BOARD OF HIGHER EDUCATION

REQUEST FOR COMMITTEE AND BOARD ACTION

COMMITTEE: Assessment and Accountability **NO**.: AAC 09-15

COMMITTEE DATE: May 29, 2009

BOARD DATE: June 4, 2009

FRAMINGHAM STATE COLLEGE
Bachelor of Science in Environmental Science

MOVED: The Board of Higher Education hereby approves the application of **Framingham State College** to award the **Bachelor of Science in Environmental Science.**

Upon graduating the first class for this program, Framingham State College 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

Framingham State College

Bachelor of Science in Environmental Science

INTENT AND MISSION

In April 2009, Framingham State College (FRC) submitted an expedited proposal to offer a Bachelor of Science in Environmental Science. The proposed program intends to train students to solve complex multidisciplinary problems and to communicate effectively with the scientific community and the general public so that they will be prepared for a variety of careers focused on the evaluation and protection of natural resources. The environmental science major is designed to provide the interdisciplinary background necessary for an environmental professional today by combining a strong foundation in science, emphasizing biology, with broad training in geographical theory and techniques. Graduates will be prepared for work as environmental analysts, town wetlands administrators, environmental educators, or environmental scientists and will also be prepared for further graduate-level study.

Environmental science is an interdisciplinary field, and thus it is difficult for a single academic department to prepare students adequately. The proposed environmental science major is the result of a collaboration between the biology and geography departments, which recognized the shortcomings of the environmental preparation offered in their respective majors. The proposed program thus builds on the current strengths in the biology and geography departments and compliments pre-existing programs. To prepare students for the workplace as environmental professionals in a variety of roles, the program will offer firm preparation in the physical sciences and a strong background in liberal arts to provide the interdisciplinary training necessary.

The proposed program's intent reflects both the mission of the state colleges and Framingham State College. The state college segmental mission statement calls for the colleges to provide programs that " …develop each student's critical thinking, quantitative, oral and written communications skills, and practical appreciation of the arts, sciences and humanities as they affect good citizenship and an improved quality of life." This new program will also support the College's mission statement that refers specifically to "…unique professional programs integrated with foundation sciences." This proposed program intends to provide the training for students wishing to build a career as professional environmental scientists and will provide information critical for responsible citizenship and the potential to improve the quality of life in the Commonwealth.

The required Letter of Intent was circulated on March 13, 2009. The University of Massachusetts Boston (UMB) and the Massachusetts Bay Community College (MBCC) submitted letters of support, stating that the proposed program is "rigorous" and "well-constructed" and has "an admirably articulated purpose and a demonstration of local and national need." UMB stated that it would like to collaborate with FRC as it expands its own environmental science offerings, and MBCC expressed the desire to set up articulation agreements. The Massachusetts Maritime Academy (MMA) also expressed support for the program but noted one potential conflict of interest with the Marine Safety and Environmental Protection undergraduate program, the environmental major at MMA

that requires students to complete a 240-hour co-op working with an outside company, agency or institution on some aspect of the environment or of environmental health and safety. MMA requested more information about the proposed internship experiences at FRC to ensure that two sets of students are not competing for the same co-op opportunities. FRC responded to MMA, indicating that students from the two institutions would not be competing for the same internship opportunities.

NEED AND DEMAND

Need

The proposed program addresses a significant public need, both nationally and within the Commonwealth. The first is that many environmental scientists are close to retirement, and the second has to do with a renewed commitment to conservation and environmental protection. According to the *U.S. Bureau of Labor Statistics Occupational Outlook Handbook* 2008-2009 edition, employment opportunities in environmental science "will be spurred by continued general awareness of the need to monitor the quality of the environment, to interpret the impact of human actions on terrestrial and aquatic ecosystems, and to develop strategies for restoring ecosystems" and is predicting to continue to grow at the growth rate for all jobs through 2014. The Bureau also predicts that a "…shift in focus from reactive solutions to preventive management will provide many new opportunities for environmental scientists and hydrologists in consulting roles."

The Massachusetts Department of Workforce Development, in its report, *Massachusetts Employment Projections through 2000 to 2010,* predicts that jobs for environmental scientists holding at least a bachelor's degree are expected to grow at a rate of 12 percent, adding approximately 760 new jobs to the workforce. Jobs for environmental science technicians holding at least an associate's degree are expected to grow at a rate of 18 percent, adding approximately 310 jobs to the workforce. This is greater than the average projected growth rate for all jobs.

Demand

Students enrolled in courses in the biology and geography departments were surveyed in fall 2007 to assess interest in the proposed program. Overall, significant interest in the program was identified. Of the 337 students who responded to the survey, 34 percent said they would be somewhat likely or very likely to choose a major in environmental science and reported they had a strong interest or moderate interest in pursuing a career in environmental science. Of the 37 students who had yet to declare a major, 43 percent said they would be somewhat likely or very likely to choose this major, and 35 percent said they had a strong interest or moderate interest in pursuing a career in environmental science. Of the 67 first-year students who responded, 27 percent said they would be somewhat likely or very likely to choose this major, and an equal amount said they had a strong interest or moderate interest in pursuing a career in environmental science.

An analysis of existing similar environmental science majors currently offered within the region indicates a need for the proposed program. Within the Metrowest area of Boston, Wellesley College is currently the only college that offers environmental science as a major. Environmental science majors take many forms and are housed in a variety of departments. Environmental biology is offered by several schools, including Bridgewater State College, Fitchburg State College, and American International College. Bridgewater State College also offers a program in environmental chemistry. Broader

environmental science majors are offered at numerous colleges, but many of these do not include environmental policy and planning or environmental law courses. The proposed Framingham State College program will provide students with both the scientific background to understand environmental problems and the policy and planning background necessary to implement solutions and is less costly than the majority of current programs.

ADMISSION AND ENROLLMENT

The approval of candidates for admission will be made on a selective basis. The College is interested in students whose preparatory program, scholastic achievement, aptitudes, interests, character, and established study habits give definite promise of success in a college program. Applicants in a comprehensive college preparatory curriculum must have a recalculated minimum cumulative grade point average of a 3.00 on a 4.00 scale. Students with a GPA between 2.0 and 3.0 may be admitted if they meet SAT requirements calculated on a sliding scale.

Transfer students must meet the following minimum standards: 12-23 college-level credit hours and a 2.50 college GPA; or up to 23 college-level credit hours, a 2.00 college GPA, and a high school transcript that meets the admissions standards for freshman applicants (SAT required); or 24 or more college-level credit hours and a 2.00 college GPA.

PROGRAM ENROLLMENT PROJECTION

	# of Students Year 1	**# of Students Year 2**	**# of Students Year 3**	**# of Students Year 4***
New Full Time	15	15	15	15
Continuing Full Time		12	24	36
New Part Time	5	5	5	5
Continuing Part Time		3	4	4
Totals	20	35	48	60

CURRICULUM (Attachment A)

The proposed program requires a total of 128 credit hours, of which 84 credits count toward the major. The foundation of the program is based in work in the sciences and geography (planning and resource management) and then allows students to pursue more advanced study in scientific applications or policy and planning. The proposed program will requires integration across disciplines through a capstone internship experience.

The following list represents agencies/organizations at which Framingham State biology or geography majors have interned in the past and/or at which faculty members have contacts with whom they have discussed internship possibilities:

Town of Ashland Conservation Office
Town of Ashland Planning Office
Town of Framingham Conservation Office
Town of Uxbridge Planning Office
Town of Weston Conservation Office
Metrowest Growth Management Committee
Massachusetts Division of Fish and Wildlife
Massachusetts Department of Environmental Protection
Massachusetts Department of Conservation and Recreation

Massachusetts Emergency Management Agency
Massachusetts Bay Transit Authority
U.S. Environmental Protection Agency
U.S. Army Corps of Engineers
New England Wildflower Society
Massachusetts Audubon Society
Aquatic Control Technology, Inc.
Horsley Witten Group
Loiserstein Environmental Engineering

Students who complete the program can complete the requirements for certification as Wetland Scientists in Training by the Society of Wetland Scientists. The WSIT certification is the first step toward certification as a Professional Wetland Scientist (PWS). PWS certification is a national credential that identifies individuals who are qualified to assess and manage wetland resources.

In addition, students who complete this program will also be eligible for certification in Massachusetts as earth science teachers if they complete the requirements for the secondary education minor and an astronomy course.

RESOURCES AND BUDGET (Attachment B)

Faculty and Administration

Seven faculty will be drawn from the Biology and six from the Geography Departments. Although the courses in the proposed program already exist (except for the capstone course) and are offered on a regular cycle, the new program will require that some courses be offered more frequently or that more sections of the courses be offered. As a result, the College plans to allocate new faculty lines in the Biology, Geography, and Chemistry Departments as program enrollment grows.

The proposed program will be housed in the Geography Department. The Biology and Geography Departments will each have an advisor dedicated to students in this major. An environmental sciences committee will be formed to review proposals for senior capstone experiences and to provide ongoing review of the curriculum and syllabi. Expenses associated with individual courses will be budgeted through the home department of each course. The Vice President for Academic Affairs has the overall responsibility for the administration of academic programs.

Library

The College reports that the library is well equipped and has many of the online materials needed to support this new major. The library also has an agreement with regional colleges for physical access to their libraries and electronic access to their catalogs. The library leadership has been proactive in working with faculty to identify appropriate resources and in assisting students to use those resources. Below is a listing of the databases in science that are currently available in the library. Additionally, the library is seeking a test subscription to an environmental science full-text database.

Research databases that include full-text journal articles:

- Academic Search Premier
- Biomedical Reference Collection: Basic
- EBSCOhost EJS

- Expanded Academic ASAP
- Health Reference Center Academic
- InfoTrac Junior Edition
- JSTOR Arts and Sciences I Collection
- Periodical Abstracts
- ScienceDirect Health & Life Sciences College Edition
- ScienceDirect Journals

In addition, the Library provides access to a number of other science databases.

Academic Search Premier (EBSCOhost)	Provides full text for over 4,700 journals, covering the social sciences, humanities, general science, multi-cultural studies, education, and much more.
ACM Digital Library	A vast collection of citations and full text from the Association for Computing Machinery journal and newsletter articles and conference proceedings.
AGRICOLA (FirstSearch)	Materials relating to all aspects of agriculture, forestry, and animal science.
BasicBIOSIS (FirstSearch)	Basic information about biology and other life sciences.
BioDigest (FirstSearch)	Life science information written in a non-technical style.
Biomedical Reference Collection: Basic (EBSCOhost)	Over 100 full-text journals covering such disciplines as clinical medicine, nursing, dentistry, and veterinary medicine.
CINAHL Full Text	Provides full-text indexing for 3,024 journals from the fields of nursing and allied health, with indexing back to 1937.
ClasePeriodica (FirstSearch)	Index of Latin American journals in the sciences and humanities.
Clinical Pharmacology (EBSCOhost)	Access to up-to-date, concise and relevant drug monographs for all U.S. prescription drugs, herbal and nutritional supplements, as well as over-the-counter, new and investigational drugs.
Expanded Academic ASAP (Infotrac)	Access a wide variety of sources from every academic concentration. Use this database to research topics in Astronomy, Religion, Law, History, Psychology, Humanities, Current Events, Sociology, Communications and the General Sciences.
GEOBASE (FirstSearch)	Worldwide literature on geography, geology, and ecology.
Health Source Consumer Edition (EBSCOhost)	Provides full text for nearly 300 health periodicals, over 1,000 health pamphlets, and 23 health reference books.
Health Source Nursing/ Academic Edition (EBSCOhost)	Provides indexing for more than 550 scholarly full text journals from many medical disciplines, as well as abstracting for over 850 general medical journals.
MathSciNet (American Mathematical Society)	A comprehensive database covering the world's mathematical literature since 1940, providing Web access to the bibliographic data and reviews of mathematical research literature contained in the Mathematical Reviews Database.
Medline (EBSCOhost)	Provides access to medical information from 1966 to present. This database also includes full text for nearly 80 biomedical journals dating as far back as 1990.

Physical Resources
The College reports having adequate laboratory resources to accommodate anticipated enrollment growth in the sciences and anticipates construction of a new laboratory building that will extend the College's capacity to support both student and faculty laboratory research. In addition to traditional biology and chemistry lab facilities, the College has a geographic information systems laboratory and a collection of topographic maps and aerial photographs of Massachusetts cities and towns.

Fiscal
The College submitted a budget for the proposed program, indicating that revenues will begin to exceed expenses starting in year three. A copy of the budget is attached as Appendix B.

PROGRAM EFFECTIVENESS
Framingham State College submitted goals and objectives for the proposed Bachelor of Science in Environmental Science program as follows:

Goal	Measurable Objective	Strategy for Achievement	Timetable
Generate an average 15 students entering the program each year.	Enrollment of 50 students.	Recruitment of new students and internal transfers to the program from other majors.	By the fifth year of program.
Maintain student-faculty ratios by providing additional sections of courses to accommodate projected enrollment growth.	Student-faculty ratios are maintained as the program grows.	Hire new faculty, very closely monitor seat availability of the following courses; CHEM 201 Organic Chemistry, BIOL251 Plant Taxonomy, BIOL348 Ecology, and GEOG 216 Introduction to Geographical Information Systems, and add extra sections as necessary	Hire an additional faculty position within the first two years.
Progressive review of curriculum and of course syllabi to ensure that program goals are met.	Syllabi and scheduling documents support the achievement of objectives.	Review course syllabi to identify areas of overlap and ensure that all critical knowledge and skill areas are adequately covered, review scheduling each year to confirm that adequate seats are available for all students in the major, and monitor the availability of positions in the internships and the research courses to ensure that all senior environmental science majors can be accommodated.	At the end of the first year of the program.

Form an environmental science committee to review student proposals for internships and research and develop agreements with local and state agencies and the private sector that will serve as host institutions for student interns.	Annual growth of internship placements with various agencies	Work with contacts at agencies and private firms to formalize and expand existing internship opportunities, develop new internship agreements and ensure that internship opportunities are tailored to the needs of Environmental Science majors.	At the end of the first year of the program.

EXTERNAL REVIEW AND INSTITUITONAL RESPONSE

The proposed program was reviewed by Dr. Michael Womersley, Associate Professor, Center for Global Change and Sustainability, Unity College; and Dr. Randall Wilson, Associate Professor and Chair, Department of Environmental Studies, Gettysburg College.

Both reviewers expressed strong support for the proposed program, stating that it meets or exceeds academic standards, is consistent with the academic mission of the College, addresses a significant public need at the local, state, and federal levels, and demonstrates sufficient commitment of resources in terms of faculty, facilities and equipment for successful implementation.

With regard to the curriculum and administration, the external reviewers recommend that the College add a formal climate change class and a economic course or adjust economic content in current courses, provide greater opportunities for students to pursue electives, introduce ES- (Environmental Science) coded courses to establish a program identity, reduce 100-level electives in favor of upper-division courses as the program develops, revisit relationship between the environmental studies concentration within the Geography Department and environmental science major to reduce confusion to students, parents and the community, and identify a program coordinator and dedicated administrative assistant support.

In its institutional response, the College outlined actions taken or in progress in accordance with each review report recommendation and/or issue raised. Specifically, the College will consider moving general education students into a course designed specifically to meet their needs and to redesign Introduction to Environmental Science as an interdisciplinary course with a more explicit focus on climate change. Likewise, the College recognizes the lack of economics in the curriculum as a weakness. In response, faculty from the environmental science program will approach the chair of the Economics Department to request a course designed for the environmental science major. If that approach is unsuccessful, the existing resource management course will be revised to further emphasize economic principles as they apply to environmental problems. The College will consider introducing ESE-coded courses, reducing 100-level electives as the program grows and offering environmental studies as a concentration within the environmental science program. The College will also evaluate the need for a program coordinator as the program grows.

STAFF ANALYSIS AND RECOMMENDATION

Board staff thoroughly reviewed all documentation submitted by Framingham State College and external reviewers. Staff recommendation is for approval of the Bachelor of Science in Environmental Science.

Upon graduating the first class for this program, Framingham State College 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

Course Number	Course Name	Credits
Required Core Courses (60 Hours=16 courses)		
BIOL 101	Biological Concepts	4
BIOL 200	Introduction to Environmental Science	4
BIOL 251	Vascular Plant Taxonomy	4
BIOL 348	Ecology	4
CHEM 103	General Chemistry	4
CHEM 201	Organic Chemistry	4
GEOL 231 or 233	*Physical Geology or Environmental Geology*	4
GEOG 212	*Geographic Perspectives on the Environment*	4
GEOG 216	*Introduction to Geographical Information Systems*	4
GEOG 235	Environmental Law and Policy	4
GEOG 240	Municipal Land Use	4
GEOG 339	Methods for Planning Analysis and Plan Making	4
GEOG 375	Resource Management	4
MATH 208	Biostatistics	4
ECON 102	Principles of Microeconomics	4
ITDL492/493 or 450	*Internship in Environmental Science* or Senior Thesis in Environmental Science	4
Science Electives (Choose 2) (8 Hours)		
BIOL 232	Invertebrate Zoology	4
BIOL 335	Wildlife Biology	4
BIOL 336	Ornithology	4
BIOL 338	Ichthyology	4
BIOL 341	Marine Biology	4
PHYS 201	Introductory Physics	4
PHYS 241	Introduction to Meteorology	4
GEOL 231	Physical Geology	4
GEOL 246	Oceanography	4
Policy and Planning Electives (Choose 2) (8 Hours)		
GEOG 110	World Regional Geography	4
GEOG 135	Introduction to Environmental Studies	4
GEOG 214	Geographical Techniques – Quantitative Methods	4
GEOG 225	Population, Food and Global Development	4
GEOG 230	Geography of Natural and Man-Made Hazards	4
HIST 348	United States Environmental History	4
ANTH161	Introduction to Cultural Anthropology	4
POLI 223	Bureaucratic Politics and Power	4
POLI 250	American Legal Systems	4
POLI 329	Public Policy Analysis	4
ITDL 301	Water: Planning for the Future	4
ITDL 302	Coastal Issues Seminar: Science and Policy	4

Communications Electives (choose 1) (4 Hours)		
ENGL 225	Introduction to Journalism	
ENGL 472	Technical Writing	
SOCI 130	Social Problems	
COMM 107	Effective Speaking	
COMM 328	Argumentation and Advocacy	
General Education Requirements (not including those required in the core above) (36 hours)		
Mathematics		4
Arts and Humanities (including literature and foreign language)		16
Social Sciences		16
Free Electives (8-16 hours depending on electives chosen above)		
Curriculum Summary		
Total number of courses required for the degree		34
Total credit hours required for degree		128

ATTACHMENT B: BUDGET

Revenues	Year 1	Year 2	Year 3	Year 4
Enrollment Assumption (FTE):				
Annual Initial Enrollment	20	20	20	20
Continuing Enrollment		15	15	15
			13	13
				12
Aggregate Enrollment	20	35	48	60
Incremental Revenue				
Fee Assumption	$5,656	$6,141	$6,616	$7,066
	$113,120	$214,935	$317,568	$423,960
Expenses				
Incremental Faculty				
Biology, Geography, Support Courses				
Year 1 addition - 1 FTE (.5 Bio, .5 Geo)	$55,000	$56,650	$58,350	$60,100
Year 2 addition - 1 FTE (.5 Bio, .5 Support)		$56,650	$58,350	$60,100
Year 3 addition - .3 FTE (Utilization Inc; VL)			$9,000	$9,000
Year 4 addition - .3 FTE (Utilization Inc; VL)				$9,000
Aggregate Incremental Faculty Costs	$55,000	$113,300	$125,699	$138,200
Incremental Departmental Support Costs	$15,000	$30,000	$35,000	$40,000
Incremental Academic Support Costs	$15,500	$27,125	$37,200	$46,500
Incremental Student Support Costs	$15,000	$26,250	$36,000	$45,000
Incremental Institutional/Infrastructure Costs	$30,620	$32,260	$47,669	$75,260
Aggregate Incremental Expenses	$131,120	$228,935	$281,568	$344,960
Net Impact	($18,000)	($14,000)	$36,000	$79,000