course Number: ECS 201

Credit(s): 1

Course Title: Seminar Series in Contemporary Environmental Issues I

Prerequisites: None

Faculty: Terri Hood

Description: Students will attend one lecture each week delivered by a faculty member fellow in the Center for Ecosystem Science and Policy or a distinguished visitor to the Center from another academic institution or from practice. The lectures will address current environmental topics involving the interaction of science and policy. Students will be required to write a short critique of each lecture and to meet once a week to discuss the lecture topic. May only be taken once for credit.

Grades will be based on the student's written critiques.

B6) ECS 301 Tools for Environmental Decision-Making: The Quantitative Perspective

Course Number: ECS 301

Credits: 3

Course Title: Tools for Environmental Decision-Making: The Quantitative Perspective

Prerequisites: ECS 112

Faculty: Professors Tim Dixon and Liana McManus

Description: Quantitative decision-making techniques and methodologies that have gained widespread use throughout a variety of ecosystem applications involving science, technology, health and economic variables. These techniques combine uncertainty with process models in order to estimate ecosystem risks and benefits within a probabilistic framework. The course will cover the quantitative methods in detail. In addition, specific real world case studies will be analyzed in student working groups.

Week

- 1: Introduction: Scoping Procedures, ecosystem classifications, species-habitat relationships, statement of a problem.
- 2: Distribution data, basic statistics, variance, chi-square and nearest neighbor analysis.
- 3: Factors in the abiotic environment, short term and long term trends, identification of anomalies.
- 4: Setting up a sampling regime, technique comparisons, physical constraints, setting limitations on quantity and timing of data collected.
- 5: Conducting a field survey.
- 6: Uncertainties in Sampling, scale and timing, patchiness.
- 7: Data Analysis; regression, ANOVA.
- 8: Data Analysis; correlation.
- 9: Spatial analysis and 3D plots, gradients.
- 10: Introduction to Remote Sensing, satellite visualization of forestry patterns.
- 11-12: Introduction to GIS.
- 13-14: Project Presentation.

Grading: Mid-term and final examination 50%, Project 30%, Class Participation and Assignments 20%.

Text: Busch, David E. and Trexler, Joel, (2002) Monitoring Ecosystems: Interdisciplinary Approaches for Evaluating Ecoregional Initiatives. Island Press. Washington

Skoal, Robert R. and Rohlf, F. James, (1995) Biometry. W. H. Freeman and Company N.Y.

B7) ECS 302 Tools for Environmental Decision-Making: The Human Perspective

Course Number: ECS 302

Credits: 3

Course Title: Tools for Environmental Decision-Making: The Human Perspective

Prerequisites: ECS 301

Faculty: Professors Richard Weisskoff and Kenny Broad

Description: This course will provide the students with exposure to a suite of analytical techniques to assess human impacts on the environment. These include qualitative and quantitative social science techniques, economic tools, environmental impact assessment, participatory approaches, conflict resolution, risk and analysis, and environmental ethics. Case studies will be used to illustrate how these tools are applied to environmental decision-making.

The course will be team taught by faculty from law, ethics, anthropology and economics with experience in local, regional and global environmental management issues. Students working in teams with a faculty mentor will develop a case study of a local management issue.

Week

- 1: Introduction: The ecological, socioeconomic and institutional matrix of natural resource management.
- 2-3: The Legislative contexts for ecological assessment.
- 4-5: Establishing value: Cost/Benefit Analysis.
- 6: Establishing value risk analysis and uncertainty.
- 7: Focusing Procedures: Public appeal, keystone species, endangerment, economic importance.
- 8: Long Term environmental health, sustainability.
- 9: Cases in environmental ethics.
- 10: Survey, interviewing and data gathering.
- 11: Conflict resolution, clear statements of positions, identifying stakeholders.
- 12: Conflict resolution, negotiating techniques and tools.
- 13-14: Project presentations and critique.

Grading: Mid-term and final examination 50%, Project 30%, Class Participation and Assignments 20%.

Text: Meffe, Gary K. et al (2002) Ecosystem Management: Adaptive, Community-Based Conservation.

Bernard, R., Research Methods in Cultural Anthropology.

Hale, Tools for Environmental Decision-making.

B8) ECS 401: Internship

Course Number: ECS 401

Credits: 3

Course Title: ECS Internship or Thesis

Prerequisites: ECS 302

Faculty: Professor Mary Doyle

Description: Students selecting the internship will be required to spend a minimum of 120 contact hours working in an outside firm or agency whose mission is to address environmental issues where science and policy intersect. Examples include: the South Florida Water Management District; the Florida Department of Environmental Protection; the Chesapeake Bay Commission; regional offices of the U.S. Bureau of Reclamation; Florida Audubon; World Wildlife Fund. Alternatively, students may select to submit a thesis addressing a complex issue or related series of issues involving the nexus of environmental science and policy.

B9) ECS 402: Senior Thesis

Course Number: ECS 402

Credits: 3

Course Title: ECS Thesis

Prerequisites: ECS 302; 3.0 GPA in ECS

Faculty: Professor J. Dixon

Individual original research of independent study supervised by a member of the UM faculty and concluded by formal thesis preparation, public oral defense and submission of the thesis.

B10) ECS 403: Interdisciplinary Approaches to Complex Human-Environmental Problems

Course Number: ECS 403

Credits: 3

Course Title: Interdisciplinary Approaches to Complex Human-Environmental Problems

Prerequisites: ECS 302

Faculty: Professors Don Olson and Kenny Broad

Short Description for Catalog: Students with diverse disciplinary backgrounds will design an interdisciplinary study focused on an environmental problem with a major science component and significant societal implications. Students will apply quantitative and qualitative methods, formulate usable policy, and communicate their results.

Description: Students will conduct an interdisciplinary study focused on a contemporary environmental problem with a major science component and significant societal implications. The goal is not for each student to become an expert in each analytical technique, but for students to be able to recognize what suite of methodological tools and disciplines are necessary to analyze different sorts of issues, and how to carryout a research project that addresses complex problems.

Students will work in multidisciplinary groups including complementary skill sets (i.e., natural, physical, social and policy sciences) and choose a problem that they will have to analyze in order to be able to make policy prescriptions. Problems chosen will vary with the skills and interests of the students, and may range, for example, from negotiating an international treaty to linking quantitative models that represent human interaction with ecological systems. Examples include:

- Vulnerability assessment of coastal zones in Pacific small island states to extreme events;
- Environment Impact Assessment, focusing on public health impacts related to alternative energy sources (e.g., hydrogen fuel cells);
- Addressing the technology transfer dispute between various countries related to the Kyoto Protocol;
- Socioeconomic and ethnic differences in response and recovery to Hurricane Andrew;
- Analysis of forestry policies and practices during prolonged droughts in Kalimantan, Indonesia;
- Human health impacts via water quality changes related to modification of Florida's dairy industry zoning laws;
- Evaluation of stakeholder preferences and values concerning drilling in the Alaska Wildlife Refuge;
- Linking macro-economic and climate models for assessment of impact of the El Niño Southern Oscillation on developing economies;
- Environmental and Social Impact Analysis of phosphate mining operation in SW Florida.

Grades will be based on:

- 15% Class Participation
- 10% Literature Review Paper
- 20% Exam on Concepts and Cases
- 20% Oral Presentation
- 35% Term Paper

Readings: A collection of relevant articles and references texts will be developed beforehand and placed on reserve at Richter Library. Texts will include:

Baron, J. (2000) Thinking and Deciding. Cambridge Univ. Press.

Bernard, R. (1988). Research Methods in Cultural Anthropology. Sage Publications.

Morgan et al. (2000). Risk Communication: A Mental Models Approach. Cambridge Univ. Press.

Morgan, D. L. and Kreuger, R. A. (1998) The Focus Group Kit. Sage Publications.

Kempton et al. (1999). Environmental Values in American Culture. MIT Press.

Week

1-3: Review of interdisciplinary concepts and methods, including exemplary case studies where these methods have been applied to environmental-societal problems.

Selected readings on application of various methods and interdisciplinary projects.

4-5: Discussion of potential topics and development of research proposal (i.e., study design and budgets).

6: Draft research proposal due. Students read proposals and critical feedback is provided by faculty and student peers during class.

7: Refine and expand details of research proposals.

8: Literature Review due. Students read literature reviews and critical feedback is provided during class.

9-11: Class work, discussions, and fieldwork will be accompanied by readings and guest lectures catered to the interests of the students (e.g., Epidemiology, indigenous knowledge, cross cultural legal frameworks, rational choice theory, etc.).

12-13: Oral presentations of research project progress and critiques.

13-15: Exam on concepts and cases, preparation of final studies, guest lectures.

**SECTION C: EXAMPLE 4-YEAR
PROGRAMS FOR VARIOUS DOUBLE
MAJORS**

C1) Overview of Requirements for B.S. Double Major in Ecosystem Science & Policy and Biology

1) Biology Requirements for B.S. Degree (34 credits)

<u>Course Title</u>	<u>Course #</u>	<u>Credit hours</u>
General Biology	BIL 150	4
General Biology Lab	BIL 151	1
Evolution and Biodiversity	BIL 160	4
Evolution Lab	BIL 161	1
Ecology	BIL 235	3
Genetics	BIL 250	3
Cellular and Molecular Biology	BIL 255	3
General Physiology	BIL 265	3
Two lab or field courses beyond 161 (for example BIL 311 and BIL 236 and BIL 236 fulfill this requirement)	BIL 311 BIL 236	3 1
Additional electives to total 34 credits (3 courses)		

Total Biology requirements for B.Sc.

34 credits

In Addition, students must complete the following

- 1) One of: BIL 311, EEN 118, MTH 120, MTH 224, PSY 204 or equivalent math-statistics course.
- 2) *One year of inorganic chem. (111-112) with lab (113-114), one semester of organic chemistry with lab (201/205).*
- 3) A minor in chem., phys, geol, marine science, biochem, and molecular biology, comp sci, math, or microbiology and immunology. [Double major with ECS fulfills this requirement.](#)

Environmental Related Biology electives include:

BIL 233	Conservation Biology	3
BIL 236	Ecology Lab	1
BIL 241	Animal Behavior	3
BIL 335	Tropical Field Biology (BIL 150/160 + labs prereq)	3
BIL 531	Advanced Field Ecology	5
BIL 533	Advanced Conservation Biology	3
BIL 537	Ecosystem Ecology	3
BIL 540	Ethology and Behavioral Ecology	3
BIL 541	Laboratory and Field Ethology	3

2) ECS Requirements for B.S. Degree (78 credits total-see above)

<u>Course Title</u>	<u>Course #</u>	<u>Credit hours</u>
ECS Core Requirements (19 credits)		
Freshman Intro to Ecosystem Science and Policy I	ECS 111 (Fall)	3
Freshman Intro to Ecosystem Science and Policy II	ECS 112 (Spring)	2
Sophomore ECS Seminar.	ECS 201	1
Sophomore ECS Seminar	ECS 202	1
Tools for Env. Dec. Making	ECS 301 (fill statistics req)	3
Tools for Env. Dec. Making	ECS 302	3
Senior Capstone (thesis or internship)	ECS 401/402	3
Senior Capstone (complex problem solving)	ECS 403	3
Environmental Related Social Science (12 credits)		
Students must take four 3-credit enviro.-related soc. sci.:		12
a. Students must select either:		
*ECO 211 & *ECO 212 (prereq. for all adv. econ. courses except ECO 345), or		
*POL 211 & *POL 212 (prereq. for all advanced political science courses)		
b. Students must take PHI 330 (Ethics) or another ethics –related course.		
c. Students must take one enviro.-rel. social sci. elect. (level 300 or greater; see list A8).		
Math (9 credits)		
Calculus I	MTH 111	3
Calculus II	MTH 112	3
Prob. & Stats.	MTH 224/PSY 204	3
Science Core (21 credits)		
Principles of Chemistry I	CHM 111	3
Chem I lab	CHM 113	1
Principles of Chemistry II	CHM 112	3
Chem II lab	CHM 114	1
Physics	PHY 101/205	4/3
Physics Lab	PHY 106/208	1
Earth System	GSC 110 or 120	3
Earth System Lab	GSC 115	2
Intro. to Marine Sci.	MSC 111	3
Environmental Related Science (17 credits)		
Evolution and Biodiversity	BIL 160	4
Evol. and Biodiv. Lab	BIL 161	1
Environmental Pollution	CAE 240	3
Ecology	BIL 235	3
Science electives (can overlap with electives in second major-see list A7)		6

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3) Suggested 4 year plan for ECS-Biology
bold is required for ECS/bold and underlined is required for Biology

Year 1:

<u>Fall</u>		<u>Spring</u>	
English comp ENG 105	3	English comp ENG 107	3
± Foreign language	3	± Foreign language	3
Calculus I MTH 111 or 131	4	Calculus II MTH 112 or 132	4
<u>General Biology BIL 150</u>	4	<u>Evol. & Biodiv. BIL 160</u>	4
<u>General Biol. lab BIL 151</u>	1	<u>Evol. & Biodiv. lab BIL 161</u>	1
Intro. to Ecosystem ECS111	3	Intro to Ecosystem ECS 112	2
Science and Policy I		Science and Policy II	
	15-18		14-17

Year 2:

<u>Fall</u>		<u>Spring</u>	
History Elective	3	History /Social Science Elect.	3
Princ. Chem. I CHM 111	3	Princ. Chem II CHM 112	3
Princ. Chem. I lab CHM 113	1	Princ. Chem II lab CHM 114	1
Earth System GSC 110	3	Intro. Marine Sci. MSC 111	3
Earth Science lab GSC 115	2	Statistics MTH 224/PHY 204	3
Am. Nat. Gov. POL 211	3	Comp. Int. Politics POL 212	3
Env. Seminar ECS 201	1	Env. Seminar ECS 202	1
	16		17

Year 3:

<u>Fall</u>		<u>Spring</u>	
Arts&Humanities Elective	3	Arts&Humanities Elective	3
Physics 101	4	<u>General Physiology BIL 265</u>	3
Physics lab 106	1	<u>Ecology BIL 235</u>	4
<u>Organic CHM 201</u>	3	<u>Ecology lab BIL 236</u>	1
<u>Organic Lab CHM 205</u>	1	Env. Pollution CAE 240	3
Ethics PHI 330	3	Env. Dec. Making ECS 302	3
Env. Dec. Making ECS 301	3		
	18		17

Year 4:

<u>Fall</u>		<u>Spring</u>	
<u>Cellular Bio BIL 255</u>	4	<u>Genetics BIL 250</u>	3
<u>BIL elective</u>	3	<u>BIL elective</u>	3
<u>BIL elective</u>	3	Arts&Humanities Elective	3
Environ. Soc. Sci. elective	3	Free elective	3
Senior Cap. ECS 401/402	3	Senior Capstone ECS 403	3
(BIL electives will fulfill Envir. Sci. electives)			
	16		15

Total credits = 125-131

C2) Overview of Requirements for B.S. Double Major in Ecosystem Science & Policy and Chemistry

1) Chemistry Requirements for B.S. Degree (34 credits)

<u>Course Title</u>	<u>Course #</u>	<u>Credit hours</u>
Principles of Chemistry I	CHM 111	3
Principles of Chemistry II	CHM 112	1
Chem I Lab	CHM 113	3
Chem II Lab	CHM 114	1
Organic Chemistry I	CHM 201	3
Organic Chemistry II	CHM 202	3
Organic Chem I Lab	CHM 205	1
Organic Chem II Lab	CHM 206	1
Spectroscopic Methods	CHM 304 (Fall)	3
Physical Chemistry I	CHM 360 (Fall)	3
Phys. Chem. Lab	CHM 364 (Fall/Spr)	1
Physical Chemistry II	CHM 365 (Spr.)	3
Instrumental Analy. Chem.	CHM 316 (Spr)	3
Instrumental Methods	CHM 320 (Spr)	2
Elective	see list	3

Total Chemistry requirements for B.S.

34 credits

In Addition, students must complete the following

1) two semesters of Physics.

Chemistry electives include:

CHM 401	Environmental Chemistry (Spr)	3
CHM 416	Environmental Analysis (Fall)	3
CHM 441	Inorganic Chemistry (Spr)	3
CHM 520	Physical Organic Chemistry (Fall)	3
CHM 563	Electronic Structure Methods (Fall)	1
BMB 506	Princ. Biochm. and Molecular Biology (Fall)	3

2) ECS Requirements for B.S. Degree (78 credits total)

<u>Course Title</u>	<u>Course #</u>	<u>Credit hours</u>
ECS Core Requirements (19 credits)		
Freshman Intro to Ecosystem Science and Policy I	ECS 111 (Fall)	3
Freshman Intro to Ecosystem Science and Policy II	ECS 112 (Spring)	2
Sophomore ECS Seminar.	ECS 201	1
Sophomore ECS Seminar	ECS 202	1
Tools for Env. Dec. Making	ECS 301 (fills stat & prob)	3
Tools for Env. Dec. Making	ECS 302	3
Senior Capstone (thesis or internship)	ECS 401/402	3
Senior Capstone (complex problem solving)	ECS 403	3
Environmental Related Social Science (12 credits)		
Students must take four 3-credit envir.-related soc. sci.:		12
a. Students must select either:		
*ECO 211 & *ECO 212 (prereq. for all adv. econ. courses except ECO 345), or		
*POL 211 & *POL 212 (prereq. for all advanced political science courses)		
b. Students must take PHI 330 (Ethics) or another ethics –related course.		
c. Students must take one envir.-rel. social sci. elect. (level 300 or greater; see list A8).		
Math (9 credits)		
Calculus I	MTH 111	3
Calculus II	MTH 112	3
Probability & Statistics	MTH 224/PSY 204	3
Science Core (21 credits)		
Principles of Chemistry I	CHM 111	3
Chem I lab	CHM 113	1
Principles of Chemistry II	CHM 112	3
Chem II lab	CHM 114	1
(choice of Biology 150/151 or Physics 101/106 or 205)		
Physics I (required for chem. major)	PHY 101 / 205	4/3
Physics Lab	PHY 106 / 208	1
Earth System	GSC 110 or 120	3
Earth System Lab	GSC 115	2
Intro. to Marine Sci.	MSC 111	3
Environmental Related Science (17 credits)		
Evolution and Biodiversity	BIL 160	4
Evol. and Biodiv. Lab	BIL 161	1
Environmental Pollution	CAE 240	3
Ecology	BIL 235	3
Science electives (can overlap with electives in second major-see list A7)		6

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3) Suggested 4 year plan for ECS-CHM double major

Year 1:

<u>Fall</u>		<u>Spring</u>	
English comp ENG 105	3	English comp ENG 107	3
± Pre-calc	3		
<u>Princ. Chem. I CHM 111</u>	3	<u>Princ. Chem II CHM 112</u>	3
<u>Princ. Chem. I lab CHM 113</u>	1	<u>Princ. Chem II lab CHM 114</u>	1
Intro. Marine Sci. MSC 111	3	Earth System GSC 110	3
		Earth Science lab GSC 115	2
Intro. to Ecosystem ECS 111	3	Intro to Ecosystem ECS 112	2
Science and Policy I		Science and Policy II	
	13-16		14

Year 2:

<u>Fall</u>		<u>Spring</u>	
History Elective	3	History/Social Science Elect.	3
± Foreign language	3	± Foreign language	3
Calculus I MTH 111 or 131	4	Calculus II MTH 112 or 132	4
<u>Physics I PHY 101 or 205</u>	4 or 3	<u>Physics II PHY 102 or 206</u>	4 or 3
<u>Physics I Lab PHY 106</u>	1	<u>Physics II Lab PHY 208</u>	1
Am. Nat. Gov. POL 211	3	Comp. Int. Politics POL 212	3
Env. Seminar ECS 201	1	Env. Seminar ECS 202	1
	15-19		15-19

Year 3:

<u>Fall</u>		<u>Spring</u>	
Arts&Humanities	3	Arts&Humanities	3
Statistics MTH 224/PSY 204	3	<u>Instr. Analy. Chm CHM 316</u>	3
<u>Organic I CHM 201</u>	3	<u>Organic II CHM 202</u>	3
<u>Organic I Lab CHM 205</u>	1	<u>Organic II CHM 206</u>	1
Ethics PHI 330	3	Env. Pollution CAE 240	3
Env. Dec. Making ECS 301	3	Env. Dec. Making ECS 302	3
	16		16

Year 4:

<u>Fall</u>		<u>Spring</u>	
Arts&Humanities	3		
<u>Physical Chem I CHM 360</u>	3	<u>Physical Chem II CHM 365</u>	3
<u>Phys. Chem I Lab CHM 364</u>	1	<u>Instr. Methods CHM 320</u>	2
<u>Spectro. Methods CHM 304</u>	3	Ecology BIL 235	3
Environ. Social Sci. Elect.	3	<u>Env. Chem. CHM 401</u>	3
Senior Cap. ECS 401/402	3	Senior Capstone ECS 403	3
	16		14

Total credits = 119-130

c. Students must take one envir.-rel. social sci. elect. (level 300 or greater; see list A8).

Math (9 credits)

Calculus I	MTH 111	3
Calculus II	MTH 112	3
Probability & Statistics	MTH 224/PSY 204	3

Science Core (21 credits)

Principles of Chemistry I	CHM 111	3
Chem I lab	CHM 113	1
Principles of Chemistry II	CHM 112	3
Chem II lab	CHM 114	1

Physics I	PHY 101 / 205	4/3
Physics Lab	PHY 106 / 208	1
Earth System	GSC 110 or 120	3
Earth System Lab	GSC 115	2
Intro. to Marine Sci.	MSC 111	3

Environmental Related Science (17 credits)

Evolution and Biodiversity	BIL 160	4
Evol. and Biodiv. Lab	BIL 161	1
(note BIL 150/151 are NOT prereqs for BIL 160/161)		
Environmental Pollution	CAE 240	3
Ecology BIL 235		3
Science electives (can overlap with electives in second major-see list)		6

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3) Suggested 4 year plan ECS-Geology

Year 1:

<u>Fall</u>		<u>Spring</u>	
English comp ENG 105	3	English comp ENG 107	3
± Foreign language	3	± Foreign language	3
Princ. Chem. I CHM 111	3	Princ. Chem II CHM 112	3
Princ. Chem. I lab CHM 113	3	Princ. Chem II lab CHM 114	1
Intro. Marine Sci. MSC 111	3	<u>Earth System GSC 110</u>	3
		<u>Earth Science lab GSC 115</u>	2
Intro. to Ecosystem ECS 111	3	Intro to Ecosystem ECS 112	2
Science and Policy I		Science and Policy II	
	15-18		14-18

Year 2:

<u>Fall</u>		<u>Spring</u>	
History Elective	3	History/Social Sci. Elect.	3
Arts&Humanities Elective	3	Arts&Humanities Elective	3
Calculus I MTH 111 or 131	4	Calculus II MTH 112 or 132	4
<u>Earth Materials GSC 260</u>	4	<u>Earth History GSC 111</u>	4
Am. Nat. Gov. POL 211	3	Comp. Int. Pol. POL 212	3
Env. Seminar ECS 201	1	Env. Seminar ECS 202	1
	18		18

Year 3:

<u>Fall</u>		<u>Spring</u>	<u>Summer</u>
<u>Depositional Sys. GSC 360</u>	4	<u>Structure GSC 480</u>	4
Statistics MTH224/PSY204	3	<u>Field Methods GSC 482</u>	2
Ethics PHI 330	3	<u>Field Geology GSC 580</u>	4
University Physics PHY 205	3	Evol. & Biodiv. BIL 160	4
Physics lab PHY 206	1	Evol. & Biodiv. lab BIL 161	1
Env. Dec. Making ECS 301	3	Env. Dec. Making ECS 302	3
	17		14
			4

Year 4:

<u>Fall</u>		<u>Spring</u>	
<u>Ig & Met Petrol GSC 440</u>	4	<u>Paleo & Strat. GSC 380</u>	4
<u>Hydrogeology GSC 550</u>	3	Remote Sensing	
		GEG 392/MGG 580	3
Arts & Humanities Elective	3	Ecology BIL 235	3
Environ. Social Sci. Elective	3	Environ. Pollut. CAE 240	3
Senior Cap. ECS 401/402	3	Senior Capstone ECS 403	3
	16		16

132-139 credits required total

C4) Overview of Requirements for B.S. in Meteorology/Mathematics-Ecosystem Science and Policy Double Minor

1) Requirements for Meteorology/Mathematics minor (48 credits)

<u>Course Title</u>	<u>Course #</u>	<u>Credit hours</u>
Surv. Modern Meteorology	MSC 103 (Fall)	3
Current Weather Topics	MSC 118 (Spr)	1
Weather Forecasting	MSC 243 (Fall)	2
Meteorological Instr.	MSC 303 (Spr)	3
Atm. Thermodynamics	MSC 305 (Fall)	3
Atm. Dynamics I	MSC 405 (Spr)	3
Atm. Dynamics II	MSC 406 (Fall)	3
Weather Analysis	MSC 407 (Spr)	4
Physical Meteorology	MSC 409 (Spr)	3
Calculus I	MTH 111 or 131	4
Calculus II	MTH 112 or 132	4
Computer Programming I	CSC 120	4
Vectors and Matrices	MTH 210	3
Prob. and Statistics	MTH 224	2
Multivariable Calculus	MTH 310	3
Ordinary Differential Equations	MTH 311	3

Total Meteorology/Math requirements for B.S. 48 credits

In Addition, students must complete the following

1) Physics 205, 206, 207, 208, 209

2) Requirements for minor in Ecosystem Science and Policy (19 credits)

<u>Course Title</u>	<u>Course #</u>	<u>Credit hours</u>
ECS Core Requirements (16 credits)		
Freshman Intro to Ecosystem Science and Policy I	ECS 111 (Fall)	3
Freshman Intro to Ecosystem Science and Policy II	ECS 112 (Spring)	2
Sophomore ECS Seminar.	ECS 201	1
Sophomore ECS Seminar	ECS 202	1
Tools for Env. Dec. Making	ECS 301	3
Tools for Env. Dec. Making	ECS 302	3

Environmental Related Social Science (3 credits)

choose 1 courses from elective list:

Environmental Related Science (3 credits)

choose 1 courses from elective list:

Total credits for minor in ECS 19

3) Suggested 4 year plan

(students will need to be able to take Calc I & II in first year to pull this off.)

Year 1: Focus on SCIENCE CORE

<u>Fall</u>		<u>Spring</u>	
English comp ENG 105	3	English comp ENG 107	3
Calculus I MTH 111 or 131	4	Calculus II MTH 112 or 132	4
<u>Surv. Modern Met. MSC 103</u>	3	<u>Weather Topics MSC 118</u>	1
Intro. Marine Sci. MSC 111	3	Earth System GSC 110	3
Intro. to Ecosystem ECS 111	3	Earth Science lab GSC 115	2
Science and Policy I		Intro to Ecosystem ECS 112	2
	16	Science and Policy II	
			15

Year 2: Continue university requirements + first year geology courses

<u>Fall</u>		<u>Spring</u>	
History Elective	3	History/Social Science Elect.	3
± Foreign language	3	± Foreign language	3
<u>Computer Prog. I CSC 120</u>	4	<u>Vectors & Matrices MTH 210</u>	3
<u>Physics I PHY 205</u>	3	<u>Physics II PHY 206</u>	3
Env. Seminar ECS 201	1	<u>Physics II Lab PHY 208</u>	1
	14	Env. Seminar ECS 202	1
			14

Year 3: Focus on major requirements

<u>Fall</u>		<u>Spring</u>	
Arts&Humanities	3	Arts&Humanities	3
<u>Atm. Thermo. MSC 305</u>	3	<u>Meteor. Instr. MSC 303</u>	3
<u>Physics III PHY 208</u>	3	<u>Atm. Dynamics MSC 405</u>	3
<u>Physics III Lab PHY 209</u>	1	<u>Statistics MTH 224</u>	3
Env. Science Elect.	3	Env. Dec. Making ECS 302	3
Env. Dec. Making ECS 301	3		
	16		15

Year 4: Focus on ECS capstone courses

<u>Fall</u>		<u>Spring</u>	
Free elective	3	Free Elective	3
Arts&Humanities Elective	3	Ecology BIL 235	3
<u>Atm. Dynamics II MSC 406</u>	3	<u>Weather Analy. MSC 407</u>	4
<u>Multivar. Calc. MTH 310</u>	3	<u>Phys. Meteorol. MSC 409</u>	3
<u>Env. Social Science Elec.</u>	3	Free Elective	3
	15		16

Total credits = 121 (109 required credits excluding free electives)

C5) Overview of Requirements for the B.A. Degree in Ecosystem Science and Policy (ECS) & Geography

1) General Education requirements for the B.A. Degree (55-68 credits):

- A. *English Composition* **3-6 credits**; ENG 105 & 106 or 107
- B. *Foreign Languages* **3-9 credits**; at least 3 credits 200 or >
- C. *History/Social Sciences* **15 credits**; 6 credits History survey sequence (HIS 101-102, 121-122, 131-132, 161-162); 9 credits in other disciplines
- D. *Arts & Humanities* **15 credits**; at least 3 credits, but no more than 6 credits, in each of 1) Fine Arts, 2) Literature, and 3) Philosophy/Religious Studies
- E. *Mathematics* **3 credits**; one of the following: MTH 103, 108, 109, 111, 131= precalc, algebra & trig, calc I
- F. *Natural Science* **11-12 credits**;
- G. *Writing* Five writing-oriented courses (W) beyond ENG 105 & 106

(no minor required because it is a double major)

2) Requirements for Geography and Regional Studies as a SECOND MAJOR

I) Students must take at least 24 credits in geography courses

II) Majors must successfully complete two of the following courses:

World Regional Geography	GEG 105	Fall/Spr	3
Intro. to Human Geography	GEG 110	Fall/Spr	3
Intro. to Geogr. Info. Tech.	GEG 199	Fall/Spr	3
Physical Geography	GEG 120	Fall/Spr	3
Intro. to Climatology	GEG 121	Fall/Spr	3

III) Students are encouraged to find a suitable internship or engage in a semester-long study abroad experience with the Career Planning and Placement Center. Upon approval, 3 credits may be earned with an internship.

(Note, grades must be C- or higher to count toward degree. Overall GPA in courses counting toward major must be 2.00 or higher)

Environmentally-relevant Geography courses include:

GEG 370	Conservation of Resources	3
GEG 371	Environmental Geography: Current Issues	3
GEG 391	Introduction to GIS	3
GEG 392	Remote Sensing of the Environment	3
GEG 430	World Cities	3
GEG 471	Ecological Biogeography	3
GEG 481	Intro to Quantitative Methods	3
GEG 491	GIS and Environmental Modeling	3
GEG 511	Field Studies in Geography	1-6
GEG 522	Urbanization in the Developing World	3
GEG 535	Internship	3
GEG 570	Gender and Development	3

3) ECS Requirements for B.A. Degree (ECS = 37 credits; 67 credits total)

***indicates course currently fulfills A&S General Education Req.**

****indicates course has been requested to count as A&S General Education Req.**

<u>Course Title</u>	<u>Course #</u>	<u>ECS</u>	<u>Credit hours</u>	
			<u>A&S</u>	<u>2nd Major</u>
ECS Core Requirements (19 credits)				
Freshman Intro to Ecosys. Science and Policy I	ECS 111 (Fall)	3		
Freshman Intro to Ecosys. Science and Policy II	ECS 112 (Spring)	2		
Sophomore ECS Seminar.	ECS 201 (Fall)	1		
Sophomore ECS Seminar	ECS 202 (Spring)	1		
Tools for Env. Dec. Making	ECS 301 (Fall)	3 (fulfills statistics)		
Tools for Env. Dec. Making	ECS 302 (Spring)	3		
Senior Capstone (thesis or internship)	ECS 401/402 (Fall)	3		
Senior Capstone (complex problem solving)	ECS 403 (Spring)	3		
Environmental Related Social Science (18 credits/12 beyond Gen.Ed./9 beyond Gen.Ed. can count toward 2nd major)				
<u>Course Title</u>	<u>Course #</u>	<u>ECS</u>	<u>A&S</u>	<u>2nd Major</u>
*Econ. or Pol. Sci. Core I	ECO 211/POL 211	-	3	
*Econ. or Pol. Sci. Core II	ECO 212/POL 212	-	3	
Ethics (3 cred. PHI prereq/poi)	PHI 330	3		
Environmental-related social science elective (see list)				9
Math (6 credits/3 beyond Gen. Ed.):				
One of; MTH 103, 108, 109, 111, 131			3	
Probability & Statistics	MTH 224/PSY 204	3		
Science Core (15 credits/3 credits beyond Gen. Ed.)				
<u>Course Title</u>	<u>Course #</u>	<u>ECS</u>	<u>A&S</u>	<u>2nd Major</u>
Principles of Chemistry I	CHM 111		3	
Chem I lab	CHM 113		1	
Principles of Chemistry II	CHM 112		3	
Earth System	GSC 110 or 120		3	
Earth System Lab	GSC 115		2	
Intro to Marine Sci.	MSC 111	3		
Environmental Related Science (9 credits beyond Gen. Ed.)				
Elementary Ecology	BIL 103	3		
Environmental Pollution	CAE 240	3		
Science electives		3		
		<u>ECS</u>	<u>Gen. Ed</u>	<u>2nd Major</u>
		37	21	9

Total credit hours = 67

3) Suggested 4 year plan for ECS-Geography B.A. Double Major

Year 1:

<u>Fall</u>		<u>Spring</u>	
English comp ENG 105	3	English comp ENG 107	3
Math 103/108/109/111/ or 131	3		
<u>World Reg. Geog. GEG 105</u>	3	<u>Intro. Hum. Geog. GEG 110</u>	3
Intro. Marine Sci. MSC 111^{^^}	3	Earth System GSC 110	3
		Earth Science lab GSC 115	2
Intro. to Ecosystem ECS 111	3	Intro to Ecosystem ECS 112	2
Science and Policy I		Science and Policy II	
	12-15		14

Year 2:

<u>Fall</u>		<u>Spring</u>	
History Survey	3	History Survey	3
± Foreign language	3	± Foreign language	3
Princ. Chem. I CHM 111	3	Princ. Chem II CHM 112	3
Princ. Chem. I lab CHM 113	1	<u>Intro. Geog. Info. GEG 199</u>	3
Am. Nat. Gov. POL 211	3	Comp. Int. Politics POL 212	3
Env. Seminar ECS 201	1	Env. Seminar ECS 202	1
	12-15		13-16

Year 3:

<u>Fall</u>		<u>Spring</u>	
Arts&Humanities Elective	3	Arts&Humanities Elective	3
Statistics MTH 223/PSY 204	3	Environ. Pollut. CAE 240	3
<u>Intro. GIS GEG 391</u>	3	<u>Remote Sensing GEG 392</u>	3
Ethics PHI 330	3	Element. Ecology BIL 103	3
Env. Dec. Making ECS 301	3	Env. Dec. Making ECS 302	3
	15		15

Year 4:

<u>Fall</u>		<u>Spring</u>	
Arts&Humanities Elective	3	Free Elective	3
<u>GEG Elective</u>	3	<u>GEG Elective</u>	3
<u>GEG Elective</u>	3	Env. Social Sci. Elect.	3
Environ. Sci. Elect.	3	Free Elective	3
Senior Cap. ECS 401/402	3	Senior Capstone ECS 403	3
	15		15

Some GEG Electives will count as Environ. Sci. Electives

Total credits = 106-120 (excludes free elective)

A similar program would be proposed for Economics (24 credits) and Political Science (30 credits). Environmentally related social science electives for ECS will be allowed to count toward other major.

C6) Overview of Requirements for the B.B.A. Degree in Business Law (School of Business Administration) with ECS minor

1) Requirements for Graduation –Bachelor of Business Administration

A. General Education

1. Arts (3 credit hours)

Select one of ARC 171, ARH 131, ARH 132, ARH 133, MCY 131, MCY 132, MCY 325, THA 101, THA 105 (These courses satisfy the Fine Arts require. for A&S).

2. English/Communications (9 credit hours)

a. ENG 105 and ENG 106

b. Select one from ENG 306 (Advanced Composition), ENG 330 (Advanced Business Communication), ENG 331 (Legal Writing) or COS 333 (Business Communication)

(one course more than A&S require.)

3. Arts & Humanities (9 credit hours)

a. Select two literature courses

1. Both courses may be from Dept. of English (Course level 200-500)

2. One course may be from Dept. of Foreign Languages and Literatures (level 300-500) and one course from Dept. of English. (level 200-500)

b. Select one course from PHI 101, PHI 130, PHI 271, REL 101, REL 111, REL 121, REL 131, REL 151, REL 231, or REL 232

(as in the ECS major, we request that PHI 330 Ethics count as a Philosophy/Religion credit)

4. Quantitative Foundations MAS 110 (Quantitative Applications in Bus.), MAS 201 (Intro. to Bus. Statistics), and MAS 202 (Intermed. Bus. Statistics).

5. Natural Science (6-8 credit hours)

Select one course from two of the following three groups:

a. GRP 1: BIL 101, BIL 104, BIL 105, BIL 106, BIL 150

b. GRP 2: CHM 101, CHM 111, MSC 101, MSC 102

c. GRP 3: PHY 101, PHY 110, GSC 103, GSC 110

(BIL 150, MSC 111, and GSC 110 required for ECS)

6. Social Science (15 credit hours)

a. ECO 211, ECO 212, and POL 211

(ECO 212 currently required for ECS)

b. Choose two courses from the list below; but one course must be HIS:

APY 101, APY 201, APY 202, GEG 105, HIS 101, HIS 102, HIS 121, HIS 122, HIS 131, HIS 161, HIS 201, HIS 202, PSY 110, or SOC 101)

(2 HIS courses required for A&S)

7. General Education Elective (3 credit hours)

B. Other Core Courses

1. ECO 302

2. POL 450

C. Business Foundation

1. ACC 211 and ACC 212 (Accounting)

2. BSL 212 (Legal Studies)

D. Upper Level Business Core

1. FIN 302 (Finance)

2. MGT 303 and MGT 304 (Business Management and Organization)

3. MGT 401 (Strategic Management Capstone-must be taken in last semester before graduation).

- 4. MKT 301 (Marketing)
 - 5. One functional Business elective (ACC, FIN, MGT, MKT)
 - 6. One general Business elective at level 300 or greater.
- E. Major/Minor within Business

2) Requirements for B.A. Degree in Business Law

A major in Legal Studies includes BSL 212, BSL 485 and twelve credits from the following: any business law course, SOC 378 (Criminology: Law and Society), POL 373 (Constitutional Law I), and PHI 332 (Philosophy of Law).

3) ECS Requirements for minor

REQUIREMENTS FOR MINOR IN ECOSYSTEM SCIENCE AND POLICY (19 credits)

<u>Course Title</u>	<u>Course #</u>	<u>Credit hours</u>
ECS Core Requirements (13 credits)		
Freshman Intro to Ecosystem Science and Policy I	ECS 111 (Fall)	3
Freshman Intro to Ecosystem Science and Policy II	ECS 112 (Spring)	2
Sophomore ECS Seminar.	ECS 201	1
Sophomore ECS Seminar	ECS 202	1
Tools for Env. Dec. Making	ECS 301	3
Tools for Env. Dec. Making	ECS 302	3

Environmental Related Social Science (3 credits)

choose 1 courses from elective list:

Environmental Related Science (3 credits)

choose 1 courses from elective list:

Total credits for minor in ECS 19

See B.S. and B.A. degree requirements for list of elective courses.

4) Suggested 4 year plan for ECS minor-Business Law B.B.A. Major

Year 1:

<u>Fall</u>		<u>Spring</u>	
English comp ENG 105	3	English comp ENG 107	3
<u>Intro. Bus. Law BSL 212</u>	3	<u>Intro. Am. Nat. Gov. POL 211</u>	3
<u>Quant. App. in Bus. MAS 110</u>	3	Earth System GSC 110	3
Intro. Marine Sci. MSC 111	3	Earth Science lab GSC 115	2
Intro. to Ecosystem ECS 111	3	Intro to Ecosystem ECS 112	2
Science and Policy I		Science and Policy II	
	15		13

Year 2:

<u>Fall</u>		<u>Spring</u>	
History Survey	3	History Survey	3
English Lit. Elective	3	English Lit. Elective	3
<u>Economic (micro) ECO 211</u>	3	<u>Economic (macro) ECO 212</u>	3
<u>Intro. Bus. Stat. MAS 201</u>	3	<u>Int. Bus. Stat. MAS 202</u>	3
<u>Princ. Fin. Account ACC 211</u>	3	<u>Manag. Account. ACC 212</u>	3
Env. Seminar ECS 201	1	Env. Seminar ECS 202	1
	16		16

Year 3:

<u>Fall</u>		<u>Spring</u>	
<u>Business Commun. ENG 330</u>	3	<u>MicroEcon. ECO 302</u>	3
<u>Coastal Law BSL 313</u>	3	<u>Ocean Law BSL 314</u>	3
<u>Fund. of Finance FIN 302</u>	3	<u>Oper. Manag. MGT 303</u>	3
Ethics PHI 330	3	<u>Marketing MKT 301</u>	3
Env. Dec. Making ECS 301	3	Env. Dec. Making ECS 302	3
	15		15

Year 4:

<u>Fall</u>		<u>Spring</u>	
Arts Elective	3	<u>Manag. & Soc. POL 450</u>	3
<u>Organ. Behav. MGT 304</u>	3	<u>Strategic Manag. MGT 401</u>	3
<u>Int. Bus. Law BSL 412</u>	3	<u>Manag. Leg. Factor BSL 485</u>	3
<u>Leg -Soc. Bus. Reg. BSL 305</u>	3	<u>Env. Movement POL 553</u>	3
Environ. Sci. Elect.	3		
	15		12

Some BSL Electives will count as Environ.Social Sci. Electives

Assumes no Foreign Language Requirement for School of Business

Total credits = 117

C7) DRAFT Overview of Requirements for 9 Semester Dual Degree in Environmental Engineering and Ecosystem Science and Policy

We are still working out the details of a dual degree program between the Engineering and Ecosystem Science and Policy. Completion of both degrees will require more than 8 semesters. One proposed program is listed below.

Delivered-To: jackie@mail.rsmas.miami.edu
Delivered-To: jdixon@rsmas.miami.edu
X-Spam-Status: No, hits=-98.5 required=5.0
X-MimeOLE: Produced By Microsoft Exchange V6.0.6249.0
MIME-Version: 1.0
Subject: RE: Civil Engineering and Environmental Dual Major with ESP
Date: Fri, 8 Aug 2003 16:34:01 -0400
X-MS-Has-Attach: yes
X-MS-TNEF-Correlator:
Thread-Topic: Civil Engineering and Environmental Dual Major with ESP
Thread-Index: AcNXjD+c7XT5WXEpRdGDAt2IDKBcvwGWaMaA
From: "Solo-Gabriele, Helena M" <hmsolo@miami.edu>
To: "Jackie Dixon" <jdixon@rsmas.miami.edu>
Cc: <fmiralles@rsmas.miami.edu>,
<dolson@rsmaas.miami.edu>,
"Solo-Gabriele, Helena M" <hmsolo@miami.edu>,
"Doyle, Mary" <m.doyle@miami.edu>,
"Chin, David A." <dchin@miami.edu>
X-OriginalArrivalTime: 08 Aug 2003 20:34:02.0350 (UTC)

Jackie,

I've gone through your updated ECS program and I have attached a dual ECS - Environmental Engineering curriculum. The total number of credits is 154/155. I was able to double-count the following courses as follows:

Earth Science GCS110 3 credits - Can count as the earth science elective within environmental engineering
Ecology BIL 160/161 5 credits - Currently BIL 150/151 is on the environmental engineering list of basic science electives. There may be chance (pending approval by the faculty from my Department) that we can put BIL 160/161 on the basic science elective list.
ECS Capstone ECS 402 - Perhaps a waiver of the requirement can be granted since Environmental Engineering students have a capstone requirement. Perhaps a formal process can be implemented for a waiver which would depend upon the content of the particular project a student is completing for the Environmental Engineering capstone. In other words the Environmental Engineering capstone course would need to also have the proper content to count towards the ECS capstone course.

Please note the special conditions (in red) at the end of the attached document. Please let me know what you think.

Helena Solo-Gabriele

DUAL DEGREE PROGRAM, 2003 - 2004
BACHELOR OF SCIENCE IN ENVIRONMENTAL ENGINEERING
BACHELOR OF SCIENCE IN ECOSYSTEM SCIENCE AND POLICY
Total Credits: 154 or 155

Freshman Year:					
CAE 111	Introduction to Engineering I	3	CAE 112	Introduction to Engineering II	2
PHY 205	University Physics I	3	PHY 206	University Physics II	3
MTH 110	Analytical Geometry and Calculus I	5	PHY 208	University Physics II Lab	1
ENG 105	English Composition I	3	MTH 112	Calculus II	4
ECS 111	Intro to ECS I	3	ENG 107	Writing About Science	3
			ECS 112	Intro to ECS II	2
<i>Total</i>		17	<i>Total</i>		15

Sophomore Year:					
CAE 210	Mechanics of Solids I	3	CAE 340	Introduction to Environmental Engineering	3
PHY 207	University Physics III	3	EEN 205	Principles of Electrical Engineering I	3
PHY 209	University Physics III Lab	1	MSC 111	Introduction to Marine Sci.	3
MTH 211	Calculus III	3	CHM 112	Principles of Chemistry II	3
CHM 111	Principles of Chemistry I	3	CHM 114	Chemistry Laboratory II	1
CHM 113	Chemistry Laboratory I	1	ECO 212	Economics II	3
ECO 211	Economics I	3	ECS 202	ECS Seminar	1
ECS 201	ECS Seminar	1			
<i>Total</i>		18	<i>Total</i>		17

Junior Year:					
CAE 330	Fluid Mechanics	3	CAE 440	Design of Water Quality Control Systems	3
CAE 201	Computer-Aided Drafting and Design	2	CAE 541	Environmental Microbiology	3
IEN 311	Applied Probability and Statistics	3	PHI 335	Professional Ethics	3
PHI 330	Ethics	3	BIL 160	Evolution and Biodiversity	4
CAE 211/212 or MEN 202	Mechanics of Solids II/Lab or Dynamics	4 or 3	BIL 161	Evolution and Biodiversity Lab	1
ESP 301	Tools for Env. Decision Making	3	ECS 302	Tools for Environ. Decision Making	3

<i>Total</i>	17 or 18	<i>Total</i>	17
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Senior Year:					
CAE 403	Senior Design Project I	1	CAE 402	Ethics, Professionalism, and Administration	3
CAE 430	Water-Resources Engineering	3	CAE 404	Senior Design Project II	2
GSC 110 or 120	The Earth System	3	CAE 542	Solid and Hazardous Waste Engineering	3
GSC 115	Env. Geol. Lab	2			
MEN 303	Thermodynamics I	3	MEN 520	Air Pollution	3
	SS Elective*	3		ENV Design Elective*	3
ECS 401	Senior Thesis or Internship	3	MTH 311	Ordinary Differential Equations	3
<i>Total</i>		18	<i>Total</i>		17

Senior Year(con'd):					
CAE 345	Water and Wastewater Analysis	3			
IEN 351	Industrial Safety Engineering	3			
CAE 540	Environmental Chemistry	3			
	ENV Design or ENV Technical Elective*	3			
	Advanced SS/H Elective*	3			
	SS Elective*	3			
<i>Total</i>		18	<i>Total</i>		

*To be selected from lists of approved Social Science/Humanities, Technical, Design, and Basic Science electives.

Last Update: Aug. 8, 2003

This curriculum will meet the environmental engineering degree requirements pending the addition of BIL 160/161 to the approved basic science list for environmental engineering majors. This request would have to be presented before the faculty of the CAE Department.

This curriculum will meet the ECS degree requirements pending a waiver of the ECS 402 capstone course. The implied assumption within this curriculum is that the Environmental Engineering capstone course (CAE403 and CAE404) will contain appropriate ECS content.

This curriculum still needs to be checked for pre-requisite conflicts and to assure that courses offered only during spring or fall semesters are in their appropriate semesters on the curriculum sheet.

**SECTION D: SUPPLEMENTARY
INFORMATION**




Executive Vice President and Provost

MEMORANDUM

August 21, 2003

To: Mary Coombs
Chair, Faculty Senate

From: Luis Glaser, Ph.D.
Executive Vice President and Provost 

Subject: Undergraduate Program of the Center for Ecosystem Science and Policy

The Center is submitting for consideration and approval by the Senate a proposal for an undergraduate program in ecosystem science and policy, which I believe is one that has been very carefully designed and considered. The budget for the center will require salary commitments to faculty teaching the newly required courses as overloads. Some salary support will also be required for the undergraduate program director and staff. In addition, laboratory equipment and laboratory costs will be incurred for student research projects.

We have carefully looked at these costs, and estimate that they will not exceed \$300,000 annually during the first three years of the program.

We believe the program will be a success if by the end of four years we would have accrued at least 40 additional students in the program. With our recruiting efforts, we think that we will accrue many more. Additional tuition revenue will clearly cover the additional costs of the programs at that time. Until then, the initial allocation of \$3 million dollars of University funds for the Center for Ecosystem Science and Policy will be adequate to cover the cost of the program. We are also actively pursuing various grant opportunities, which will help in this regard. Thus the program will not produce additional costs to the University beyond what is already budgeted, and will ultimately be covered by increased revenue.

Thank you for your attention for this matter and your help and that of the Senate in starting a wonderful and exciting new program.

LG/mc

D2) Marketing Plan

Initial recruitment for undergraduate (double) majors for the Center for Ecosystem Science and Policy is being planned in collaboration with Ed Gillis, Director of Admissions and Associate Dean of Enrollment. Initial contact e-mails will be sent out shortly after full approval for the CESP program is granted. Targeted individuals are high school juniors and seniors with sufficient SAT scores (1150) who have indicated one of the following areas of interest:

- 1) requested information from University of Miami ("inquiries")
- 2) marked one of the following areas of interest on their SAT's:
(biology, business management and organization, chemistry, communication studies, earth systems, economics, environmental science, geography and regional studies, geological sciences, health science, International studies, journalism, Latin American studies, legal studies, marine science-biology, meteorology, physics, political science, pre-law, pre-med, psychology, public relations, systems analysis, ecosystem science and policy, environmental engineering)
("prospects")

The initial contact e-mail will direct interested parties to a CESP website which gives a more in-depth description of the program, as well as further contact information. A sample draft brochure is included with this document. Brochure, e-mail, and telephone contacts will be made by the director (Jacqueline Dixon) and assistant director (Terri Hood) of the Undergraduate Program to those students who indicate further interest. Campus visits will be coordinated. Intensive follow-up efforts for this year's high school seniors will be completed by end of November. Work with high school juniors will continue throughout the year. Estimates of numbers of individuals at each successive stage are:

- initial e-mail: several thousand
- mailed brochures: several hundred
- telephone contact, campus visits: 100 - 200
- students accepted to program: 50
- first student class: 20 - 25

In addition to incoming freshman, a limited number of current UM students from selected programs (e.g. pre-med) who meet academic requirements will be considered for inclusion into the program ("change of major").

We also hope that the upcoming capital campaign will include requests for scholarships for our program.

D3) Advising Plan

The director (Jacqueline Dixon) and assistant director (Terri Hood) will advise the students in the program. To prepare for this task, both Dixon and Hood are advising 10 undeclared freshmen this year. Additional faculty will be added to the advising staff as our program grows.

D4) Frequently Asked Questions

1. This is designed in the context of the current Gen Ed requirements. What affect will the new Gen. Ed. requirements have on your proposed program?

In general, our program is planned within the context of the more rigorous Arts & Sciences requirements, therefore the proposed Gen. Ed. requirement changes will have little affect on our proposed program.

The highlights of the new Gen Ed requirements are:

Freshman Seminar (3 credits/class size <24): ECS could easily offer several freshman seminars. For example, global warming/sea level rise; emerging diseases; the ozone layer; the Everglades—lot’s of potential topics. We can’t require or offer this, however, until the new Gen Ed requirements are approved.

Math-ECS requirements will cover this.

Writing covered by ECS. However, the new wording Gen. Ed. wording only includes 105 and 106 and excludes 107 (Science writing). I wonder if this is an accidental or intentional omission.

Capstone Experience: Covered by ECS 403.

Areas of Knowledge:

Natural World	6 credits
People and Society	6 credits
Arts	6 credits
<u>Humanities</u>	<u>6 credits</u>
Total	24 credits

When we compare the new University Gen. Ed. requirements to the existing Arts & Sciences requirements below, you can see that we have no problems satisfying the new requirements.

	Number of Credits	
	B.S.	B.A.
<i>Arts and Science Requirements</i>		
English	3-6	3-6
Language	3-9	3-9
History/Social Science	12	15
Arts& Humanities	12	15
Math	11-12	3
Natural Science	4-8	11-12
<i>ECS Requirements</i>		
Ecosystem Science and Policy Core	19	19
Env.-Related Social Science	12 (3 elective)	18 (9 elective)
Math	9	6 (includes statistics)
Science Core	21	15
Env.-Related Science	17 (6 elect.)	9 (3 elective)

2. Almost all these programs are very heavy and very tightly controlled. How are you going to deal with advising?

ECS faculty are committed to doing the advising. Terri Hood and I are signing up to advise 10 undeclared majors each this fall in preparation for our roles as advisors of ECS students. We will also be active in advising the current batch of environmental science majors.

3. Are there similar programs elsewhere that also have very heavy, controlled academic obligations and have been successful?

The program most comparable is Marine Science. It is also a double major program and very successful. The various credit loads are given below and are similar to those proposed in ECS:

Program	Credits Required
Marine Science/Biology	133
Marine Science/Chemistry	124
Marine Science/Geology	129
Marine Science/Physics	135

Also Engineering requires heavy, controlled schedules. For example:

Civil Engineering	129
Architectural Engineering	129
Environmental Engineering	128 or 129
Electrical Engineering	127
Audio Engineering	137
Wireless Communication	132
Computer Engineering	129
Industrial Engineering	128
Mechanical Engineering	126

4. In both this and the other specific proposed BS lists, the sophomore year is particularly heavy.

Yes, for this reason we limited our ECS requirements to the 1 credit seminar series. There is no avoiding the basic core courses that must be taken in order to begin integration of the material in the junior year.

5. Will students want to do this?

Marine Science has a steady state enrollment of roughly 250 students. This shows that students are willing to take on a rigorous program. In particular, students are willing to take on the challenge of a rigorous program if they feel that they are in an elite group. Efforts will be made to have special sections for our ECS students in large survey courses such as MSC 111 or BIL 150 in order to maintain cohesion among the students.

6. Will they be able to?

They manage it in Marine Science. Also, the program is designed for incoming students not ready to take calculus and needing 2 semesters of language. This, unfortunately,

describes the average student currently enrolled at UM. Only 1/3 of the Marine Science students enter ready to take calculus. **We hope to use this program to recruit a better caliber of student.** Students beginning their first year ready to take calculus and having tested out of a course or two will not find the load so overwhelming.

7. What happens if students can't manage such a heavy load in one or more semesters?

If a student has a bad semester, there are various options to catch up. Many of the first and second year courses are available during the summer. The internship/research credits will be taken during the Fall semester, but most likely the work/research will be done during the summer before their senior year, thus freeing up some units in the fall of year. The worst case scenario, is that the student must take an extra semester to finish or they reduce their involvement in ECS to a minor.

8. Are your majors free to take ENG 106 or 107 or is 107 required? You list the latter in your suggested 4 year plan, but don't state in the overview of requirements that 107 is required.

During our evaluation by the A&S curriculum committee, I was informed that either 106 or 107 fulfill the English Composition requirement. ESC students may take either 106 or 107; however, 107 will be recommended. If a student starts the program late, and has already taken 106, we won't make them go back to take 107. Remember that the example 4-year plans are just that—examples or guidelines. Each student may arrange their courses differently as planned with their advisor.

D5) Letters of Approval

Letters have been requested from each department chair to confirm that 1) elective courses will be taught on a regular basis, 2) faculty have permission to teach our courses, and 3) that our second major may replace a required minor. Letters will be added to this document as received.



Date: 22 September 2003

To: Jacqueline Dixon, Professor and Director
Undergraduate Program in Ecosystem Science and Policy
Department of Geological Sciences

From: David A. Chin, Chairman
Department of Civil, Architectural, and Environmental Engineering

Subject: Proposal for a New Undergraduate Program in Ecosystem Science and Policy

The faculty of the Department of Civil, Architectural, and Environmental Engineering (CAE) has considered the proposal for a new undergraduate program in Ecosystem Science and Policy.

The faculty is recommending that the following issues be addressed:

- The CAE faculty understands that the technological component of the ECS program is contained in CAE 240 (Environmental Pollution), which is a core course. Please clarify in the proposal that CAE 240 will be required for students in both the B.S. and B.A. tracks.
- Environmental-related engineering is one of the major thrust areas of the College of Engineering, and there are a significant number of faculty members across several departments whose efforts are focused in the environmental area. The CAE faculty is concerned that the role and profile of environmental engineering in the undergraduate ECS program is too low. The CAE faculty is of the opinion that this is partially due to the under representation of the College of Engineering on the ECS Advisory Committee. To address this concern, it is recommended that the College of Engineering be represented by three members on the ECS Advisory Committee. These representatives should be in the areas of Environmental Engineering, Mechanical Engineering, and Industrial Engineering.
- Hand-written comments and corrections have been made on the original copy of the proposal, which is attached to this memorandum.

If these items are addressed, then the CAE faculty, along with our faculty colleagues and Dean of the College of Engineering would fully support your modified proposal, and enthusiastically recommend approval by the Faculty Senate.



MEMORANDUM

Date: September 21, 2003

To: Jacqueline E. Dixon, Ph.D.
Director of Proposed Undergraduate Program
In Ecosystem Science and Policy

From: David P. Janos, Ph.D.
Associate Professor of Biology

A handwritten signature in blue ink, appearing to read "D. Janos", written over a light blue circular stamp or mark.

Subject: Undergraduate Program in Ecosystem Science and Policy

Thank you for allowing me to review the *Draft Proposal for a New Undergraduate Program in Ecosystem Science and Policy at the University of Miami*. Because I served for several years as the coordinator of the Conservation and Management (Biology) track of the University's former Environmental Science Program, and because two of the undergraduate courses that I offer (BIL 335 and 336) are listed in your proposal (p. 15) as "environmentally-related science electives", I read your proposal with interest.

I heartily wish to endorse your proposal. I consider it to represent a significant advance beyond the existing Environmental Science Program in three fundamental ways. Those fundamental advances are: (1) organizing the undergraduate program as a double major in the manner of our highly successful Marine Science Program, (2) proposing a suite of carefully conceived new courses within the Ecosystem Science and Policy (ECS) major, and (3) taking full advantage of the new Center for Ecosystem Science and Policy (CESP).

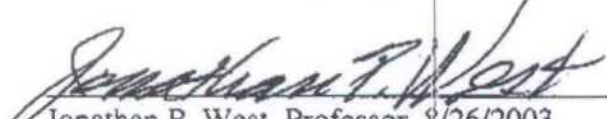
Advances 1 and 2 above complement one another and should serve well to transcend institutional impedimenta that have hampered the Environmental Science Program. In effect, the "tracks" of the Environmental Science Program were weak mimics of the double major approach that you have proposed. Faculty volunteers supervised tracks associated with their departments, but the tracks most often had to be cobbled together from existing offerings and might not form a coherent curriculum in the way that participating departments' formal majors do. A double major will fully enfranchise and invest participating departments. Moreover, Environmental Science courses often depended upon the good graces of participating departments for faculty staffing. The ability of your proposed program to offer salary commitments to faculty teaching new ECS courses as overloads (see the Provost's memo, *Proposal* ... p. 52) is critical for ensuring reliable, conceptually-coordinated ECS course offerings.

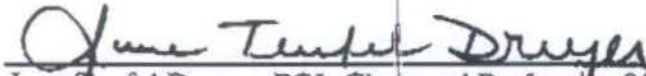
The third, and perhaps most exciting advance offered by your proposal is its linkage with the new CESP. Activities within that Center will provide many exciting new opportunities for ECS undergraduate majors. In that regard, I hope that you also will seek to forge ties with the newly funded Institute for Interdisciplinary Tropical Science and Institute for Theoretical and Mathematical Ecology of the College of Arts & Sciences.

I look forward to acceptance and successful implementation of your proposal.

Department of Biology
P.O. Box 249118
Coral Gables, Florida 33124-0421
Telephone: 305-284-3973
Fax: 305-284-3039

This note will confirm my interest in teaching or lecturing in the CESP program so long as it does not interfere with my other commitments, including customary undergraduate and graduate teaching responsibilities in the Department of Political Science.


Jonathan P. West, Professor 8/26/2003

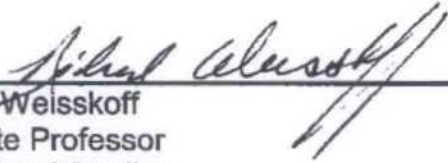

June Teufel Dreyer, POL Chair and Professor 8/26/2003

To Andee Cohen
UM School of Law
1311 MillerDr., Ste. C-320
Coral Gables, FL 33146

-or-

Interoffice mail locator code: 0221

I am committed to teach CESP courses. In fact, I am and have been doing so, through the already-existing International Studies Course, Development and Environment: Water and Poverty" which is taught in the Spring semester with Prof. Solo-Gabriele (Engineering) and Suman (RSMAS).



Richard Weisskoff
Associate Professor
International Studies

Aug 27, 2003 Date

Richard Williamson, Chair [Signature] date 9/3/03



Memorandum

To: Dr. M. Doyle

From: Dr. P. K. Swart

A handwritten signature in black ink, appearing to read "P. K. Swart". The signature is written in a cursive, somewhat stylized hand.

Subject: Commitment towards teaching courses in the CESP Program

Date: Tuesday, August 26, 2003

The memo serves to confirm my enthusiastic willingness to teach courses associated with the new CESP program. Such courses might include biogeochemical cycles, global change, and geochemical hydrology.

Cc: Dr. G. Eberli, Chairman Marine Geology and Geophysics

Dr. G.P. Eberli
Chair MGG

A handwritten signature in black ink, appearing to read "G.P. Eberli". The signature is written in a cursive, somewhat stylized hand.

Rosenstiel School of Marine and Atmospheric Science
Division of Marine Geology and Geophysics
4600 Rickenbacker Causeway
Miami, Florida 33149-1098
(Office) 305 361-4663 (Fax) 305 361-4632



August 22, 2003

To whom it may concern:

Dr. Donald B. Olson is available to teach in the new CESP curriculum. In particular he is involved in planning for the second semester freshmen course and in several of the upper level offerings.

A handwritten signature in blue ink, appearing to read "Don Olson", written over a horizontal line.

Dr. Donald B. Olson, Professor
Phone: 305-361-4074
Email: don@rrsl.rsmas.miami.edu

A handwritten signature in blue ink, appearing to read "Bruce Albrecht", written over a horizontal line.

Dr. Bruce Albrecht, Chairman
Phone: 305-361-4043
Email: balbrecht@rsmas.miami.edu

A handwritten signature in blue ink, appearing to read "Otis Brown", written over a horizontal line.

Dr. Otis Brown, Dean
Phone: 305-361-4000
E-mail: brown@rsmas.miami.edu



MEMO

To: Prof. Mary Doyle
From: Kenneth Broad, Division of Marine Affairs and Policy, RSMAS
Date: August 22, 2003

ky

Re: CESP teaching commitment

This memo serves to reaffirm my commitment to teaching selected courses that will be offered by the Center for Ecosystem Science and Policy at the University of Miami. The below signature of department chairperson serves as indication of my availability to teach in the CESP undergraduate program.

Date: August 22, 2003

A handwritten signature in blue ink, appearing to read "S. F. Meltzoff", with a long horizontal flourish extending to the right.

Dr. Sarah Meltzoff
Chair, Division of Marine Affairs and Policy



College of Arts and Sciences
Department of Geological Sciences
P.O. Box 249176
Coral Gables, Florida 33124
Phone: 305-284-4253 Fax: 305-284-4258
email: geology@miami.edu

25 August 2003

From: Dr. Terri Hood
To: CESP Advisory Committee
Re: time/effort commitment to CESP

I plan to commit 50% of my time to CESP duties (and am currently already doing so).
These duties will include recruitment, advising, and coordinating/teaching the ESP
201/202 seminars.

Terri Hood

(Geological Sciences Chairman)

(Date)

Cynthia Drew, Ph. D.
Associate Professor of Law
e-mail: cdrew@law.miami.edu



Telephone: 305-284-6387
Fax: 305-284-6506
Assistant: Manouchka: 305-284-4263

August 26, 2003

Professor Mary Doyle
Director, Center for Ecosystem Science and Policy
University of Miami School of Law
1311 Miller Drive, Room #G-468
Coral Gables, Florida 33146

Dear Mary,

This is to confirm the Law School's and my understanding that I will be available next year to teach in the new CESP undergraduate program.

Best,

A handwritten signature in cursive script that reads "Cynthia A. Drew".

Cynthia A. Drew
Associate Professor of Law
University of Miami School of Law

A handwritten signature in cursive script that reads "Stephen J. Schnably".

Stephen J. Schnably
Associate Dean

8/27/03

Date



September 8, 2003

MEMORANDUM

TO: Prof. Mary Doyle
CC: Profs. Jacqueline Dixon, Tim Dixon
FROM: Gregor Eberli, Chair, MGG *GE*
SUBJECT: CESP teaching commitment

This memo indicates my approval for Drs. J. and T. Dixon to teach in the CESP teaching program. Both will continue to teach the graduate courses at MGG on a regular basis. An additional MGG course listed and taught on a regular basis and might be of interest to the students in the CESP program is MGG 525 "Applied Environmental Geophysics".



August 26, 2003

Professor Mary Doyle
Director
Center for Ecosystems Science and Policy
University of Miami

Re: Letter of Commitment to Teach in the Ecosystems Science and Policy Curriculum

Dear Mary:

Please let this brief statement confirm my commitment to teach in the recently developed undergraduate program in Ecosystems Science and Policy. I am very excited about this opportunity, both personally, and by participating as an engineering faculty member in the program.

I am looking forward to interacting with ESP students and faculty.

Sincerely,

Fernando Miralles-Wilhelm
Assistant Professor

David A. Chin
Professor and Chairman

D6) Library Assessment

OTTO G. RICHTER LIBRARY ECOSYSTEM SCIENCE AND POLICY MAJOR RESOURCE MATERIALS

The Otto G. Richter Library has a strong collection of materials in both print and electronic formats to support the proposed Ecosystem Science and Policy major. Print materials are systematically acquired through approval plan purchases; monographs from every major scholarly publisher are automatically added to the collection on an ongoing basis. In addition, the subject specialist currently assigned to environmental sciences, keeps an eye out for publications that may not fit the parameters of our approval plan but that would still prove useful to the collection. Many of these works are cataloged under the main Library of Congress Subject Headings “ecology” or “environmental sciences.” The Richter Library is a depository library for state, federal and international government publications. Documentation of Congressional hearings, laws, acts, and organizations that deal with environmental issues is extensive. Materials are received in both print and electronic format and include serials such as: Caribbean Currents, Earth System Monitor as well as material published by the United Nations such as Environmental Data Report. Richter’s collection of electronic journals dealing with environmental issues is particularly strong as is the electronic collection of indexing and abstracting services that cover the content of these publications. The following lists are not intended to be comprehensive, but highlight the core library resources available to support the proposed Ecosystem Science and Policy major.

PRINT SOURCES

Periodicals

Many titles that deal with environmental issues are available in both print and electronic format. Listed below are titles that are available in print only that may be useful to the program:

- [Avicennia : Revista De Ecología, Oceanología Y Biodiversidad Tropical](#)
- Biology and Environment
- [Bulletin Du Muséum National D'histoire Naturelle](#)
- [Bulletin Of The Ecological Society Of America](#)
- [Bulletin Of The International Society For Tropical Ecology](#)
- [Chemosphere, Global Change Science](#)
- Ecological Engineering
- Ecology
- Environmental Performance Reviews
- Landscape Ecology
- Molecular Ecology
- Nature and Resources
- [Revue D'écologie](#)
- [Vie Et Milieu](#)

Reference Sources

Dictionaries

- Concise Oxford Dictionary of Ecology
- Dictionary of Ecology and Environmental Science
- Dictionary of Ecology and the Environment
- Dictionary of Ecology, Evolution and Systematics
- Soil and Environmental Science Dictionary

Directories

- Environmental profiles: A Global Guide to Projects and People

- Who is Who in Service to the Earth: People, Projects, Organizations, Key Words
- World Who is Who and Does What in Environment and Conservation
- Compilation of E.P.A.'s Sampling and Analysis Methods
- Conservatoin Biology: the Theory and practice of nature, Conservation, Preservation and Management

Handbooks

- Cooper's Comprehensive Environmental Desk Reference
- Handbook of Environmental Data on OrganicChemicals
- Handbook of Environmental Management and Technology

Encyclopedias

- Encyclopedia of Biodiversity
- Encyclopedia of Environmental Biology
- Encyclopedia of Environmental Issues
- Encyclopedia of Environmental Science and Engineering
- Encyclopedia of Environmental Studies
- Encyclopedia of the Environment
- Encyclopedia of Environmetrics

Indexes

- Current advances in ecological & environmental sciences
- Ecology Abstracts
- Environment Abstracts

ELECTRONIC SOURCES

Books

National Academy Press Digital Library (1960s to present)

The National Academy Press is a searchable multidisciplinary digital library of full-text book length research studies and policy reports by leading experts in their fields. Environmental issues titles may be browsed by category.

Indexes & Abstracts

Agricultural and Environmental Biotechnology Abstracts (1993 to present)

Agricultural and Environmental Biotechnology Abstracts covers publications on agricultural products involving both plants and animals, new applications across the food industry, and environmental developments.

Applied Science & Technology Index (October 1983 to present)

Applied Science & Technology Index indexes English-language periodicals published in the United States and elsewhere. Non-English-language articles are also indexed if English abstracts are provided. Undergraduate focus.

Biological Abstracts (1980 - 1988)

Biological Abstracts indexes journal articles and meeting reports for biology and related areas in the life sciences, including references to articles that focus on research findings, clinical studies, and discoveries of new organisms.

BIOSIS Previews (1989 - present.)

BIOSIS Previews is the world's most comprehensive reference database for life science research. It covers original research reports and reviews in biological and biomedical areas.

Ecology Abstracts (1982 to present)

Ecology Abstracts covers current ecology journal research across a wide range of disciplines, reflecting recent advances in light of growing evidence regarding global environmental change and destruction.

EIS: Digest of Environmental Impact Statements (1985 to present)

This resource indexes and provides detailed abstracts of the hundreds of environmental impact statements the Federal Government releases each year. The subfile Environmental Routenet is also accessible.

Environmental Engineering Abstracts (1990 to present)

Environmental Engineering Abstracts covers the world literature pertaining to technological and engineering aspects of air and water quality, environmental safety, and energy production.

Environmental Sciences and Pollution Management (1981 to present)

This is a multidisciplinary database that indexes and abstracts the world's research literature in the fields environmental sciences and pollution management.

GEOBASE (1980 to present)

GEOBASE indexes and abstracts research literature in physical and human geography, earth and environmental sciences, ecology, and related disciplines.

GeoRef (1785 to the present)

GeoRef, the database of the American Geological Institute (AGI), indexes and abstracts the worldwide technical literature covering geology, seismology, marine geology, geophysics, geological maps, hydrology, archaeology, and other related areas.

Health and Safety Science Abstracts (1981 to present)

Health and Safety Science provides a comprehensive survey of recent journal articles, government publications and other resources relating to public health, safety, and industrial hygiene.

Oceanic Abstracts (1981 to present)

Oceanic Abstracts indexes journal articles and other international technical publications pertaining to the marine and brackish-water environment.

Pollution Abstracts (1981 to present)

Pollution Abstracts indexes scientific research and policy literature covering all areas of pollution and its effects on people and animals.

Risk Abstracts (1990 to present)

Experts define risk as a combination of the magnitude and probability of adverse effects. Risk Abstracts indexes the interdisciplinary journal literature centered on the identification and alleviation of risk in today's world.

Water Resources Abstracts (1967 - present)

Water Resources Abstracts provides summaries of the world's technical and scientific literature on water-related topics covering the characteristics, conservation, control, pollution, treatment, use and management of water resources. [\[more information\]](#)

Journal Collections

American Chemical Society Electronic Journals (1879 to Current)

Over a century of essential chemistry on your desktop. Over 30 full-text journals published by the American Chemical Society (ACS) are available through the ACS service. They may also be viewed and searched using the EBSCO Online Journal gateway.

American Meteorological Society (AMS) Journals Online (1962 to present)

Contains the full-text of journal and bulletin articles published by the American Meteorological Society.

BioOne (Varies. From 1998 to present.)

BioOne provides access to the complete text of research journals in the biosciences published by scientific societies such as the Wilson Ornithological Society, the Society of Wetland Scientists, and the Entomological Society of America.

Blackwell Synergy (1997 - Present)

This service provides the full-text over 600 journals published by Blackwell Publishing, Blackwell Science and Munksgaard including subject areas of Medicine, Social Sciences and Humanities.

Springer LINK Forum for Science (Dates vary (most back to 1997))

This is a digital library of 495 full-text engineering, economics, and science journals, and selected book series.

Journals

JOURNAL TITLE	COLLECTION
---------------	------------

Annales Geophysicae	EBSCO
Annales Geophysicae: Atmospheres, Hydrospheres and Space Sciences	Springer
Atmospheric Environment	SDIRECT
Atmospheric Science Letters	SDIRECT
Bulletin of Environmental Contamination and Toxicology	Springer
Bulletin of the American Meteorological Society	EBSCO
Climate Dynamics	EBSCO
Climate Dynamics	Springer
Climatic Change	Kluwer
Desalination	SDIRECT
Ecological Applications	JSTOR
Ecological Engineering	SDIRECT
Ecological Entomology	Blackwell
Ecological Entomology	Blackwell
Ecological Management and Restoration	Blackwell
Ecological Modelling	SDIRECT
Ecological Monographs	JSTOR
Ecological Research	Blackwell
Ecology	JSTOR
Ecology Letters	Blackwell
Ecology of Freshwater Fish	Blackwell
Ecosystem Health	Blackwell
Environment and Behavior	EBSCO
Environment International	SDIRECT
Environmental and Experimental Botany	SDIRECT
Environmental and Molecular Mutagenesis	Wiley
Environmental Conservation	EBSCO
Environmental Engineering and Policy	Springer
Environmental Entomology	BioOne

Environmental Forensics	SDIRECT
Environmental Geology	Springer
Environmental Geosciences	Blackwell
Environmental Impact Assessment Review	SDIRECT
Environmental Management	EBSCO
Environmental Management	Springer
Environmental Management and Health	Emerald
Environmental Microbiology	Blackwell
Environmental Pollution	SDIRECT
Environmental Quality Management	Wiley
Environmental Research	SDIRECT
Environmental Science and Technology	AChemS
Environmental Toxicology	Wiley
Environmetrics	Wiley
Geophysical Journal International	Blackwell
Global Change Biology	Blackwell
Global Environmental Politics	MUSE
IEEE Transactions on Geoscience and Remote Sensing	IEEE
Indoor Air	Blackwell
Journal of Aerosol Science	SDIRECT
Journal of Aging and Health	EBSCO
Journal of Applied Meteorology (JAM)	EBSCO
Journal of Atmospheric and Oceanic Technology (JCLI)	EBSCO
Journal of Atmospheric and Solar-Terrestrial Physics	SDIRECT
Journal of Atmospheric and Terrestrial Physics	SDIRECT
Journal of Climate (JCLI)	EBSCO
Journal of Contaminant Hydrology	SDIRECT
Journal of the Atmospheric Sciences (JAS)	EBSCO
Journal of the Geological Society	EBSCO

Meteorology and Atmospheric Physics	Springer
Monthly Weather Review (MWR)	EBSCO
Planetary and Space Science	SDIRECT
Pure and Applied Geophysics	Springer
Regional Environmental Change	Springer
Resources, Conservation and Recycling	SDIRECT
Science of The Total Environment, The	SDIRECT
Tellus A	Blackwell
Tellus B	Blackwell
Theoretical and Applied Climatology	Springer
Waste Management and Research	Blackwell
Waste Management and Research	SDIRECT
Water Research	SDIRECT

Literature Reviews

Annual Reviews (Current year. Archival holding dates vary.)

The Annual Reviews service provides searchable, full text access to review articles published in 29 series covering the biomedical, physical and social sciences.

Papers & Proceedings

GEOBASE (1980 to present)

GEOBASE indexes and abstracts research literature in physical and human geography, earth and environmental sciences, ecology, and related disciplines. Annual review for [Ecology, Evolution, and Systematics](#), Earth and Planetary Sciences, and Environment and Resources are available.

Web Resource Guides

ELDIS - Development & Environment Information (Dates vary)

ELDIS is an Internet gateway to wide range of resources on development and environmental issues.
Compiled by Jane Schillie, September 23, 2003

I. Monographs

The Law Library collects primary sources of U.S. law comprehensively. That is, all statutes, cases, regulations, both current and historical are housed here. Most, if not all treaties and other primary sources of international environmental law are also acquired and retained by the Law Library. Secondary sources relating to U.S. environmental law are selected more intensively than that of foreign jurisdictions, although the library has a growing collection of works on the law of the European Union, including environmental law in the EU. The library concentrates on works with a law or law-related focus. Therefore, reliance is mostly on Richter Library and RSMAS for scientific, political or others work on the environment, ecosystems and natural resources. There is some overlap in holdings with RSMAS for the benefit of graduate law students in the Ocean and Coastal Law program as well as other law students taking courses in Law of the Sea, Marine Ecology or other related courses.

The following subject headings are useful when searching for monographs and other materials in BARON, the Law Library's catalog.

ENVIRONMENTAL LAW	TOXIC TORTS
AIR – POLLUTION	CHEMICALS LAW AND LEGISLATION
WATER – POLLUTION	SUSTAINABLE DEVELOPMENT
COASTAL ZONE MANAGEMENT	NATURAL RESOURCES
MARINE RESOURCES	CONSERVATION
HAZARDOUS WASTES	ENDANGERED SPECIES

The following is a sampling of monographs from the collection:

- Campbell-Mohn, Celia. **Environmental law: from resources to recovery.** St. Paul, Minn., West Pub. Co. (1993). Kept up-to-date with pocket supplements.
- Campbell-Mohn, Celia. **Sustainable environmental law: integrating natural resource and pollution abatement law from resources to recovery.** St. Paul, Minn., West Pub. Co. (1993).
- DeLong, James V. **Out of bounds, out of control: regulatory enforcement at the EPA.** Washington, D.C., Cato Institute (2002).
- Dernbach, John C. **Stumbling toward sustainability.** Washington, D.C. , Environmental Law Institute (2002).
- Falque, Max. **Marine resources: property rights, economics and environment.** Boston: JAI (2002).
- Fischbeck, Paul S. and Farrow, Scott R. **Improving regulation: cases in environment, health, and safety.** Washington, D.C.: Resources for the Future (2001).
- Kibel, Paul Stanton. **The earth on trial: environmental law on the international stage.** New York, N.Y., Routledge (1999).

- MacNaughton, Ann, L.. **Environmental dispute resolution: an anthology of practical solutions.** Chicago, Ill., American Bar Association (2002).
- National Research Council. **Science and the Endangered Species Act.** Washington, D.C., National Academy Press (1995).
- Thomas, Craig W. **Bureaucratic landscapes: interagency cooperation and the preservation of biodiversity.** Cambridge, Mass., MIT Press (2003).
- Shapiro, Sidney A. **Risk regulation at risk: restoring a pragmatic approach.** Stanford, Cal., Stanford University Press (2003).
- Susskind, Lawrence. **Negotiating environmental agreements: how to avoid escalating confrontation, needless costs, and unnecessary litigation.** Washington, D.C., Island Press (2000).

II. Serials

The Law library subscribes to over 30 major legal journals relating to environmental law. Most are law reviews. Some of the other serial publications include *“Environment, energy and resources law: the year in review”* of the American Bar Association, Section of Environment, Energy and Resources, the *“National Wetlands Newsletter”* published online by the Environmental Law Institute, and *“Coastal Management”* (an international journal of marine environment, resources, law and society).

III. Loose-leaf Services

Loose-leaf services provide continuously updated sources of laws in addition to analysis or explanation of laws. The Law Library provides most of the major loose-leaf services containing analysis of environmental legal issues. The library generally does not have loose-leaf services designed solely for practitioners which consist mostly of forms or checklists. Some of the major loose-leaf services in the Law Library are:

Environmental law. St. Paul, Minn. West Pub. Co. (1986-)
 Environment reporter. Washington, D.C., BNA (1970-).
 Treatise on environmental law. New York, N.Y. Matthew Bender (1973-)
 Law of environmental protection. St. Paul, Minn. West Pub. Co. (1987-).
 State environmental law. New York, N.Y., Clark Boardman (1999-).
 Law of water rights and resources. New York, N.Y. Clark Boardman (1988-).
 Law of wetlands regulation. New York, N.Y. Clark Boardman (1989-).
 Law of chemical regulation and hazardous waste. Eagan, Minn., Thomson/West (1986-).
 Public natural resources law. New York, N.Y., Clark Boardman (1990-).
 International environment reporter. Washington, D.C., BNA (1978-).
 International protection of the environment: Dobbs Ferry, N.Y., Oceana Publications (1995-).

IV. Electronic Sources

Environmental Law Reporter <http://www.elr.info/index.cfm> from the Environmental Law Institute is a database of state, federal and international primary law sources searchable by a topical index or by author, document title, document number or date. It also includes Guidance and Policy documents, ELR's News & Analysis, State News & Analysis, International News &

Analysis, ELR Health and Safety News & Analysis and ELR Update, an e-mail news service. The online database replaces the ELR loose-leaf which is no longer published in print.

Everglades Litigation Collection <http://exchange.law.miami.edu/everglades>
The University of Miami School of Law Library houses an extensive collection of legal and scientific materials underlying years of environmental litigation over the Florida Everglades. The cases contained in this repository collectively constitute one of the longest and most complex pieces of litigation in the United States. The Law Library's holdings include over one million pages of pleadings, deposition and hearing transcripts, exhibits, scientific data and agency reports. Another one million microfilm reel frames cover voluminous document productions. The collection covers litigation that began in 1988 and continued through the mid-1990's.

/HW

University of Miami Libraries

Report for the MAR: RSMAS bib stats on all mar items to 8-31-03 [CL #185]

Review File: 5 MAR: MAR Library items to 8-31-03 (58243) (Item Records)

37429 records were processed. (0 records had been deleted.)

Statistics on bib records attached to all items with a location "mar**"

Record Count represents # of bib records

Copies represents total# of items attached to bib - * including items NOT in RSMAS

Bib Location 'multi' not split out				
Field	Code	Meaning	Record Count	COPIES
LOCATION	arch	Architecture	1	3
LOCATION	ascfl	ASC Florida	17	45
LOCATION	ascrm	ASC Archival Collections	1	1
LOCATION	ascsp	ASC Special	1	2
LOCATION	ascun	ASC University	2	5
LOCATION	gp	GovInfo U.S.	19	47
LOCATION	gpfl	GovInfo Florida Docs.	3	47
LOCATION	gpigo	GovInfo IGO	10	17
LOCATION	gpmap	GovInfo Maps	4	7
LOCATION	gpmic	GovInfo Microfiche	6	58
LOCATION	gpmpf	GovInfo Map Planfiles	6	6
LOCATION	gpref	GovInfo Reference	1	2
LOCATION	gprem	Off-Campus Pre-76 US Docs	1	2
LOCATION	mar	Marine Lib. Stacks	27401	38539
LOCATION	marat	Marine Lib. Atlas	37	115
LOCATION	marbb	Marine Lib. Biscayne Bay	7	13

Review File: 7 MAR: items w/ call# in item record (5858) (Item Records)
5858 records were processed. (0 records had been deleted.)

This report is generated from a CL file of the RSMAS items, where there is a call# field in the item rec

Range	Description	R C
AS1-AS911.999	AS 1-911 Academies/Learnd Soc	
B-B5740	B 1-5739 Philosophy	
C1-C51.999	C 1-51 Aux. Sciences of History	
CC1-CC960.999	CC 1-960 Archaeology	
DS152-DS700.999	DS 152-700 Asia/Middle East-General	
F1-F300.999 +	F 321-964 US Local History	
F1201-F1400	F 1201-1399 Mexico	
F2136-F2141	F 2136-40 Virgin Islands	
G1-G10000	G 1-9999 Geography-General	
GB1-GB399.999	GB 1-399 Physical Geography	
GB400-GB446.999	GB 400-446 Geomorphology/Terrain	
GB449-GB460.999	GB449-460 Coasts	
GB561-GB650.999	GB 561-650 Other Natural Landforms	
GB651-GB979.999	GB 651-979 Hydrology.Water	
GB1001-GB1201	GB 1001-1200 Groundwater.Hydrogeology	
GC1-GC62.999	GC 1-62 Oceanography-General	
GC65-GC82.999	GC 65-82 Underwater exploration	
GC83-GC95.999	GC 83-95 Submarine topography	