

BOARD OF HIGHER EDUCATION
REQUEST FOR COMMITTEE AND BOARD ACTION

COMMITTEE: Academic Affairs

NO.: AAC 11-35

COMMITTEE DATE: May 31, 2011

BOARD DATE: June 7, 2011

**APPLICATION OF UNIVERSITY OF MASSACHUSETTS AMHERST TO AWARD THE
MASTER OF SCIENCE IN SUSTAINABILITY SCIENCE**

MOVED: The Board of Higher Education hereby approves the application of **University of Massachusetts Amherst** to award the **Master of Science in Sustainability Science**.

Upon graduating the first class for this program, the University shall submit to the Board a status report addressing its success in reaching program goals as stated in the application and in the areas of enrollment, curriculum, faculty resources, and program effectiveness.

Authority: Massachusetts General Laws Chapter 15A, Section 9(b)

Contact: Dr. Francesca Purcell, Associate Commissioner for Academic and P-16 Policy

BOARD OF HIGHER EDUCATION

June 2011

University of Massachusetts Amherst

Master of Science in Sustainability Science

INTENT AND MISSION

The University of Massachusetts Amherst (UMA) filed an expedited application to offer the Master of Science in Sustainability Science (MS-SS). The purpose of the proposed program is to prepare students professionally for a broad range of sustainability-focused careers in industry, government, or the non-profit sector. All students will have the opportunity to be involved in campus sustainability projects. The proposed program intends to promote both theoretical knowledge and practical skills that move communities, the state, and the nation toward a more rational use of energy and better protection of the natural environment.

Students will graduate with: (1) a systems-based foundation for analyzing current environmental challenges; (2) pragmatic training and field experiences; (3) critical thinking and communications skills; and (4) knowledge and understanding of the interrelated scientific, social, economic and political underpinnings of environmental problems, solutions, and practices. The proposed 12-18 month accelerated program is built around a practice/career-based curriculum that requires students to work closely with an NGO, government agency or company to complete a 4-credit internship.

Students will be required to select one of four concentrations: Sustainable Agriculture and Food Systems, Environmental Quality, Water Sustainability, and Urban Sustainability. Because the field of sustainability science is broad and highly interdisciplinary, the program design allows students to build a strong intellectual foundation for analyzing interconnections between social, economic and ecological systems, and to develop a focused understanding within a particular domain.

All of the necessary resources are currently available because this program combines the course offerings of several existing departments and builds on the experience of the College of Natural Science with three similar interdisciplinary graduate programs. The proposed program has been approved by the University's internal governance procedures and was approved by the Board of Trustees of the University of Massachusetts on February 23, 2011. The letter of intent was circulated on March 1, 2011. No responses were received.

The proposed program is consistent with the mission of the University of Massachusetts Amherst. The current mission priorities of the University of Massachusetts Amherst are defined by the Chancellor and the executive management team in the 2010 document *UMass Rising*. The strategic plan identifies environmental sustainability as one of the six highest level priorities for the Amherst campus. This priority is to be embodied not only in UMA's academic and curricular offerings, but also in campus facilities and operations.

NEED AND DEMAND

Nationally, the Bureau of Labor Statistics reports that environmentally related jobs are expected to increase by 28% over the next decade, almost three times the average for all occupations, and that many employers in this area will seek people with a master's degree. This growth in employment will be spurred largely by increasing demands placed on the environment by population growth, greater awareness of the problems caused by environmental degradation, and by a trend toward sustainability in the global business world. In June 2010, IBM released a survey of 2,400 CEOs and 3,600 students from 40 countries; respondents, both CEOs and students "viewed sustainability issues as having a large impact on organizations over the next five years." The move toward sustainability in corporate life matches the broader societal concern for energy efficient buildings as well as an increasing move toward organic and healthily produced local food, and widespread recognition of the impacts of climate change.

Additional evidence of the need for this program comes from the rapid growth of sustainability-related curriculum at the undergraduate level across the country, and the number of emerging programs at the graduate level. According to the Association for the Advancement of Sustainability in Higher Education, there are now over 70 colleges and universities with an undergraduate bachelor's degree, minor, or certificate program in sustainability, up from only 20 in 2005. At the graduate level, leading universities have recently started graduate level academic sustainability programs (e.g., Arizona State University, Columbia University, and University of South Florida). Each of these graduate programs, plus those at a small number of masters granting institutions have shown immediate growth in student enrollment, underscoring the demand for programs in this academic area.

Graduates of the proposed program will be prepared for careers in a variety of sectors. Examples of currently advertised positions include:

- **Private Sector.** Large corporations and medium-sized businesses routinely hire sustainability professionals at all levels. Examples include the corporate retail sector (e.g., *Wal-Mart* Area Coordinator of the Heritage Sustainable Agriculture Program; *JCPenny* Sustainability Procurements Officer; *Stop and Shop*: Sustainable Energy Manager), and businesses focusing on energy practices (e.g., *Energia*: Programs Coordinator; *Sandri*: Energy Consultant). Many major companies now include environmental responsibility as a function at upper management levels, thus providing tracks for career advancement.
- **Higher Education.** UMass hired its first Sustainability Coordinator in 2009. In 2010, the Association for the Advancement of Sustainability in Higher Education drew 2,000 sustainability professionals representing more than 600 campuses. Participants held jobs at these campuses that included: Director of Sustainability, Sustainability Coordinator, Director of Sustainable Agriculture Projects, and Director of Sustainable Campus Planning.
- **Local Municipalities/Regional Organizations.** Recently advertised jobs within the state of Massachusetts include: Energy Task Force Coordinator (*Town of Amherst, MA*); Public Health Preparedness Planner (*Pioneer Valley Planning Commission, Springfield MA*) Energy Sustainability Coordinator, (*Greenfield, MA*).
- **NGOs.** Career openings for graduates include positions with sustainable agriculture non-profits ('Local Hero' Campaign Coordinator for *Communities*

Involved in Sustaining Agriculture); environmental organizations (River Steward, Connecticut River Watershed Council), and urban planning NGOs (Regional Coordinator for *Transition Towns Programs*)

- **State Agencies.** New legislation is encouraging state agencies to reduce energy use, increase their efforts to provide sustainable services to their local populations, and to create new programs. Careers include: *Massachusetts Dept of Energy Resources* - Clean Energy Fellow; Program Director for Green Communities Program, *Massachusetts Department of Environmental Protection*, and Safe Drinking Water Coordinator.

In July 2010, UMA conducted a survey of 150 former participants in the UMass Amherst Eco-Rep Program, a current student program that works and promotes environmental literacy on campus and beyond. Among the 91 survey respondents (a 61% response rate), 82% reported that they intend to pursue an advanced degree after leaving college; and 53% of that group were specifically interested in a one-year, accelerated master's degree in sustainability immediately following the completion of their bachelor's degree. Students who participated in the survey represented diverse academic majors. The three largest groupings were from the natural sciences (42%), business and marketing (15%) and the social sciences (22%, including political science, communications and economics).

To gauge the market for the proposed degree, the UMA survey asked students' whether they would prefer a degree focused on sustainability studies, as opposed to other existing masters programs that might touch on aspects of sustainability, (e.g., Environmental Conservation, Geography, Regional Planning, etc.) The response was in favor of an actual sustainability degree program (92%), highlighting the strong interest in UMA creating the proposed MS-SS degree program.

In addition to the proposed program, the Five College Consortium (a nonprofit educational consortium established in 1965 to promote the broad educational and cultural objectives of its member institutions which are the University of Massachusetts Amherst, Amherst College, Hampshire College, Smith College, and Mount Holyoke College) is creating an undergraduate certificate program in sustainability which will articulate with the proposed M.S. degree. This will provide a recruiting pool of students from the four member colleges all of which have high percentages of students who pursue graduate studies.

Within the Commonwealth, the only similar graduate degree is a 48-credit program from Harvard University. Nationally, there are only five other Carnegie Research 1 institutions offering a Master's degree in sustainability. The remaining programs are located in the southwest (Arizona State), New York/New Jersey (City College of New York, Columbia & Rutgers) and the southeast (Univ. of South Florida). Since UMass will be the only public university in New England with a 12-18 month, 33-credit hour Master of Science in Sustainability Science degree, the University anticipates no program duplication.

ACADEMIC AND RELATED MATTERS

Admission

To be accepted into the proposed MS-SS degree, applicants must have:

- Completed a bachelor's degree from an accredited college or university.
(Students from all academic backgrounds and disciplines will be considered for this program. A major in the natural sciences is not absolutely necessary, but may help waive prerequisite course requirements which include math, statistics, and introductory biology, physics, and chemistry.)
- A 3.0 overall undergraduate G.P.A.
- A personal statement and resume

Each incoming student will be assigned to a faculty advisor who will oversee student progress towards degree completion, and each of the four concentration directors will serve on student committees and monitor degree completion rates within their concentration.

The program is designed to admit students for the beginning of the fall semester, and to be completed with a practicum/internship during the summer of the following year. The projected time from admission to graduation is therefore 12 months, and assuming that a small number of students might require one additional semester, UMA anticipates that all students will graduate within 18 months of admission.

Enrollment

The enrollment projections are as follows:

	# of Students Year 1	# of Students Year 2	# of Students Year 3	# of Students Year 4*
New Full Time	8	12	15	20
Continuing Full Time				
New Part Time				
Continuing Part Time				
Totals	8	12	15	20

Curriculum (Attachment A)

The 33-credit degree comprises core courses, a concentration area, internship, and elective courses.

Core requirements: a set of 4 courses and 2 seminars will cover the intellectual foundation of sustainable systems (environmental, social/urban and economics/politics) and will introduce a systems-based approach to understanding their interconnectedness.

Concentration: students will select at least 3 classes from within a given track (and approved by their advisor). There are four concentration areas: (1) Environmental Quality, (2) Sustainable Agriculture & Food Systems, (3) Water Sustainability & Climate Change, and (4) Urban Sustainability.

Independent Project/Internship: The primary goals of the internship requirement are (a) to give students a guided and structured opportunity to apply their coursework to real-world problem-solving and (b) to develop their skills in needs assessment, systems analysis, project management, and communication. Students will be required to complete 160 hours for the internship. Part of the student's evaluation will be based on their employer's assessment of their performance in addition to an introductory paper, weekly conference calls, journal entries, and the final report.

Two Electives: the elective classes are intended to broaden students' knowledge of sustainability issues beyond their own specific concentration.

Internship Opportunities

The following is a list of companies, non-profit organizations, town governments, and agencies with connections to faculty on the MS-SS steering committee. These organizations will offer internship opportunities to students in the proposed degree program:

American Lung Association
Boston, MA

Northeast Energy Association
Greenfield, MA

Amherst Energy Task Force
Amherst, MA

Northeast Organic Farming Association
Massachusetts (NOFA/MASS)

Center for Ecological Technologies
www.cetonline.org

Nuestras Raíces Community Agriculture
Holyoke, MA

Community Involved in Sustaining
Agriculture
Deerfield, MA

Pioneer Valley Planning Commission
Springfield, MA

Connecticut River Watershed Council
Greenfield, MA

Riverland Farm CSA
Sunderland, MA

Department of Energy Resources (MA)
Boston, MA

Pioneer Valley Transition Towns Initiative
Springfield, MA

Department of Environmental Protection
(MA)
Boston, MA

Sandri Renewable Energy Program
Greenfield, MA

Energia
Holyoke, MA

Stop & Shop Sustainable Energy
+Seafood Programs
Needham, MA

The Food Bank of Western Massachusetts
Hatfield, MA

Gardening the Community
Springfield, MA

Hadley Planning Board
Hadley, MA

Johnson Controls (energy efficiency in
buildings)
Springfield, MA

Leading By Example, Massachusetts State
Agency
Boston, MA

North Amherst Community Farm
Organization
Amherst, MA

The Nature Conservancy
CT River Watershed Program,
Northampton MA

NRCS - Natural Resource Conservation
Service
State headquarters, Amherst MA

UMass Sustainability Internships Program
CO2 Emission Calculations, Food
Services sourcing

Whole Foods Sustainability Programs

Student Learning Outcomes

Students who successfully complete the proposed MS in Sustainability Science will graduate with the following knowledge and skills:

Knowledge: Students will...

- understand the theories and definitions of sustainability (i.e. historical and current theorizing about the interplay between "people, planet and profits")
- understand the key principles of assessing ecosystem services;
- grasp the broad historical contours of the industrial revolution, the scientific-technological revolution, and urbanization;
- be familiar with the thought of at least 4 seminal thinkers in the arena of sustainability;
- recognize the ethical, social and environmental consequences of environmentally-relevant technologies; and
- develop in-depth understanding of their particular concentration.

Skills: Students will demonstrate competence in...

- systems analysis (the ability to identify the interrelated environmental, economic, social and policy dimensions of a given environmental challenge);
- explaining the linkages between ecosystem services, economic prosperity, and human/cultural flourishing;
- carrying out quantitative analyses of sustainability (data gathering, holistic life-cycle costing, energy/carbon accounting);
- applying course knowledge and theory to real-world problem-solving;
- communicating both within and outside their field (writing, oral presentation and internet-based communication); and
- project management skills.

RESOURCES AND BUDGET

Faculty and Administration

The proposed program will be an interdisciplinary program housed in the College of Natural Sciences (CNS). The program will be overseen by a steering committee, comprised of a representative from each of the program concentration areas, and chaired by the director of the program. The chair of the steering committee will report to the Graduate Academic Dean of CNS.

Because this program combines the course offerings of several existing departments and builds on the experience of the College of Natural Science with three similar interdisciplinary graduate programs, all the necessary resources are already available. This includes faculty, courses, library and IT resources and advising resources. The only new hiring necessary for the implementation of this proposal is that of a new part-time Graduate Program Director to be hired in year one and who will teach one class and will oversee the seminar. UMA anticipates that revenue generated by the program by its third year can be used to hire a part-time administrator who will assist with marketing, course coordination between departments, seminar organization and other administrative functions.

Library and Information Technology

Reference librarian assistance is already available to students and faculty at the UMass W.E.B. Du Bois Library as well as the Integrated Sciences and Engineering Library. Library research is currently supported and facilitated by a Sustainability Librarian dedicated to identifying new resources related to the field of sustainability. Since 2008, this Sustainability Librarian has been responsible for creating and updating research guides related to sustainability, local food, renewable energy resources, green building & infrastructure, climate change. The Registrar's Office has already created a new database field in SPIRE, the University's enrollment system, so that courses that are included in the program can be identified through a simple query.

Fiscal (Attachment B)

Expenses (Full Implementation = 20 students/yr, starting Year 4)

1. **Program Director: Salary + fringe = \$25,000.** A 30% FTE part-time Program Director will be hired to teach the new introductory course chair the steering committee, oversee marketing and recruitment, and act as liaison to the advisory committee. Of the 30% FTE, 10% is for teaching and 20% is for service and administration.
2. **Graduate Teaching Assistantships: \$18,000.** (included on Budget sheet with part time/adjunct instruction costs) Three graduate assistantships of 10 hours/week each cost \$3,330 (stipend) + \$910 (fringe) + \$1740 (curriculum fee) = \$5,980. Although the instructional costs of the program come primarily from departmental revenue match, these teaching assistantships allow for the flexibility of opening additional sections and adding additional seats for critical larger enrollment courses.

3. **Adjunct instruction: \$8,000.** UMA is budgeting for one class per year on an as-needed basis. This will allow the University to hire an adjunct to fill a particular curriculum need.
4. **Departmental stipends for faculty incentives: \$20,000.** Departments with faculty who take on the responsibility of advising a student and overseeing their project/internship experience will each be provided an incentive of \$1,000/student which can be allocated to the faculty members involved in the program and used for research project costs, conference travel, etc.
5. **Part-time staff administrator: \$6,400.** A \$16/h part-time administrator will be hired in Year 3 to assist 10h/wk with student applications, bookkeeping, coordinating with internship partner organizations, etc.
6. **Library materials: \$3,000.** UMA currently employs a Sustainability Librarian who is responsible for identifying new resources related to the field of sustainability. The \$3,000 allocation will be used to build holdings related to sustainability, local food, renewable energy resources, green building and infrastructure, climate change, and leverages the Library's commitment of staff time in this area.
7. **Marketing.** The **\$2,000** annual budget will be used to co-sponsor speakers coming to the Five Colleges, for printing and distributing recruitment materials such as large format posters to targeted feeder schools.
8. **General Operating Administrative Budget (\$3,000) and Reserve (\$4,600).** The operating margin of \$4,600 is approximately 5% of the program budget.
9. **Years 1-3, from program inception to full-scale implementation.** At steady-state, the program will enroll 20 students per year. In years 1-3, enrollment will be capped at 8, 12 and 15 students respectively to ensure that the University is indeed operating within the margins of its anticipated capacity and providing a high quality program. Since income from tuition and fees will accordingly be lower in the initial years, expenses are adjusted accordingly.

Revenues

UMA's revenue projections come from assuming enrollments of 8, 12, 15 and 20 students in years one through four. The University assumes that roughly half of these students will come from out-of-state.

PROGRAM EFFECTIVENESS

The University submitted goals and objectives for the proposed program. The University plans to employ the following measures to ensure effective program delivery and to refine its efficiency:

Goal	Measurable Objective	Strategy for Achievement	Timetable
<p>1. Recruitment and Enrollment</p> <p><i>Recruit a strong application pool each year from the local Five College system and from elsewhere in Massachusetts (and beyond), and enroll a selective cohort of students.</i></p>	<p>At steady state (from Year 4 onwards) the objective is to enroll 20 new students per year. As an index of selectivity, UMA will track the Number of Applicants to the program and the Yield% (i.e., the percentage of students who is accepted to the program and who accepts the offer).</p> <p>UMA's target by Year 5 is 60 applicants per year, of which the University expects to offer ~30 acceptances. UMA will monitor these numbers and plan to have the acceptances lead to 20 new enrollees per year.</p>	<p>Promote the program with:</p> <ul style="list-style-type: none"> ○ UMass Amherst juniors and seniors in appropriate majors ○ Eco-Rep students (~70 students per semester from a wide range of majors, all interested in sustainability) ○ Students in the Five Colleges Sustainability Certificate Program students (starting Fall 2011). <p>Market the program as an integral part of the CNS communications team and the broader UMass Green Team marketing initiative.</p>	<p>To ramp up to full implementation, UMA envisions beginning with 8 students in Year 1, and expanding the recruitment efforts and marketing in AY2011/12.</p>
<p>2. Student satisfaction and performance.</p>	<p>Performance on standardized UMass/Office of Institutional Research satisfaction survey on completion of program.</p> <p>Placement in jobs post-graduation</p>	<p>All incoming students assigned faculty advisor to assist with course selection, mentoring, internship connections.</p> <p>Foster internship opportunities for students through advisory board and Career Services office.</p>	<p>ongoing</p>

Goal	Measurable Objective	Strategy for Achievement	Timetable
3. Time-to-completion and Graduation rates.	<p>UMA will evaluate these goals with the following metrics</p> <ul style="list-style-type: none"> ○ % of cohort completing degree within 15 months, ○ % of cohort completing degree within 2 years. ○ % leaving without degree within 3 years of starting. <p>The objectives are 90% completion within 2 years and fewer than 15% leaving without degree.</p>	For doctoral students, the the Office of Institutional Research (OIR) already tracks doctoral degree milestones, time to completion, and the number students withdrawing without a degree. UMA will use OIR's existing systems plus in-house tracking to monitor the three degree-completion metrics.	Systems in place at OIR by Fall 2011 for entering cohort.
<p>4(a) Review and maintain the program's strategic direction on an ongoing basis.</p> <p>4(b) Objectively assess program's effectiveness and quality.</p>	<p>Develop an evaluation plan with the Advisory Board that can be utilized every two years to assess program effectiveness. Evaluation plan will include reviewing recruitment success, teaching evaluations for classes and exit interviews with students.</p> <p>Perform an independent curriculum review by end of academic year 2 (2012-2013) and add other course offerings if appropriate.</p>	<p>Develop an external advisory board by identifying and recruiting a diverse group of 8-10 sustainability experts from industry, local and state government, the non-profit sector, plus 1-2 reps from other higher education institutions.</p> <p>Maintain Sustainability Advisory Board with staggered 3-year terms of rotation.</p> <p>Research sustainability programs at other institutions to identify potential gaps in curriculum and areas for improvement</p>	<p>Advisory board appointed by summer 2011.</p> <p>Annual program evaluation plan to be developed by April 2012</p> <p>Ongoing from AY 2012 onwards</p> <p>Curriculum review team in AY2012/13.</p> <p>New five year plan to be drafted at end of academic year 5 and submitted to Sustainability Advisory Board and Dean of the</p>

Goal	Measurable Objective	Strategy for Achievement	Timetable
		During Academic Year 5, invite an academic external review team to audit program (AQAD-type review).	College of Natural Sciences
<p>5. Revenue</p> <p><i>The goal is for the new program to be self-sufficient financially. Budget projections show the program generating net revenue for Amherst campus and UMass system (above program expenses).</i></p>	<p>\$/yr returned to College of Natural Sciences for program running costs.</p> <p>\$/yr of new net revenue for UMass Amherst central budget (i.e. campus-retained surplus <u>after</u> paying program costs).</p>	<p>The new Amherst campus already has a revenue-sharing policy in place, and will return \$4,500/student of the program's tuition and fees back to the Dean of CNS.</p> <p>Under this arrangement, UMA anticipates generating over \$100k/yr for the Amherst campus and over \$50k/yr for the state.</p>	<p>Program will cover all its own costs and generate surplus revenue from Year 2 onwards.</p> <p>Total projected revenue from Year 4 onwards >\$250,000 (steady state enrollment of 20 students – see budget on p16).</p>

EXTERNAL REVIEW AND INSTITUITONAL RESPONSE

External Review

The proposed program was reviewed by the evaluation team of Dr. Christian Wells, Director of the Office of Sustainability at the University of South Florida and by Dr. Paul Rowland, Executive Director of the Association for the Advancement of Sustainability in Higher Education. Overall, the team expressed confidence that the UMA program was relevant and responsive to student and faculty demand; was consistent with degrees being offered in the field; was crafted to present unique opportunities for students to choose concentrations not available in other programs; and had the potential to produce engaged and employable graduates. In reviewing the curriculum, the team agreed that the breadth and depth of courses included in the proposed program were appropriate for the master's degree and affirmed that the admission and degree requirements were sufficiently rigorous to attract and attain top quality students. The team recommended that the institution should provide greater clarity regarding its expectations for student capacities related to math and science; explain expectations with respect to the internship project; ensure program cohesiveness, and consider dropping "climate change" from the "water sustainability and climate change" concentration. The team cited faculty diversity and credentials as a major strength of the proposed MS-SS but was unsure if the current number of faculty would be sufficient as the program continued to grow. While convinced that the resources allocated for the program were reasonable,

the team questioned the planned addition of administrative staff in year three and suggested that increasing administrative support earlier would avoid slowing the progress of the program. It was also proposed that budget adjustments be made to accommodate faculty development and stewardship of the internship project.

Institutional Response

In response to the evaluation team's report, UMA developed pre-requisites required for acceptance into the proposed program and outlined its strategies for ensuring program cohesiveness including a set of student learning outcomes. The University dropped "climate change" from the concentration. UMA addressed the team's concerns about budget allocations and administrative support by adjusting the timeline and budget to hire additional administrative program support one year earlier than originally planned.

STAFF ANALYSIS AND RECOMMENDATION

Board staff thoroughly reviewed all documentation submitted by UMA and external reviewers. Staff recommendation is for approval of the Master of Science in Sustainability Science.

Upon graduating the first class for this program, the University shall submit to the Board a status report addressing its success in reaching program goals as stated in the application and in the areas of enrollment, curriculum, faculty resources and program effectiveness.

ATTACHMENT A: CURRICULUM OUTLINE

Graduate Program Curriculum Outline – (Board of Higher Education Form)

Major Required (Core) Courses (Total courses required = 6, including one from each of the categories A+B+C)		
Course Number	Course Title	Credits
The following three courses are REQUIRED for all students		
ECO 610	Perspectives on Sustainability	3
ECO 691A	Fall Seminar	1
ECO 692	Spring Seminar	1
A: Environmental Systems (choose any 1)		
ECO 621	Landscape Ecology	4
ECO 697LU	Land-Use and Watershed Management	3
GEOSCI 530	Environment and Population	3
LANDARCH 547	Landscape Pattern and Process	3
B: Urban and Social Systems (choose any 1)		
GEOSCI 670	Urban Environmental History	3
REGIONPL 591B	Sustainable Cities	3
LANDARCH 591F	Green Urbanism	3
REGIONPL 577	Urban Policies	3
C: Economics & Politics of Sustainability (choose any 1)		
ECO 697Z	Environmental Economics and Sustainability	3
ECON 765	Economics of Development – Structural Problems	3
GEOSCI 597G	Geography Policy and the Environment	3
RESECON 720	Environmental & Resource Economics	3
Subtotal # Core Credits Required		14-15

Concentration & Internship (Total courses required = 4: of these, three must come from within a single concentration area, and the 4-credit internship should be in a similar field)		
1: Environmental Quality		
ENTOM 574	Disease Vector Biology	3
ENVIRSCI 504	Air Pollution & Climate Change Biology	3
ENVIRSCI 575	Environmental Soil Chemistry	3
ENVIRSCI 585	Animal and Environmental Toxicology	3
MICROBIO 597E	Environmental Microbiology	3
PUBHLTH 562	Air Quality Assessment	3
PUBHLTH 565	Environmental Health Practices	3
PUBHLTH 590N	Indoor Environmental Health	3
RGNPL 591G	Housing and Public Health	3
Subtotal # Concentration Credits Required		9+4=13
2: Sustainable Food Systems and Agriculture		
ENTOMOL 581	Integrated Pest Management	3
NUTR 597G	Food & Nutrition Policy	3
POLISCI 784	Environmental Policy	3

PLNTSOIL 555	Urban Plant Biology	3
PLNTSOIL 597A	Phyto/Bioremediation	4
PLNTSOIL 590B	Sustainable Food & Farming	3
PPA 697K	Comparative Public Policy	3
Subtotal # Concentration Credits Required		9+4=13
3: Water Sustainability		
CEE 661	Subsurface Pollution	3
GEOSCI 587	Hydrogeology	3
GEOSCI 519	Aqueous and Environmental Geochemistry	3
GEOSCI 591C	Environmental and Climate Modeling	3
GEOSCI 697V	Water Geographies: Conflict and Sustainability	3
ECO 528	Forest and Wetland Hydrology	3
ECO 597R	Watershed Science & Management	3
ECO 597W	Wetlands Assessment & Field Techniques	3
ECO 697LU	Land Use & Watershed Management	3
ECO 768	Wetlands Ecology & Conservation	3
REGIONPL591CC	Planning for Climate Change	3
Subtotal # Concentration Credits Required		9+4=13
4: Urban Sustainability		
ARCHDES 520	Building Energy and Environmental Systems	3
BCT 597D	Sustainable Building and LEED Certification	3
BCT 597B	Building Energy Performance Analysis	3
ECO 697U	Urban Ecology	3
GEOSCI 670	Housing and Urban Development	3
LANDARCH 604	Urban Design	3
LANDARCH 591F	Green Urbanism	3
M&I ENG 570	Solar & Direct Energy Conservation	3
PUBADMN 697BB	Urban and Housing Policy	3
REGIONPL 591B	Sustainable Cities	3
Subtotal # Concentration Credits Required		9+4=13
Internship/Project Requirement related to primary concentration area		
ECO 696	Practicum in Sustainability	4
Subtotal # Internship/Project Credits Required		4

Elective Courses: take any 2 courses from the concentration options above or the list below. At least 1 elective must be in a DIFFERENT area of the student's concentration.

GEOSCI 592N	National Parks and Protected Areas	3
NUTR 578	Nutrition in the Developing World	3
NUTR 640	Public Health Nutrition	3
NUTR 678	Topics in International Nutrition	3
PUBHLTH 666	Environmental & Occupational Toxicology	3
PUBHLTH 671	Risk Assessment and Management	3
PUBHLTH 690F	Social Justice	3

CURRICULUM SUMMARY

Total courses required for the degree:	12
Total credit hours required for degree:	33
<i>Prerequisite or Other Additional Requirements:</i>	<i>N/A</i>

ATTACHMENT B: BUDGET

NEW ACADEMIC PROGRAM BUDGET

One Time/ Start Up Costs	Annual Expenses				
	Cost Categories	Year 1	Year 2	Year 3	Year 4
	Full Time Faculty (Salary & Fringe)	0	0	0	0
15,000	Part Time/Adjunct Faculty, TAs (Salary & Fringe)		13,500	20,000	26,000
	Staff	25,000	25,000	25,000	31,400
	General Administrative Costs	1,000	2,000	2,000	3,000
-	Instructional Materials, Library Acquisitions		2,000	2,500	3,000
-	Facilities/Space/Equipment	-	-	-	-
-	Field & Clinical Resources	8,000	12,000	16,000	20,000
3,000	Marketing		2,000	2,000	2,000
2,000	External Review; Repay revolving loan				4,600
20,000	TOTALS	34,000	56,500	67,500	85,400

One Time/Start- Up Support		Annual Income			
		Year 1	Year 2	Year 3	Year 4
	Revenue Sources				
20,000	Grants				
	Tuition	53,760	94,320	113,340	157,200
	Fees	72,330	113,820	140,500	189,700
	Departmental	0	0	0	0
	Reallocated funds				
	Other (specify)				
20,000	TOTALS	126,090	208,140	253,840	346,900