

Report of the Environmental Science Studies Work Group

January 2007

Clean technology, green technology, is going to be the growth industry of the 21st century. Mom, Dad, tell your kids; anything green is going to have a great job associated with it. Green design, green services, green consulting, green manufacturing-green technology is going to be the growth industry of the 21st century. Now wouldn't we want to lead the growth industry of the 21st century? Tom Friedman (May 15, 2006)

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TABLE OF CONTENTS

Environmental Science Studies Work Group Members	ii
Part I: Executive Summary	1
Table of Environmental Programs at JMU	2
Part II: Recommendations	4
Recommendation 1: Create a “School for the Environment”	4
Recommendation 2: Revise Existing Curriculum; Create New Curriculum in Congruence with the Goals of the School of Environment	6
Recommendation 3: Create a “House” Major for the School of the Environment.....	7
Recommendation 4: Begin Planning for a Master’s Program	7
Part III: Report of the Environmental Science Studies Work Group	8
I. Academic Programs in Environment: State and National Profiles.....	9
II. The Facts About our Programs at JMU: Market Demand and Student Interest	11
III. The Niche of the Environment Program at JMU	16
IV. Evaluation	19
Appendices	
Appendix A: Charge to Committee Considering Environmental Curriculum Issues.....	21
Appendix B: Proposed Models for the Major in the School of the Environment.....	22
Appendix C: Compare Virginia and Other Schools	24

Part I: Executive Summary

The Environmental Science Studies Work Group (ESS) was charged with reviewing the existing environmentally oriented programs at James Madison University (JMU) and making recommendations about how to transform these disparate efforts into a sustained and viable academic endeavor, one that can be shared with enthusiasm by the several colleges involved in environmental science studies.

There are eight JMU programs related to environment: 3 minors, 4 concentrations and 1 major. There are three institutes and two centers. Additionally two new majors with environmental applicability are poised for approval and implementation: the B.S. in Engineering and a B.S. in Geographic Sciences.

1. Process

We examined the content and enrollments of the academic programs, profiled comparable programs nationwide, and reviewed existing programs in Virginia. We considered occupational viability and what credentials would be most competitive. We wrestled with the highly charged question of the proper place for environmental studies at JMU, thinking both of curricular and administrative niches. Finally, we contemplated the civic and ethical obligations suggested by a serious approach to environment, and we tried to ensure that those concerns are part of the informing structure of our recommendations.

2. The Niche for Environment Study at JMU

For JMU students there is no clear path for navigating the disconnected ways environmental issues are addressed. Presently majors and minors are either too tightly contained within the boundaries of a department to be flexible, too diffuse to offer sufficient substance or so scattered administratively as to be invisible to students. A coherent academic environment for environmental study will naturally suggest praxis for JMU's socially active students, and indeed the Fall of 2006 finds an upswell of faculty and student interest in the "greening" of JMU.

3. Current Practices in Virginia and Nationwide

There is limited consistency across the many environmentally focused programs found in Virginia and the U.S. We reviewed eight programs in Virginia and six outside of Virginia. In almost all cases, programs require students to adhere to specific tracks that are either science-based, management/mitigation-based, or social science/policy-based and the environmental science/studies programs were

Environmental Programs at James Madison University December-06

Existing Majors and Minors in Environmental Science Studies

Program Name	Coor/Direct	Status	# students
Earth Science	Geology--BA	major	7
Environ Information Systems	Frysinger/ISAT	minor	2
Environmental Management	Frysinger/ISAT	minor	4
Environmental Studies	Dilts/Geology	minor	14

Pending Majors w/ relevance to Environment Science Studies

Engineering	ISAT	Emphasis on sustainability
Geographic Sciences	ISAT	Geospatial science w/ emphasis on environment

Existing Centers and Institutes in Environmental Science Studies

Institute for Environment	Steve Frysinger 2002
Center for Environment, Health and Safety (CEH&S).	Steve Frysinger 2002
Institute for Conservation Law Enforcement.	Steve Frysinger 2004
Center for Energy and Environmental Sustainability (CEES).	Shen Air , CJ Broderick; Renewable Energy , John Miles; Alternate Fuel Vehicle Lab , Chris Bachman; & Pure Water , Tom Benzing 2006
Institute for Health & Environmental Communication	Pete Bsumek, Sharlene Thompson 2006

based in an academic department, whether that department included some iteration of "environment" in their title or not. The majority of programs were science based. Programs that are tied to a science-based structure tend to view cross-disciplinary relationships as internal to the sciences. When social science perspectives are prominent in the curriculum the housing program is usually Geography. Relatively little can be said about collaborative partnerships from the data readily available.

4. Market Demand

There is a substantial job market for students who choose to pursue a comprehensive environmental program of study. According to the U.S. Department of Labor job growth in environmentally oriented careers is expected to equal, or exceed the average growth for all occupations through 2014. Such professions are not limited to engineering. Job posting rubrics for persons with "environmental expertise" include: Natural Resources & Conservation; Environmental Policy, Legislation & Regulation; Environmental Advocacy & Communication; Environmental Science & Engineering; Outdoor & Environmental Education; Environmental Jobs in Higher Education, and International Environmental. In Virginia a search on any given day produces over 100 listings for environmentally defined positions.

5. JMU Student Interest

The current catalog and administrative structure for environment study discourages discovery and depth by its scattered presentation and uncoordinated affiliations, so none of the existing environmental programs show a robust enrollment or some are too new to judge. However, enrollments of students in environmentally oriented elective courses with environmental focus are substantial: 2003-2004: 1119 seats filled; 2004-2005: 1168 seats filled; 2005-2006: 1077 seats filled.

6. Skill Sets for the 21st Century-the Importance of Cross Disciplinary Approaches

Working in an environmental field requires an ability to converse in a multidisciplinary environment and have experience with interdisciplinary teamwork. Science, technology and engineering are not sufficient background for 21st century environment professions. Even traditional jobs in environmental science and technology and resource management now require multidisciplinary skill sets ranging from knowledge of advocacy & conflict resolution, to business & management practices, to governmental policy-making & international affairs.

7. Evaluation (Not in Order of Priority)

- a. There is substantial student and faculty interest in environmental studies at JMU.
- b. Environmental studies in the 21st century is necessarily cross disciplinary.

- c. JMU's environmental catalogue needs to be coordinated and visible.
- d. The social science and humanities perspectives on environment need to be brought into environmental initiatives.
- e. Given appropriate administrative location and resources, JMU could pioneer collaborative initiatives in environment both internally and externally.

8. Recommendations

- I. Create a School of the Environment (absorbs the Institute for Environment).
- II. Revise existing minors and create a common course for the minors.
 - Rename the Environmental Studies minor to Environmental Science.
 - Revise the Environmental Management minor.
 - Create a Humanities/Social Science minor Environmental Studies--to complement the COSM and CISAT offerings.
 - Develop a common course for the three minors.
- III. Create a house major for the School of the Environment, building upon experience with the three minors.
- IV. Begin planning for a Master's program.

Part II: Recommendations

Recommendation 1: Create a "School of the Environment"

Mission: The School of the Environment provides an independent voice for environmental studies at James Madison University, guides and coordinates environmental programs and initiatives across campus and models an innovative and original administrative presence for effective environmental programs in the Commonwealth of Virginia.

Goals for the School of the Environment

- 1. For students: To bring clarity and visibility to the academic and applied programs available for students interested in the environment; to provide coordinated and comprehensive student advising; to provide more opportunities for students to meet and work with faculty involved in environmental scholarship; to recruit and nurture the next generation of environmental leaders.
- 2. For students and faculty: To develop new aspects of environmental studies at JMU that will enrich student learning opportunities and faculty research and teaching opportunities.

3. For faculty: To provide an academic location for faculty interested in environmental studies, and a welcoming community for all faculty from the disciplines to join with the School's core faculty in research, teaching and outreach projects; to create a home for multi-disciplinary research grants and funded programs.
4. For JMU: To facilitate, coordinate, model and showcase the opportunities in academic and applied environmental studies across campus and in the larger community; to enhance JMU's reputation as a "green" campus, and encourage community collaborations, both academic and applied; to be responsible for a consistent environmental catalog entry, showcasing descriptions of each environmental program and highlighting linkages between cross disciplinary programs and environmental programs housed in disciplinary units.

Implementing the Goals for Recommendation 1

1. **Authority for Environmental Curriculum.** The School will organize and house a C & I committee that will have oversight responsibility for the mission and goals of the School. This C & I committee must be independent of all existing colleges, and have CAP representation. This committee will have the same standing as any departmental or school C & I, not having exclusive veto power over unit decision, but having voice and standing to speak for environmental initiatives. Future environmental initiatives should be developed in collaboration with the School and its programs.
2. **A full-time, independent administrator** to oversee the implementation and growth of the School.
3. **A Core Faculty.** The School may house a core faculty who are appointed to the School in full time, tenure track positions, and receive tenure and promotion within the School. The School may offer joint and affiliate appointments to faculty in the disciplines who would like to work with the School's faculty. The School may also employ adjunct instructors as needed. This core faculty need not be large, as the strength of the School will come from the consortia of programs who are delivering environmentally focused curriculum. The School must be able to develop key courses, however, that fill needs that existing units cannot address. The School will operate by the guidelines established by the Faculty Handbook and best practices for an academic unit.
4. **Budget.** The School will have a budget and support staff commensurate with its responsibilities and goals.

Boundaries for this Recommendation

1. Will facilitate, coordinate and guide decision making about environmental programs in existing units; will not dictate catalogue, curriculum or any other administrative prerogatives currently exercised by departments, schools, or colleges of the administrative units.

2. Will build from and absorb the existing "Institute for the Environment."
3. Will advocate on behalf of JMU's environmental programs.

Recommendation 2: Revise Existing Curriculum; Create New Curriculum in Congruence with the Goals of the School of the Environment.

Goals for School of Environment Curriculum

1. Coordinate curricular experiences in general education to upper-level studies in the sciences, technology, and management related social sciences to best address the diverse aspects of environmental sustainability.
2. Provide student research and learning experiences that reflect an emphasis on integrative environmental sustainability, while maintaining the intellectual integrity of the contributing disciplines.
3. Encourage student participation in decision-making and actions that lead to sustainability and co-existence between humans and their environments.
4. Involve JMU students in synthesizing and communicating the findings of environmental research and teaching to a nonscientific audience (e.g. K-12 educators, business, media and legislative audiences).
5. Foster and sustain the cross-disciplinary exchange of research and learning experiences with a focus on contemporary and historical environmental issues.

Implementing the Goals of Recommendation 2

1. Revise and rename the current Environmental Studies minor to Environmental Science.
2. Create an Environmental Studies minor that emphasizes Social Science and Humanities approaches to the environment.
3. Revise the Environmental Management minor.
4. Create a cross-disciplinary, team taught senior seminar, required in all three minors, emphasizing multiple perspectives, ethical issues, and problem solving in the real world.

Boundaries for Recommendation 2

The three minors become participants in the School. This recommendation sets up a structure of minors that can support current curricular needs, and anticipates curriculum growth, as per Recommendation III.

Recommendation 3: Create a "House" Major for the School of the Environment

Goals for the Proposed Major

1. The major would reflect the goals and mission of the School of the Environment and the minors curricula.
2. This major would build upon the success and identity of the three minors identified in Recommendation II for development and revision.
3. The major would support ongoing development of cross disciplinary, team-taught courses.
3. Although the Environmental Science Studies Work Group was not charged with developing a major, models are included in Appendix B of this report, signaling the enthusiasm and interest of the group for this next phase of development.

Implementing the Goals of Recommendation 3

1. The current committee seeks authorization to proceed with development of this major.

Boundaries for Recommendation 3

The proposed major should be supported by the data generated by the work of the committee. The proposed major should not significantly overlap with existing majors, but rather provide a new pathway relative to both JMU and environment programs statewide.

Recommendation 4: Begin Planning for a Master's Program

Anticipating a master's program is a logical outcome in the context of JMU, where the institution is eager to establish niche programs of distinction that will enhance student marketability and faculty research opportunities. A master's program opens up funding possibilities not available for a B.S. program. In the field of environmental studies a master's degree is desirable for maximum employability and career advancement. The goals for the master's program should be consistent with the goals and mission of the School of the Environment.

Part III: Report of the Environmental Science Studies Work Group

Introduction

Although there were many lingering lessons to be extracted from Hurricane Katrina, perhaps the least noted but most important lesson was the stark perspective we received on a system-wide failure to comprehend the complex and interactive effects of our environmental decision making. Conflicting perspectives on everything from weather forecasting to medical preparedness, engineering to animal control, pollution to law and order, and energy to altruism converged in this single event.

Environmental studies is not a matter of proper science or proper systems management or proper social geo-dynamics, or proper political priorities. It is all of these things and more, and the faculty and students who are willing to enter this arena of multiple, contending perspectives need the kind of training that transcends any single discipline and is willing to bend to superior insight wherever it may be found. We are looking for expert knowledge combined with effective communication skills combined with a true passion to protect the lovely world we inhabit.

JMU faculty and students do not lack for idealism and energy for environmental causes. Over the past several years, JMU has hosted a proliferation of environmental activities, both curricular and applied. Some of these activities have been funded by outside grants, and others funded by faculty enthusiasm and a principled concern for how we are interacting with our ecosystems. We do not have, however, a stable foundation from which to integrate and develop these multiple approaches so that students who are interested in the environment can easily locate a dynamic and well conceived academic pathway to channel that interest.

The Environmental Science Studies Work group was charged with reviewing the existing programs, and making recommendations about how to transform these disparate efforts into a sustained and viable academic endeavor, one that can be shared with enthusiasm by the several colleges involved in environmental science studies. The charge to the group is available in Appendix A.

Process and Structure

The Environmental Science Studies Work Group met 10 times over the course of the calendar year 2007. Additionally several subgroups met periodically for research and writing purposes and this work informed the deliberations of the committee of the whole. Discussion of proposals also took place on Blackboard.

We examined the content and enrollments of existing programs at JMU, profiled comparable programs nationwide, and reviewed existing programs in Virginia. We considered occupational viability and the credentials required to send students well prepared for a rapidly moving professional edge. We puzzled over the variety of credentials, training and location of the many environmentally interested faculty at JMU. That is, we wrestled

with the highly charged question of the proper place for environment studies at JMU, thinking both of curricular and administrative niches. Finally, we engaged in contemplation of the civic and ethical obligations suggested by a serious approach to environment, and we tried to ensure that those concerns are part of the informing structure of our recommendations.

I. Academic Programs in Environment: State and National Profiles

Comparing Structures of Programs at Other Institutions

Many institutions offer options in environmental programs at both the undergraduate and graduate levels. But with such apparent broad offering of programs nationwide, there is only limited consistency across such programs (Romero & Jones, 2003). Appendix C charts these various program at undergraduate and graduate levels.

The structures of programs in eight Virginia institutions were compared: George Mason University, Virginia Tech, University of Virginia, Radford University, College of William & Mary, Hampton University, Virginia Commonwealth University, and University of Mary Washington. In addition, six environmental programs external to Virginia were also examined. Within each program, information on several aspects were sought: (a) program format/exit credential, (b) administrative entity responsible for program, (c) the cross-disciplinary nature of the program, (d) curricular components, either explicit or implicit, (e) collaborative partnerships with other internal or external entities, and (f) contact person and program size. The information was extracted from publicly available web pages and downloadable advising sheets, with a primary emphasis on undergraduate programs.

Program Format (Major, Minor, Certificate, Concentration)

In examining the program format, the exit credential upon program completion was the primary criteria. Successful completion implies that a student has navigated a specific curriculum path that is tied to a degree or certificate. Among the programs examined, there were three main categories: (a) a BA or BS in Environmental Science, (b) a BA or BS in a traditional field (geology, geography, engineering), with a selected concentration or secondary major in Environmental Science/Studies, or (c) an undergraduate certificate in environmental science/studies. This pattern was consistent across programs, whether internal or external to Virginia. Within programs, however, there are often specialized tracks or concentrations, each of which is aimed at a narrow range of career characteristics. These seem to be dependent on faculty interests. The majority of programs were science based.

Curriculum Components

In almost all cases, programs require students to adhere to specific tracks that are either science-based, management/mitigation-based, or social science/policy-based. In many cases, the first two (science- and management-based) categories are tied together, often through specified areas, such as resources analysis or management, or around a specific

theme, such as marine science or ecology. These programs emphasize a strong basis in traditional science fields (biology-chemistry-physics-geology) with specialized coursework later in the curriculum. In the case of geography degrees, however, the emphasis is placed on planning, land-use policy, and social/cultural aspects of the environment. Many of the courses tend to be specialized in the environment from the earliest part of a student's academic career, once general education requirements have been met.

Administrative Entity (Department, School, Institute, Center)

In almost all cases, environmental science/studies programs were based in an academic department, whether that department included some iteration of "environment" in the title or not. These departments were either a department of geology (in the case of more science-based programs) or a department of geography (with a more social science/policy emphasis). Where programs are shared across department lines, it is not always clear where administrative authority is based, but clearly defined curricula sheets tied to exit credentials are usually provided. In many cases, a director or coordinator for programs was listed, but their role and appointment was not always explicit. In the absence of a coordinator or director, the assumption is made that the program is directed by the chair of the primary or host department, or their delegate.

Cross-Disciplinary Nature

Programs that are tied to a science-based structure tend to view cross-disciplinary relationships as internal to the sciences. That is, the range of courses and experiences that students participate in are primarily across the sciences and mathematics. Within this category, there is either a specific, interdisciplinary reference to coursework in the social sciences or humanities, or none at all outside of general education requirements. Programs that are more social science based tend to view student experiences in a more holistic fashion. In these cases, the cross-disciplinary nature is perhaps more implicit with less specificity for interdisciplinary relationships across disciplines

Collaborative Partnerships

Relatively little is noted in this analysis of collaborative partnerships within environmental programs. There are either specific partners named or no systematic information is provided. The University of Texas, for instance, names specific partners including academic departments across colleges, research centers and institutes, and other external agencies. Other programs that name specific partners tend to offer program tracks that are common to multiple programs, such as the College of William & Mary.

Contact Person and Size

As mentioned above, programs that are explicitly inter- or cross disciplinary in the scope of their curricula and research are directed or coordinated by a named individual. It is not very clear in most cases (Texas is the exception) what the exact nature of the appointment of the director is, whether the appointment is purely administrative or not, whether such

appointments are part of or supplemental to the director's workload, and what sort of curricular or administrative authority is vested in the director. The exact (or even approximate) numbers of students in most programs is not provided. One can infer from the numbers of faculty involved in programs the relative size of the demand for coursework, but these inferences are problematic. Programs frequently list affiliated faculty, but their roles (research or instructional or both) are not always provided. The level of commitment of faculty is not always explicit, as well, so it is difficult to tell if faculty provided dedicated instruction and cross disciplinary research, or merely have research interests that coincide with the program. Where listed, the number of faculty committed as "core" members is usually small, on the order of 4-8 faculty members.

II. The Facts About our Programs at JMU: Market Demand and Student Interest

In this section we demonstrate that there is a substantial job market for students who choose to pursue a comprehensive environmental program of study, and that there appears to be significant student interest for a comprehensive environmental studies program here at JMU. To do so, first we detail the growing demand for environmental jobs. Then, we discuss why there appears to be substantial student interest for a comprehensive environmental studies program here at JMU. Finally, we describe the multidisciplinary "skill sets" that will best prepare students for the booming new environmental jobs market.

A. The General Job Market: Why the Market Values Environmental Studies

The job outlook for students with environmentally oriented knowledge and skill sets is tremendous. It is obvious that clean and alternative energy is the wave of the future.¹ Indeed, even conservative market observers are predicting that the job market that will experience the most significant expansion over the next decade is "environmentally focused." Consider, for example, the 2005 *Fortune Magazine* study, which included a survey by OBM (a leading outplacement and executive coaching firm) of its thousands of career counselors and outplacement specialists and an analysis of the Bureau of Labor Statistics' job growth projections the greatest increase in job demand over the next decade by far "will be for folks who know how to clean up spaceship earth" (Fisher 2005).

It is important to note that these jobs are not limited to the engineering field. Indeed, engineers cannot produce technological solutions to problems without accurate and effective science. In fact, it takes effective science to determine the nature of a problem in the first place. Nor can engineers offer solutions that are not economically feasible. Thus there is a need for environmental economists and effective environmental managers. Perhaps more importantly, many of the "technologies" that are needed to prevent environmental problems do require new tools, so much as better decision making. Hence, there is also a need for public policy analysis, sociological understanding, and knowledge of communication and conflict resolution skills.

¹ For an excellent discussion on this topic see Lugar, Friedman, and Naim 2006.

Even a cursory search of the Internet for job listings with an environmental focus produces an impressive result. Job postings which specifically seek "environmental expertise" can be found across a very wide spectrum. For example, one website (Environmental Career Opportunities: <http://www.ecojobs.com/>) lists jobs under the following categories:

- Natural Resources & Conservation Jobs
- Environmental Policy, Legislation & Regulation Jobs
- Environmental Advocacy & Communications Jobs
- Environmental Science Jobs & Engineering Jobs
- Outdoor & Environmental Education Jobs
- Environmental Jobs in Higher Education
- International Environmental Jobs

Furthermore, the U.S. Department of Labor predicts that job growth in these areas is expected to grow as rapidly as or exceed the average growth for all occupations through 2014 (U.S. Department of Labor Bureau of Labor Statistics).

Regarding private sector and not-for-profit opportunities in Virginia, a search of "thingamajob.com", the website of Allegis Group Family of Hiring Companies (the largest privately owned staffing company in the world) revealed 97 environmental job openings in Virginia. Salaries for these jobs range from 35,000.00-negotiable.

B. Resource Management Job Market Growth

Opportunities in the public sector – state and local government – are also promising. A search of "Virginia Jobs" (the official state employment website) revealed 36 job openings for which environmental expertise is required. These jobs are listed under the following categories: environmental manager, environmental specialist, and natural resource specialist, and offer salaries ranging from \$30,000.00-\$80,000.00.

Until recently the job market in federal natural resources agencies was almost non-existent. However, that is about to change. A recent report presented by the Renewable Natural Resources Foundation in association with the American Association for the Advancement of Science concludes that "government agencies, particularly those charged with managing and protecting the nation's natural resources, are facing a crisis. Their employee base is changing as more employees become eligible to retire resulting in lost institutional memory and difficulties in maintaining core competencies" (Colker and Day 2003-2004, p. 7). Indeed, over one half of the Senior Executive Staff of the Department of the Interior, USDA Forest Service, and Environmental Protection Agency will retire by 2007. As this occurs and current employees are promoted we can expect a corresponding increase in entry-level resource management and regulation compliance positions.

While these figures and trends are not definitive, they suggest there are vibrant public and private sector markets for environmental specialists in Virginia.

C. Student Interest

There are several ways in which to gauge student interest in a new comprehensive environmental program of study. The simplest is to see how many students are currently enrolled in our existing environmental programs. If we were to use this method to gauge student interest we would have to conclude that there is not a great need for a new program. Below is a list of current JMU programs of study and corresponding enrollments.

Majors:

1. Geography/Environmental Studies Concentration
2003-2004: 14
2004-2005: 14
2005-2006: 18

2. ISAT: Environmental Concentration
2003-2004: 38
2004-2005: 30
2005-2006: 18

3. Geology: Earth Science (Start 2006)
No data available (the major is less than a year old)

4. Economics/Environmental & Natural Resources Concentration
No data

Minors:

1. ISAT/Environmental Information Systems (Start 2001)
2003-2004: 9
2004-2005: 10
2005-2006: 4

2. ISAT/Environmental Management (Start 2004)
2004-2005: First year
2005-2006: 2

3. Geology/Environmental Studies (Start 1999)
2003-2004: 6
2004-2005: 13
2005-2006: 14

Based on the above numbers we might conclude that in 2005-2006 only 56 students (36 concentrators and 20 minors) were interested in environmental programs of study. However, this method of determining student interest in environmental studies is not representative. First, we believe that students are not drawn to these programs because the current catalogue is confusing. As it now stands, environmental programs are dispersed throughout the catalogue as subsections of different majors. Second, there is no comprehensive advising system for students with environmental interests, nor is there an effective matriculation system for students with environmental interests. Third, because these programs are dispersed across four different academic units-Geology, Economics, ISAT, and Geography-it is likely that advisors are as unfamiliar with these programs as are potential students. Finally, we wonder how a student can see an advantage to one of these courses of study if the environmental program does not alter the nature of the degree earned (i.e., a concentration)? We also wonder why, for example, a student who is pursuing a degree in sociology would look in the ISAT section of the catalogue for a minor? Indeed, it should be noted that as the curriculum currently stands there is no environmental program that is realistically accessible to students in the social sciences and the humanities.

We believe that the current catalogue creates a situation in which students with environmental interests tend to major in particular fields and dabble in a variety of environmentally oriented elective courses. In this scenario, we believe that students with genuine interest in environmental topics are "supplementing" their chosen course of study with a variety of environmentally oriented elective courses in large part because they currently see no advantage to formally adopting a concentration or a minor. There is strong evidence to support this conclusion. If we look at the enrollments of students in environmentally oriented elective courses (courses with a clear and discernible environmental focus based on their title, or their catalogue description) we see substantial enrollments. It should be noted that the following numbers count only classes that are truly electives. In other words, courses that are required for any program of study (General Education, or core courses in majors) have been excluded. Thus we believe these numbers are actually low, as many students take required courses as electives.

Elective Courses with Environmental Focus:

1. Geography

2003-2004: 457 enrolled
2004-2005: 495 enrolled
2005-2006: 540 enrolled

2. ISAT (excludes GISAT 112)

2003-2004: 324 enrolled
2004-2005: 281 enrolled
2005-2006: 179 enrolled

3. Social Science (CAL and Economics)
 - 2003-2004: 105 enrolled (includes SCOM 313: Special topics)
 - 2004-2005: 136 enrolled (includes SCOM 313: Special topics)
 - 2005-2006: 112 enrolled (no econ courses offered this year)

4. College of Math and Science
 - 2003-2004: 233 enrolled
 - 2004-2005: 256 enrolled
 - 2005-2006: 246 enrolled

TOTALS:

2003-2004: 1119 enrolled in elective "environmental courses"
2004-2005: 1168 enrolled in elective "environmental courses"
2005-2006: 1077 enrolled in elective "environmental courses"

These enrollment numbers suggest that there is substantial interest among JMU students for a comprehensive environmental program of study. While it should be noted that the above enrollment numbers do not indicate that, for example, 1077 different students took elective courses that have an environmental focus in 2005-2006, they do reveal that in that year 1077 "seats were occupied" in courses that explicitly address environmental topics. In other words, JMU students are pursuing environmental study despite the limitations of our current presentation.

D. Environmental Skill Sets for the 21st Century

Of equal importance, the theoretical knowledge and practical skills that federal resource management agencies now require are multidimensional and multi-disciplinary. Here is a detailed description of the skills we anticipate for our students:

Necessary qualities will include intelligence, adaptability, flexibility and dynamism because resource professionals will be coping with changes and developments in science, engineering, the economy, and society. Multidisciplinary courses, technology and computer training, and interpersonal skills will be required. Especially important will be a resource manager's ability to communicate complex and politically sensitive issues. (Colker and Day 2003-2004, p. 21-22)

As the U.S. becomes increasingly racially and ethnically diverse, resource managers will need ethics and diversity training. Multiple language skills will be very useful. Resource managers will build and participate in interdisciplinary partnerships and teams. As national priorities shift, important leadership and advocacy skills will include conflict resolution, decision management, critical thinking, negotiation and facilitation. To cope with the complexity of environmental issues, resource managers will require education in business, economics, social sciences, and natural sciences as well as technological and computer training. (Colker and Day, 2003-2004)

III. The Niche of the Environment Program at JMU

External to JMU

James Madison University is a community resource and a community leader on environmental issues, sometimes intentionally and sometimes by default. At present most environmental services fall into the later category primarily because there is no institutional home for the variety of things that individual faculty and, more rarely, departments do. One example suffices to illustrate this point. In 1996 Paul Goodall on the ISAT Faculty helped start a Shenandoah Valley organization called the Pure Water 2000 Forum with primary funding from Coors Brewing Company, the Department of Conservation and Recreation and other participating organizations. The organization has thrived, continuing to do draw funding and support projects, like the removal of the McGaheysville Dam on the South Fork of the Shenandoah River. The Pure Water Forum (as it is now officially called) also did a study along the 1-81 corridor looking at the potential impact of a chemical spill on water supplies in the towns of Shenandoah County. They had some input from Dr. Tom Benzing also in ISAT, and an ISAT graduate student, but no involvement from other parts of campus, even though we have a hydrogeologist in the Geology Department who could have contributed to this effort. This connection was never made because there is no mechanism promoting interdepartmental communication on environmental activities at JMU.

There are many examples to use illustrating both JMU's service and research potential to aid local and state organizations that could be enhanced if there were a coordinating body encouraging cooperation. In 1971, the Head of the Transportation Research Council, School of Engineering, and University of Virginia approached JMU's College of Science and Mathematics to aid in evaluating the environmental impacts of VDOT's activities throughout the State. Soil erosion and sediment control was identified as one of the major problems. Over the next 15 years, faculty were involved in a number of research projects designed to evaluate various methods of erosion and sediment control. In 1978, JMU faculty compiled the first Manual on Erosion and Sedimentation Control for VDOT.

In addition to the Pure Water Forum, a number of other organizations work with JMU faculty: the Department of Game and Inland Fisheries, the Department of Environmental Quality, the Department of Forestry, the United States Forest Service, the United States Geological Survey, Rockingham County Public Schools, and a number of other local school districts, Coors Brewing Company, Merck Corporation, Valley Conservation Council and many more. All of these groups have contacted and used faculty and/or student time to do environmental tasks or supervise educational or research efforts on their behalf. The way these relationships develop at present depends solely on the connections made by individual faculty members, and if they do expand from that faculty member it occurs solely at the initiative of that faculty member. We do not have a place to direct people when the university is contacted about community or regional needs relating to the environment.

The proposed School of Environment (SOE) could serve as a one-stop clearing house for all the environmental programs at JMU. Perhaps someone calls needing assistance with historic building preservation. Their call is directed to the school which holds the list of

faculty and activities, finds the Anthropology/Sociology or History Department and faculty with that portfolio and gets them connected. The faculty can then find students or other resources that can work on the problem with the caller. The same would be true for an energy question. The Center for Energy and Environmental Sustainability could hang its shingle in both the School of Environment and the ISAT Department, making it much easier for people interested in biodiesel or wind or conservation to find key resources to meet their needs. At the same time the School of Environment could also direct people to non-JMU based organizations doing things in these areas.

An additional aspect of the potential external niche for the SOE at JMU relates specifically to the Community Service Learning (CSL) component. At present students do become involve with environmental work in the community through groups like the Friends of the Blacks Run Greenway, Pure Water Forum or specific "clean-up" days with a number of organizations. According to Richard Harris, who heads the CSL program, there is no group on campus that connects students regularly with these opportunities. The CSL office does know that Shenandoah National Park would like to use more volunteers with their invasive species program, and the Forest Service would like more help with their trail development and maintenance programs, but these both require training and longer time commitments than most volunteer students are able to give. SOE could easily connect students and professors from a number of departments to service learning opportunities in the region.

Internally at JMU

The interest in environmental problems around the country grows continually. We are seeing expanding attention paid to environmental issues with global warming and its implications at the top of the list. Disasters like Hurricane Katrina lead students to ask disturbing questions along with the rest of society: Why are large storms more common now? Why are my favorite animals, the polar bears, endangered? What does it mean to see robins in northern Alaska? Why don't our leaders respond to this crisis?

How do we at JMU answer these questions? Some of our answers are science oriented, some related to policy, others related to economic considerations, and more related to how we live on the planet. Finding answers means stepping beyond disciplinary boundaries and looking at systems from multiple directions. Teaching these issues becomes a complex mix of just about every field on campus. Yet our programs here do not lend themselves to asking or answering these questions from perspectives that go beyond a disciplinary focus. We have strong interest in environmental and energy issues in many places across campus, from business and economics to anthropology in addition to Physics and ISAT. These have some focus in various "centers" that have sprung up: the Institute for the Environment (nearly 70 affiliated faculty members); the Center for Energy and Environmental Sustainability; Center for Conservation and Law Enforcement. However these centers have no mutual home, nor is there a campus wide umbrella they can come under that connects them to other parts of the campus.

This disconnect is the largest failing of the present environment opportunities at JMU. How could a School of Environment work to meet student needs? Many freshmen come to campus with a sense of what they are interested in studying, but commonly have few clues to determine a direction of study. Presently if they ask, "How can I study the environment at JMU?" they could get a variety of answers depending upon who they question, and all could be right when answering, but have no connection to other, equally right answers. Directing the student to one place that coordinates all the answers for advice makes a great deal of sense. Some students may have interest in green business design and management. Others may prefer looking at social impact of environmental problems, while others might wish to study the science of environmental problem solving. Advisors under the umbrella of the School could help the students find a track that suits them that could be through any number of departments, or one of the joint majors proposed to be run by the school itself. This would give our programs better visibility within the JMU community and could attract more students.

At present JMU is not an environmentally astute institution, though to be fair, very few educational institutions are at this point. We have people and even programs that are becoming better, but these are isolated on campus and do not have a strong institutional profile (though the biodiesel and wind energy programs are attracting attention.) A School of Environment could speed the greening of the JMU campus in a variety of ways. Here are some possible questions potential students and their parents could ask about JMU's environmental programs:

- Is JMU a green campus? What ways do you promote environmental sensitivity?
- Who supplies the power to the JMU campus? Does it come from sustainable energy sources?
- Has the university invested in energy saving technologies?
- What kind of research do you do in relation to alternative energy?
- Do you have any courses of study about how to manage green businesses?
- What are the personal and social implications of being "green"? Are there ways you enhance this understanding on the campus?
- How does the campus manage its water, soil and landscaping? Is this ecologically sound? Do students get involved in this process?
- Does the campus buy local food? What does it do about making sure students have healthy meals on campus that come from healthy, environmentally sound sources?
- What kind of air quality do you have in your buildings? Are the buildings healthy? Are you planning any upgrades to improve buildings on campus?
- How does JMU interact with the surrounding community on such issues? What do you do with the city of Harrisonburg? Does the institution have any interaction with the agricultural communities of the Shenandoah Valley? How about their school systems? How you relate to Shenandoah National park, George Washington National Forest? What do you do with the Shenandoah River, now on the 10 most endangered rivers list?

The essential niche of the School of the Environment is to provide a way for JMU to supply better environmental education to its students in a variety of ways; to coordinate the various programs on campus that relate to the environment; to connect the campus to community groups and organizations that work on the environment or have environmental concerns; and to provide an opportunity for students to do research or training activities on-campus or off-campus that address these questions.

IV. Evaluation

1. There is plenty of student interest at JMU for an environmental studies program.

Clearly we are not suggesting that all of the students who elect to take an environmentally oriented class would become majors in a new unified program. However we have evidence that if the option existed many students would select an ES major in such a program.

2. Environmental studies in the 21st century is necessarily cross disciplinary. The course enrollment numbers probably suggest that no one department or college can, at present, sustain a comprehensive program in environmental studies. However, these same enrollment numbers do suggest that the university as a whole could easily support a full service environmental program. Current information on career opportunities suggests the necessity of a strong multidisciplinary training.

3. The environmental catalogue needs to be unified. A unified catalogue, which would bring all of JMU's environmental programs of study under one catalogue heading would offer several advantages. First, it would enable students and prospective students to easily identify environmental studies as a course of study. Second, it would better facilitate advising of students with environmental interests. Third, it would make it much easier to promote environmental programs at JMU. Fourth it would provide a more attractive program for prospective students with environmental interests.

4. The social science and humanities perspectives on environment need to be better recognized in environmental programs. Currently there is no environmental program of study that is oriented toward CAL students, nor are any of the currently existing programs realistically accessible to CAL students. Yet a substantial number of seats are occupied in environmental elective courses in CAL. Moreover it is clear that effective communication to both general and specialized public audiences is an essential component for successful environmentally oriented programs. Students in the humanities and social sciences will bring to environmental initiatives essential communication skills and cultural insights not readily available through science-only or technology-only training.

5. Given appropriate administrative initiatives and resources, JMU could pioneer collaborative initiatives in environment both internally and externally. The potential for collaboration is relatively unrealized both at JMU and statewide. If environmental programs at JMU were afforded the same curricular self-determination and administrative

authority as any other program unit at JMU, we could begin to foster partnerships both academic and applied that currently have no home base for mutual planning.

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Appendix A

CHARGE TO COMMITTEE CONSIDERING ENVIRONMENTAL CURRICULUM ISSUES

(thanks to Vida Huber for giving permission to use parts of the IIHHS task force charge/document in this context) January 2006.

As part of the long range academic planning process, Provost Brown has requested that attention be given to the place environmental studies should play in JMU's curriculum development. He has requested that Dr. A.J. Morey convene a work group to serve as the vehicle for exploring and making recommendations about potential program direction in this area.

The charge to the group is to develop recommendations for future educational programs at JMU in the area of environmental studies that might be selected for further development. (For purposes of this document and beginning the group's work, the term environmental studies also includes environmental science and environmental management.) The group is asked to expand its focus beyond existing disciplinary boundaries, departmental lines and existing JMU academic programs. Consideration should be given to options of new programs, modifying, redefining or changing the focus of existing programs, as well as creating collaborations among existing or new programs.

The group's recommendations should have the following characteristics:

- Be future oriented
- Be consistent with the mission and strengths of the university
- Capitalize on existing and potential for developing faculty strengths
- Embrace a cross disciplinary response to societal issues
- Evidence wisdom incorporated from multiple and varied sources

Consider varied types of programs (undergraduate, graduate, majors, minors certificates, etc.)

The committee report will come as recommendations about the opportunities that should be considered. It is important that the work reflect a strong statement of why it should be considered, the factors considered in making the recommendation, the basis upon which it is being recommended, etc. The recommendations are for programs to be considered to development. The report is not intended to be a full program/curricula proposal of such a program.

APPENDIX B

PROPOSED MODELS FOR THE MAJOR IN THE SCHOOL OF THE ENVIRONMENT

I. Proposed Major Requirements Stemming from Recommendation III Discussions.

1. Each of the current or proposed minors (recommendation II) becomes a concentration in the major.
2. There will be core requirements for each concentration. Students could double-count disciplinary major courses used in the core requirements of the Environment major so that the major will function as a second major for them.
3. Students could also elect this as a major by fulfilling the Core requirements for each concentration, subsequently continuing coursework in the chosen concentration for the linked major.
4. The major should be designed to avoid duplication of existing programs.

II. BS/BA Environment: Frysinger proposal

The School of Environment will create and house a new undergraduate degree program entitled "Environment", with both B.A. and B.S. degrees offered.

A. B.S. Environment

The B.S. Environment program focuses on natural science, specifically the study of nature and human interaction with it. It includes two tracks (Theoretical and Applied), and all B.S. students share common foundation courses (e.g. biology, chemistry, geology, math and physics). Upper division courses will be developed or selected from currently offered courses at JMU as appropriate for the track.

B. B.A. Environment

The B.A. Environment program focuses on social science as pertains to the environment. It may also consist of tracks such as Human Nature (psychology, sociology, anthropology, &c) vs. Human Activity (business, economics, geography, design, &c). B.A. students would take one or more foundation courses that provide them with an adequate scientific background to support their focus (e.g. GISAT 112, "Issues in Environment"). B.A. students will be especially encouraged to take advantage of their foreign language skills by participating in international programs.

B.A. and B.S. students will take annual seminar courses together, share other courses as appropriate, participate in joint colloquia and other activities, and will be strongly encouraged to form diverse teams for research/thesis projects. Students majoring in Environment may optionally choose to complete a second major,

facilitated by the fact that courses taken for the Environment major may also be applied to other majors of the University and vice versa.

III. Environment Major as Second Major: Wiggins Proposal.

The School of Environment would create and house a new undergraduate degree program entitled "Environmental Studies". Rather than being a stand-alone major, this new major would be designed to complement other majors in existing disciplines, and thus would be taken only as a second major.

The Environmental Studies Major would consist of three parts: a "natural and applied sciences" part, a "liberal arts/social sciences" part, and a "synergy" part:

--The natural and applied sciences part would provide an introduction and survey of coursework in the natural sciences and ISAT. Students would choose from a selection of existing courses (including GenEd courses?) in biology, chemistry, geology, geography, ISAT, mathematics, statistics, etc.

--The liberal arts/social sciences part would provide an introduction and survey of coursework in the liberal arts and the social sciences. Students would choose from a selection of existing courses (including GenEd courses?) in anthropology, communication, economics, political science, sociology, etc.

--The synergy part would include new inter-/multi-/crossdisciplinary courses that would be developed by the School of Environment (this would be the main part of the major). These courses would involve the use of case studies, service and experiential learning, and senior (capstone) seminars, with a goal of fostering interaction among students and faculty from multiple and varied primary major disciplines.

The parts would be designed so that students with a primary major in Science & Mathematics or ISAT would have already taken the coursework in the natural and applied sciences part, and would then take the coursework in the liberal arts and the social sciences. Similarly, students with a primary major in Arts and Letters (or Business?) would have already taken the coursework in the liberal arts/social sciences part, and would then take the coursework in the natural and applied sciences. The synergy courses would be taken by students from all the primary majors.

Students completing the Environmental Studies major would graduate with a solid grounding in an established academic discipline, would take environmentally related coursework from other disciplines, would be exposed to the content and challenges of the inter-/ multi-/ cross- disciplinary nature of environmental issues, and would gain experience in working and collaborating with people from other disciplines.

APPENDIX C

COMPARE VIRGINIA AND OTHER SCHOOLS

Institution	Format	Curricular Emphasis	Administrative Entity	Cross-Disciplinary Nature	Collaborative Partnerships	MS programs
George Mason University	BS in Earth Science Graduate Certificate in Env. Management	Environmental Science concentration in BS; Emphasis in Physical, Social, or Biological aspects	Within Department	Range of various ecology and environmental geology courses; Biological, Physical, Social aspects	None noted	Environ. Science & Policy; Environ. Science Studies
Virginia Tech	BS in Civil/Env. Engineering	Environmental and Water Resources track	Within Department	CEE core plus track-specific courses	None noted	Environ. Engr.; Environ. Sci & Engr.; heavy on basic science
University of Virginia	BA in Environ. Sci BS in Environ. Sci	Environmental Policy; Natural Resources; Water Resources;	Department	Requirements for geology, chemistry, biology, ecology, stats, social science	None noted	Environ. Science., interdisc, with heavy emphasis on basic science.
Radford University	BA in Geography BS in Geography	Environmental Sciences concentration; Tracks for Land Management/planning and Advocacy/Policy/Education	Within Department	Primarily social/physical geographic aspects	None noted	None noted
College of William & Mary	BS in primary science field; BA in primary social/policy field	Environmental Science secondary major; Environmental Studies secondary major; Minor in Environmental Science & Policy	Across departments as a secondary (add-on) program	Selection of general and specialized science courses; Selection of specialized courses in social science & humanities	Keck Lab Biology Dept Economics Dept Geology Dept Government Dept Sociology Dept	No separate degree, but concentrations within MS Biology, MA Policy, MS Marine Science

Institution	Format	Curricular Emphasis	Administrative Entity	Cross-Disciplinary Nature	Collaborative Partnerships	MS programs
Hampton University	BS in Marine & Environmental Science	Emphasis on biological and ecological aspects of marine environment	Department	Coursework in General Education plus classical science disciplines; Field program highlighted	None noted	Biology, w/ concentration in Environ. Science
Virginia Commonwealth University	BS in Environ. Sci; Minor in Environ. Sci.	Core science and interdisciplinary environmental science coursework with limited social science	Separate Center, curriculum across departments	Coursework in basic sciences across range; Interconnections of science and policy	Joint appointments for faculty between Center and home science or humanities department	MEnvS (Env.Studies); MS Env.Studies (Science) Accelerated BS to MS prgm.
University of Mary Washington	BS-Env. Sci and Geology major	Natural Science track; Social Science track	In department with Geology	Solid science combined with social science/ humanities requirements; Field program highlighted	None noted	None noted
Western Washington University	BS in Env. Studies BA in Env. Studies	BS emphasis: Aquatic, Marine, or Terrestrial Ecology; Environmental Chemistry or toxicology BA emphasis in Environ. Education, Planning & Env. Policy, and Geography with separate tracks	In Department with Geography; Cross-department program	Primarily social geographic focus, with specialized ecology classes	Not explicit, but between Geography and Education, Journalism, and humanities programs	MS.Environ Science MS Geography MEd Environ Education
Oregon State University	BA? BS? Certificate?	Core areas of science, social perspectives, and environmental science; multiple specializations	Not apparent	Clear interdisciplinary focus to curriculum. Research and learning opportunities are interdisciplinary	Not apparent	MA, MS in Biogeochem, Ecology, Environ. Educ., Nat'l Res. Water Res., Quant. Analysis, Prof. Sci.; Cert-Sustainable Nat'l Resources

Institution	Format	Curricular Emphasis	Administrative Entity	Cross-Disciplinary Nature	Collaborative Partnerships	MS programs
Ohio University	Environmental studies certificate	Environment-intensive on top of Biology/Chemistry/Physics/Geology/Geography Degrees	Separate certificate jointly managed across departments.	Certificate is intended to provide synthesis across 5 programs. Curriculum not explicit	Apparent across 4 sciences and geography departments	MS Geol – Surface Processes; MSES Biology
University of Texas Environmental Sciences Institute	Certificate program in environmental sciences	Based primarily on Geography, Geology, Marine Science, Biology, and “Biodiversity Law”	Separate entity with clear partners	Explicit multidisciplinary units are described, from academic departments to research institutes, not limited to science but inclusive of Arts & Humanities	Explicit interdisciplinary partners, with multiple research and study opportunities for students.	Integrated Watershed Science Graduate Portfolio Program
University of Idaho	BS in Environmental Science	Options in Biological, Physical, and Social sciences; Each includes solid science, cross-disciplinary humanities, and mitigation/management components	Program managed across departments of Biology, Physical sciences, and Social sciences	Solid science combined with social science/ humanities requirements; Field program highlighted	Internal and external partners are specified	MS, Environ. Science; MEngr, MS Environ. Engr.
Iowa State University	BS in Environmental Science	Primarily Earth sciences-based, closely tied to Earth processes	Program across Earth sciences and agronomy departments	Solid science foundations with traditional science domains specified	College of Agriculture and College of Liberal Arts & Sciences	MS Environ. Science w/interdisciplinary emphasis and research