2010

James Madison University
Climate Action Report

January 15, 2010

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Executive Summary

James Madison University (JMU) is a public master's level university located in Harrisonburg, Virginia. JMU is a 655-acre residential campus of approximately 19,000 students and about 2,700 faculty and staff. JMU has a long history of contribution to environmental stewardship. On Earth Day 2008, President Rose publically announced the University's commitment to environmental stewardship. JMU's initial emphasis was on creating an administrative structure to facilitate communication and coordination and to involve stakeholders in the planning process. An administrative office and five supporting service committees were created. In 2009, JMU adopted the following defining characteristic:

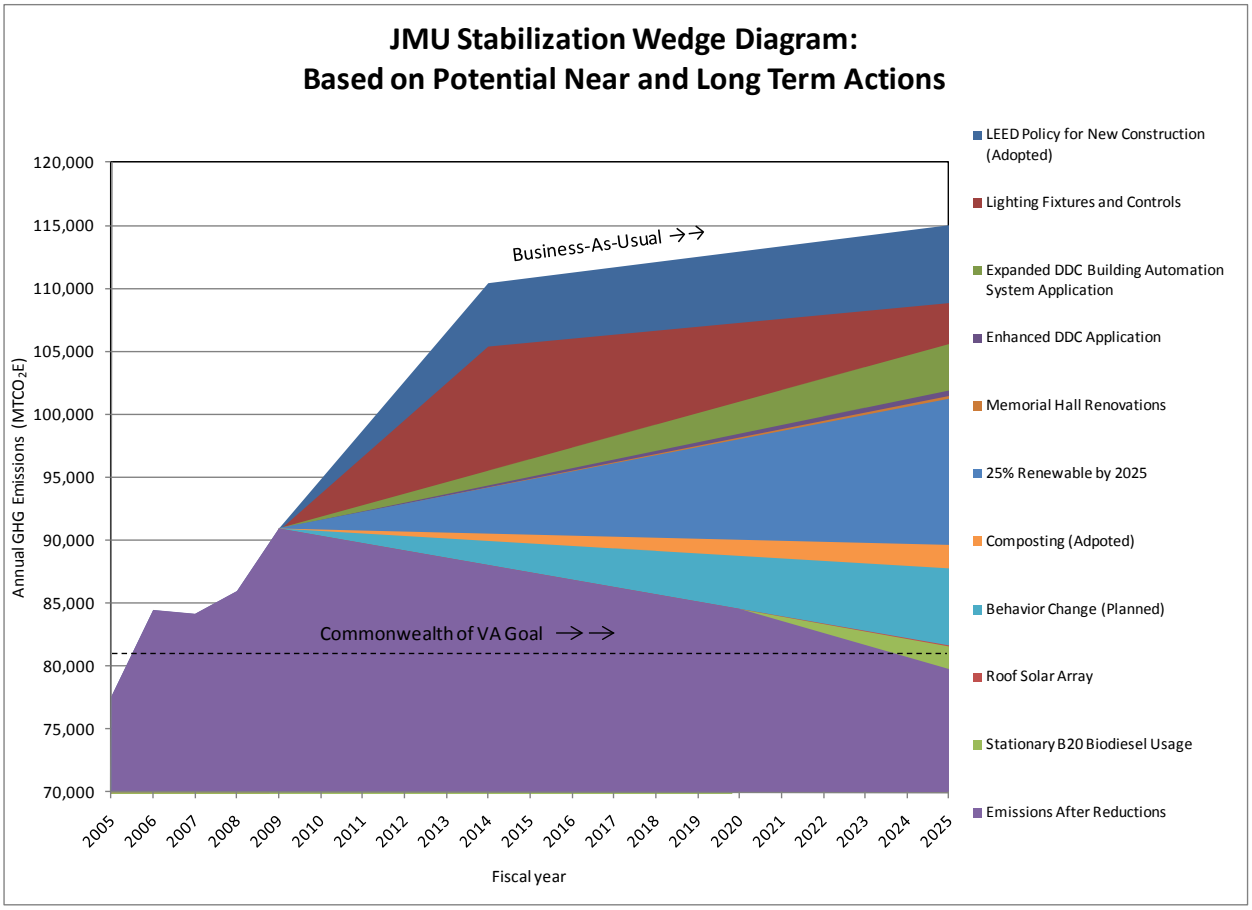
> "The university will be an environmentally literate community whose members think critically and act, individually and collectively, as model stewards of the natural world."

JMU is committed to multiple environmental priorities including renewable energy, energy conservation, waste reduction, water conservation, alternative transportation, environmental literacy, and ecosystem restoration. Initial targets and strategies for these priorities have been drafted and will be analyzed to determine cost and benefits, as well as environmental, social, and financial impacts. Action plans, including targets for expected accomplishments, specific performance measures to evaluate progress towards targets, and implementation strategies, are anticipated to be completed for each of these areas by May 2010.

Consistent with state mandates and fiscal responsibility, JMU selected energy as the first environmental priority to address, and the resulting Climate Action Report is presented within this document. In support of climate neutrality, JMU signed the American College and University Presidents' Climate Commitment (ACUPCC) in 2007. JMU's responsibilities to the ACUPCC include maintaining an emissions inventory, developing a Climate Action Plan, and reshaping our institutional and individual policies and actions to strive toward climate neutrality.

The JMU emissions inventory established that JMU's greenhouse gases (GHG) emissions were 77,593 metric tons carbon dioxide equivalent ($MTCO_2E$) in the baseline year of fiscal year (FY) 2005. After accounting for institutional growth, JMU's gross emissions are expected to increase to 115,033 $MTCO_2E$ by 2025 under business-as-usual scenarios. As an interim goal to carbon neutrality, the Commonwealth of Virginia's Executive Order 59 develops a strategy to reduce statewide GHG emissions to 30% below business-as-usual by 2025. For JMU, this would correspond to an emissions target of 80,523 $MTCO_2E$ by 2025, or approximately 34,500 $MTCO_2E$ below business-as-usual emissions. A campus energy analysis, combined heat and power feasibility study, and renewable energy use pathway study (separate from this Climate Action Report) are being conducted to identify opportunities to reach the reduction target for state government.

Since 2008, JMU has adopted numerous measures, including composting and a sustainable building policy. These two measures achieve a reduction of approximately 3,000 $MTCO_2E$ annually. These and other possible measures are presented in the figure below as an example of how JMU might achieve the interim target for state government should adequate resources be secured for these projects.



Given the current economic situation, establishing approaches to identifying and securing resources is a pivotal element of this Climate Action Report. The potential for loans is one of the project evaluation criteria.

Acknowledgments

JMU would like to acknowledge those individuals and organizations that have contributed to the development of this Climate Action Report, including JMU President Dr. Linwood Rose who has provided the leadership to make visionary commitments on behalf of the University. JMU also acknowledges O'Brien & Gere for assisting with the engineering and scientific analysis in the development of this Plan.

Environmental Stewardship and Sustainability Commission

Commission Co-Chairs:

Towana Moore, Associate Vice President of Business Services;

Maria Papadakis, Center for Energy and Environmental Sustainability

Commission Members:

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Dang, Thanh	Public Works Planner, Harrisonburg Public Works
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Kaufman, Abe	Facilities Management
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1. Introduction

1.1. Institutional Background: James Madison University

James Madison University (JMU) is a public master's level university located in Harrisonburg, Virginia. Established in 1908 as the State Normal and Industrial School for Women by the Virginia General Assembly, the University's name was changed to Madison College in 1938 in honor of the fourth President of the United States. In 1966, JMU became a coeducational institution and was renamed James Madison University in 1977.

JMU is a residential campus of approximately 19,000 students and about 2,700 faculty and staff. The 655-acre campus is centralized geographically, but does have a number of facilities and properties not located on the main campus, including Memorial Hall, Grace Street Galleries, Blue Ridge Hall, the Edith J. Carrier Arboretum, the JMU Farm, the Turner Ashby Monument, the motor pool, and a variety of warehouses and administrative operations. There are 33 dorms, 55 educational and administrative buildings, and 14 auxiliary facilities. The university has over 4.5 million square feet of conditioned space, and Residence Life houses approximately 5,800 students on campus each year.

JMU has a long history of contribution to environmental stewardship, including its signature of the *Talloires Declaration* and adoption of biodiesel fuel. In 2007, the President's Commission on Environmental Stewardship and Sustainability issued a report recommending actions to institutionalize environmental stewardship, and President Rose signed the American College and University Presidents' Climate Commitment (ACUPCC). An administrative organization for campus environmental stewardship, the *Institute for Stewardship of the Natural World* (ISNW) was created. In 2009, a campus greenhouse gas (GHG) emissions inventory was completed and a JMU defining characteristic was adopted:

> "The university will be an environmentally literate community whose members think critically and act, individually and collectively, as model stewards of the natural world."

JMU has been in a state of transformation with a 21% increase in gross square footage of campus building space during the period of fiscal year (FY) 2005 to 2008 and a corresponding growth of over 500 full-time equivalent students per year over the same period. This Climate Action Report includes all campuses and satellite locations where the University has operational control and can enforce a change in policy. All references to 'University buildings' refer to those within the organizational boundary of the GHG emission inventory only.

1.2. Program Background: Environmental Stewardship at JMU

In October 2006, JMU Provost Dr. Brown created the Campus Sustainability Working Group, a broad-based coalition of representatives from JMU's Facilities Management, Business Services, Residence Life, Center for Energy and Environmental Sustainability, student organizations, faculty, and the City of Harrisonburg. This group was charged with:

1. Evaluating JMU's current policies and practices as they affect sustainability.
2. Exploring opportunities and options to make JMU a "green" university.
3. Proposing a path forward to institutionalize sustainability efforts on campus.

In April 2007, President Rose elevated the working group to the President's Commission on Environmental Stewardship and Sustainability, and asked the group to continue its primary tasks. The 2007 report, *Enhancing Sustainability at James Madison University*, provides a summary of that collaboration. As described in the report, three broad mandates shape JMU's commitment to sustainability, evaluations of the university's performance, and appropriate strategies for greening the campus: the *Talloires Declaration*, Governor Kaine's Executive Order 48, and the ACUPCC.

The Commission's findings indicate that JMU is ahead of the curve in important ways, including energy efficiency practices, use of alternative fuel vehicles, availability of carbon-neutral energy, an award-winning recycling program, innovative food service procurement, and support by the student body for green initiatives. However, key challenges exist in three critical areas: energy consumption, transportation demand management, and the need for integrated landscape and water management practices. In addition, there are many opportunities for improvement in areas where JMU is already doing well, for collaboration with the City of Harrisonburg, and for strengthening the coordination and collaboration between the University's multiple environmental curricula and research centers. The Commission's analysis of the current state of sustainability at JMU generated nearly 200 specific recommendations for enhancing environmental responsibility and stewardship. These recommendations range from very detailed prescriptions about such items as lighting and equipment purchasing to broader changes in campus culture to very high cost items such as the restoration of Newman Lake.

The Commission developed the following six principles for a Sustainable Campus Ecology:

1. Create an institutional culture of sustainability.
2. Work toward carbon neutrality.
3. Minimize material impacts.
4. Conserve and steward natural resources.
5. Foster interdisciplinary research, education, and literacy in sustainability.
6. Build a sustainable community through partnerships, service, and outreach.

Many of the Commission's recommendations have been implemented:

- A farm internship program was created.
- Dining Services is facilitating community local food discussions.
- A sustainable landscaping project was created for students living in Frederickson Hall.
- A position was created for a stormwater management engineer in Facilities Management.
- An in-depth transportation demand analysis has been initiated.
- Sustainability-based learning communities were formed.

- The campus GHG inventory was completed.
- A joint master's degree in Sustainable Environmental Resource Management was launched between JMU's ISAT program and the University of Malta.
- Sustainability topics have been incorporated into orientation materials.
- A dorm challenge for electricity and water use is held in the Village Residence Halls annually.
- A JMU sustainability web portal was created.
- JMU participates annually in the RecycleMania Challenge.
- A campus stewardship training series, including campus water stewardship, has been implemented.

A snapshot of the campus environmental status in 2008 is provided below:

Environmental Metrics at JMU in 2007-2008: A Snapshot

- Climate: ~86,033 metric tons of carbon dioxide equivalent ($MTCO_2E$)/yr, 4.92 ($MTCO_2E$)/FTE student
- Air emissions: oxides of nitrogen ~ 33.45 tons, volatile organic carbon ~19.89 tons
- Potable water usage: 111.9 million gallons
- Electricity: conventional= 84.6 million kWh; Purchased renewable energy= 0 kWh
- Waste: waste to energy= 731 US tons/yr, landfill= 1324 US tons, recyclables= 1009 US tons; JMU recycling rate: 33%, RecycleMania recycling rate: 22%
- Fleet fuel economy (FY08-09): average (not weighted by mileage)= 15.6 mpg city/20.0 mpg hwy;
- fleet average air pollution score= 3.6 (0-10 scale); full fuel cycle climate= 11.1 $MTECO_2$
- SOV commute: students=>13,308,472 mi, faculty=> 2,219,551 mi, staff=> 4,919,859 mi
- Attitudes: in the Continuing Students Survey in 2007, 13% of students considered becoming involved in a program to clean up the environment as "essential".

Creation of the ISNW as an administrative body was one of the recommendations of the Commission. The role of the ISNW is to facilitate sustainability by coordinating environmental stewardship efforts across campus, advocating for priorities, and challenging all members of the JMU community to think critically about their role in achieving the long-term stewardship of Earth. The ISNW serves as an internal and external point of contact for university-wide environmental stewardship activities. One of the ISNW's primary tasks was to utilize the Commission's recommendations to develop an actionable plan.

In fall 2008, an ISNW office was established in Maury Hall with an executive director, assistant, and student staff. Cross-divisional committees have been formed to recommend environmental stewardship actions in critical areas: awareness, education & research, operations, campus accessibility, and policies & practices.

The Awareness Committee develops programs and approaches to share knowledge and information that promotes personal and cultural change for faculty, staff and students. The committee has completed a framework and outreach program. In 2009-10 they are presenting the ISNW effort to organizations and departments across campus.

The Education & Research Committee promotes curricular development across disciplines and general education, as well as research opportunities to engage faculty, staff, students and the

community in improving our environment. Their benchmarking of educational and research efforts at JMU related to stewardship of the natural world is included in this document. Benchmarking includes reviewing literature, developing and implementing instruments (surveys), and identifying best practices. They are defining student learning outcomes for all students that operationalize the JMU environmental stewardship defining characteristic. This is a first step in ensuring these outcomes are addressed and assessed within the JMU curriculum and co-curriculum. This includes review and synthesis of existing work in this area and defining/implementing assessment techniques to measure learning outcomes. They are also considering goals for other members of the JMU community.

The Operations Committee reviews how the University manages such areas as grounds, the physical plant, waste and recycling to incorporate stewardship practices that will improve the environment and our community. They are developing recommendations for sustainable landscaping and the Facilities Management Operations Manual.

The Campus Accessibility Committee reviews the transportation, parking and motor pool issues and opportunities. The committee has drafted recommendations for improved bicycling and carpooling. They are developing recommendations for the Transportation Master Plan, including a Bicycle Master Plan; researching bicycle libraries; and, researching expanded carpool matching opportunities.

The Policies & Practices Committee reviews university policies and recommends changes that will impact stewardship in areas such as dining, procurement, and housekeeping. Six sets of policy recommendations were submitted for 2009-10.

After review by staff in relevant areas, the Executive Council forwards committee recommendations to the vice presidents for consideration. Selected recommendations are forwarded for further review by the relevant areas and some recommendations are developed into projects or programs. Program and project oversight is conducted by the JMU faculty or staff in the relevant departments. Collaborative implementation of projects with is encouraged by JMU. Many of the recommendations of these committees to date are reflected in this report.

JMU formally adopted environmental stewardship as one of a handful of characteristics that define its community, "The University will be an environmentally literate community whose members think critically and act, individually and collectively, as model stewards of the natural world."

A vision statement accompanies the characteristic, **"**Human health and well being are dependent upon our ecosystems, which support, provision, regulate, and contribute to culture. We, as a higher education community, will advance environmental literacy via our actions, educational programs, research, scholarship, and service. We, as students, graduates, faculty, and staff, will make personal and professional choices that ensure ecological health for future generations. JMU will be nationally recognized as a leading public university in the south for individual and institutional efforts to sustain our planet for future generations."

The ISNW has taken the Commission's principles for a sustainable campus and developed them into three goals for the campus:

- Minimizing materials impact, emissions, toxins, solid waste, and consumption
- Conserving, stewarding, and restoring natural systems

- Advancing environmental literacy and engagement through research, education, and community programs.

Initial environmental priorities were identified including renewable energy, energy conservation, waste reduction, water conservation, alternative transportation, environmental literacy, and ecosystem restoration.

Six environmental policies were adopted. Highlights of these policies include:

- All construction of a new building or renovation shall utilize materials and methods that provide quantifiable conformity to sustainable construction as defined by the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. Per Commonwealth of Virginia requirements, buildings and renovations shall be designed and built to obtain a minimum LEED Silver certification.
- Industrial and institutional cleaning products that meet Green Seal certification standards for environmental performance are purchased or required to be used by janitorial contractors.
- All desktop computers, notebooks, and monitors purchased must meet, at a minimum, the Electronic Product Environmental Assessment Tool (EPEAT) environmental criteria designated as "required" (bronze registration) or higher as contained in the IEEE 1680 Standard for the Environmental Assessment of Personal Computer Products.
- All electrical products purchased by JMU will meet the US EPA ENERGY STAR certification.
- Copy Center paper products are being purchased from Forest Stewardship Council certified distributors. Further, all paper products have 30% recycled content. 100% recycled paper is available upon request

Examples of specific projects since 2008 and their estimated environmental benefits are included below:

Water Conservation:

- Going trayless in cafeterias and converting to front-loading washing machines saves ~2.5 million gallons of water annually.

Energy Conservation:

- Building Dashboards, which provide instant on-line water and energy use data, have been installed in 15 buildings. A 10% reduction in electricity and water use in these facilities is anticipated based on behavior change in response to this information.
- JMU has increased from 5% to 20% biodiesel-blended fuel for diesel vehicles.
- The sustainable building construction policy is estimated to save more than 1,100 MTCO2E annually. JMU's first Leadership in Energy and Environmental Design (LEED) silver certified building, the East Campus Dining Hall, was commissioned in Fall 2009, and the Wayland Residence Hall renovation is targeting gold-level LEED certification.

Waste Reduction:

- A comprehensive recycling program review was conducted which resulted in a campaign to support JMU's annual participation in RecycleMania, recycling at all concessions and catering, installation of approximately 500 more recycling bins, recycling training for

building coordinators, and purchase of an industrial shredder to replace burning of confidential materials. JMU's recycling rate has increased to 34%.

- JMU has contracted to compost food waste from its largest dining hall with an agreement to expand to most dining facilities on campus. This is anticipated to save approximately 1,800 $MTCO_2E$ annually.
- JMU's used fryer oil goes to The Greener Oil Company to be converted to biodiesel fuel.

Ecosystems Restoration:

- A five-organization local team, including JMU Facilities Engineering, was selected for a grant for "Community Solutions to Stormwater Issues in Blacks Run and Cooks Creek". The grant was funded by the Chesapeake Bay Stewardship Fund and the National Fish and Wildlife Federation. The runoff-reducing practices will stop 509 pounds of nitrogen, 78 pounds of phosphorus and 19 tons of sediment each year from flowing off lawns, schoolyards, public lands and commercial properties into Blacks Run. This is part of JMU's comprehensive stormwater management program, which has a full-time coordinator.

Alternative Transportation:

- All vehicles purchased must be biodiesel, electric or hybrid.
- The campus will transition to peripheral parking in 2011-12, which will encourage use of alternative modes of transportation.
- Bicycle improvements have begun, and additional free transit has been added.

Environmental Literacy:

- The ISNW organizes a newsletter, website, training sessions, an annual guest lecture, and the five supporting committees.
- A faculty professional development group, the Arboretum Collaborative, is fostering sustainability across the curriculum in 10 courses outside of traditional environmental areas.
- Highlights of recently-introduced academic sustainability programs include a bachelor's degree in Engineering, sustainable business certificate, joint masters degree with the University of Malta, and organization of three environmental minors.

Initial targets and strategies for these priorities have been drafted and will be analyzed to determine the cost and benefits, as well as environmental, social, and financial impacts. Action plans, including targets for expected accomplishments, specific performance measures to evaluate progress towards targets, and implementation strategies, are anticipated to be completed for each of these areas by May 2010. Sample strategies currently under consideration include:

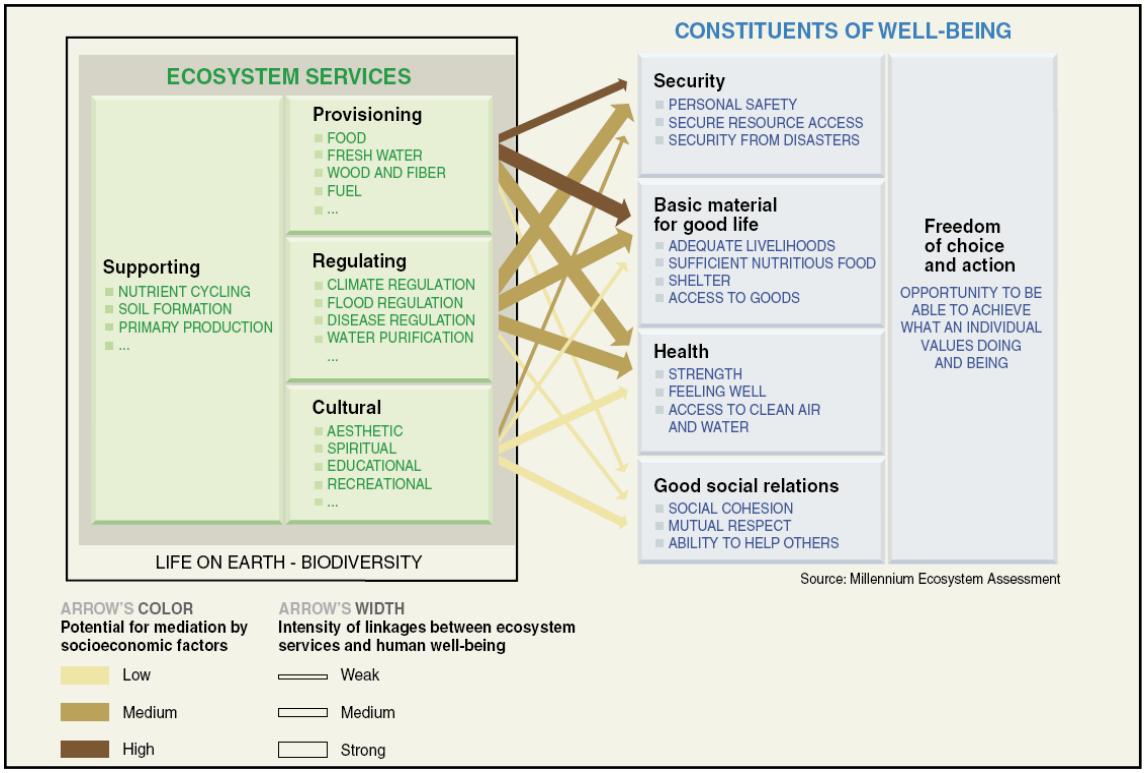
- Updating the transportation demand management and the Facilities Management Operations Manual to incorporate sustainability best practices.
- Developing explicit policies and strategies regarding campus landscaping and land use practices that foster water conservation, reduce erosion and sedimentation, improve downstream water quality, and enhance biodiversity.
- Implementing a shoreline stabilization for Newman Lake to reduce sedimentation and siltation, and adoption of a long term goal for redesigning the lake and natural stream channels to provide more effective stormwater management, water purification, wildlife habitat, and aesthetic value
- Implementing an athletics sustainability program.
- Establishing a single administrative position to coordinate toxic and hazardous materials management.

- Designing and implementing an integrated pest management program.
- Incorporating sustainability topics and certifications into the professional development requirements for Facilities Management staff.

Clearly, JMU is investing significant resources in becoming a model steward of the natural world. The next sections provide background on the scientific and policy based motivations for this commitment.

1.3. Scientific Background: Environmental Impacts

The Millennium Ecosystem Assessment Report summarizes human-environment interdependence, "Everyone in the world depends completely on Earth's ecosystems and the services they provide, such as food, water, disease management, climate regulation, spiritual fulfillment, and aesthetic enjoyment. Over the past 50 years, humans have changed these ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber, and fuel. This transformation of the planet has contributed to substantial net gains in human well-being and economic development. But not all regions and groups of people have benefited from this process—in fact, many have been harmed. Moreover, the full costs associated with these gains are only now becoming apparent."



From Millennium Ecosystem Assessment, 2005.

Universities play a pivotal role in addressing these environmental issues. As outlined in the *Talloires Declaration*, universities can:

1. **Increase Awareness of Environmentally Sustainable Development**: Use every opportunity to

raise public, government, industry, foundation, and university awareness by openly addressing the urgent need to move toward an environmentally sustainable future.

2. **Create an Institutional Culture of Sustainability**: Encourage all universities to engage in education, research, policy formation, and information exchange on population, environment, and development to move toward global sustainability.

3. **Educate for Environmentally Responsible Citizenship**: Establish programs to produce expertise in environmental management, sustainable economic development, population, and related fields to ensure that all university graduates are environmentally literate and have the awareness and understanding to be ecologically responsible citizens.

4. **Foster Environmental Literacy for All**: Create programs to develop the capability of university faculty to teach environmental literacy to all undergraduate, graduate, and professional students.

5. **Practice Institutional Ecology**: Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.

6. **Involve All Stakeholders**: Encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in environmentally sustainable development. Expand work with community and nongovernmental organizations to assist in finding solutions to environmental problems.

7. **Collaborate for Interdisciplinary Approaches**: Convene university faculty and administrators with environmental practitioners to develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.

8. **Enhance Capacity of Primary and Secondary Schools**: Establish partnerships with primary and secondary schools to help develop the capacity for interdisciplinary teaching about population, environment, and sustainable development.

9. **Broaden Service and Outreach Nationally and Internationally**: Work with national and international organizations to promote a worldwide university effort toward a sustainable future.

10. **Maintain the Movement**: Establish a Secretariat and a steering committee to continue this momentum, and to inform and support each other's efforts in carrying out this declaration.

In fulfillment of this Declaration, JMU has committed to being a model steward of the natural world.

To address all of JMU's goals (minimize material impacts, toxins, solid waste, and consumption; conserve, steward, and restore natural systems; and advance environmental stewardship through research, education, and community programs), the ISNW Executive Council recommended an approach similar to that of the United States Environmental Protection Agency's (USEPA's) environmental stewardship strategy: I) prioritize environmental issues with greatest potential gains; II) engage individuals and facilitate behavior change, mainstream stewardship in decision processes, and showcase best practices and accomplishments; and, III) initiate a manageable number of actions in cross-cutting areas and lead by example. Actions in parts II and III were selected to capitalize on JMU's strengths and align with the strategic emphasis areas. To achieve this, JMU plans to develop

biennially-updated action plans for each of JMU's environmental priorities. The first plan completed, the JMU Climate Action Report, is presented here.

1.4. Scientific Background: Climate Change Impacts

Based on the significance of climate change as well as JMU's commitment to pursue climate neutrality, the scientific background of climate change merits detailed discussion. In its Fourth Assessment Report released in 2007, the United Nations Intergovernmental Panel on Climate Change (IPCC) stated that:

- Warming of the climate system is "unequivocal" based on observations of temperatures, sea levels, and snow melts;
- Global concentrations of GHGs in 2005 far exceeded the natural range observed over the last 650,000 years; and
- Most of the observed increase in global average temperatures since the mid-20th century is "very likely" (*i.e.*, greater than 90% confidence) due to the observed increase in anthropogenic or human-caused GHG concentrations.

Climate change will cause impacts on water resources, food production, ecosystems, weather patterns and human health in all parts of the world, including:

- Decreased water availability and increasing drought in mid-latitudes and semi-arid low latitudes;
- Decreased cereal productivity at low latitudes;
- Risk of extinction of global plant and animal species (up to 30% or even more depending on scenario);
- Increased warm spells, heat waves and heavy precipitation events; and
- Increased morbidity and mortality from changing weather patterns, changed disease vector distributions, and malnutrition.

Further, these effects will be felt over several decades due to the long atmospheric life spans of GHGs.

1.5. Policy Background: Evolving Climate Change Policy and Legislation

The United Nations Framework Convention on Climate Change (UNFCCC) coordinates international efforts to combat climate change. The Kyoto Protocol to the UNFCCC (1997) called on developed countries to reduce their total GHG emissions in the 2008 to 2012 commitment period by an average of 5% versus a 1990 baseline. Over the past decade, the European Union has undertaken high-profile steps to meet their Kyoto targets, including the establishment of the European Union Emissions Trading Scheme (EU ETS, 2007).

While the United States has not participated in the Kyoto Protocol commitments, U.S. federal policy on climate change has developed rapidly in recent months as evidenced by the following:

- *February 12, 2009:* The American Recovery and Reinvestment Act 2009 allocates over $36 billion for energy efficiency, conservation and renewable programs

- *March 10, 2009:* The USEPA releases a proposed rule for mandatory GHG reporting that would account for 85 - 90% of U.S. GHG emissions
- *March 31, 2009:* A proposed bill establishing a cap-and-trade system with mandatory GHG reduction targets is circulated among lawmakers (American Clean Energy and Security Act of 2009)
- *April 17, 2009:* The USEPA releases a proposed endangerment finding stating that GHGs endanger human health and welfare; this was a follow-up to a 2007 U.S. Supreme Court ruling stating that CO_2 was a pollutant and as such was subject to regulation by the USEPA
- *May 19, 2009:* President Obama announces new vehicle fuel economy standards that harmonize states and the federal legislation / standards
- *June 26, 2009:* The American Clean Energy and Security Act of 2009 passes the House of Representatives
- *June 30, 2009:* USEPA grants waiver to the state of California to set its own, state-specific GHG emissions limits for cars
- *September 22, 2009:* USEPA finalizes GHG mandatory reporting rule
- *December 7, 2009:* USEPA finalizes endangerment finding on greenhouse gases, and cause or contribute finding on greenhouse gas emissions from new motor vehicles and new motor vehicle engines.

While numerous high profile federal environmental policies are emerging from the Obama Administration, voluntary and mandatory programs have been on-going for some time at the local, state, and regional levels. Prominent among these are:

- USEPA Climate Leaders
- The Climate Registry
- Regional Greenhouse Gas Initiative (RGGI)
- California's Global Warming Solutions Act (Assembly Bill 32)
- U.S. Mayors' Climate Protection Agreement
- ACUPCC

1.6. Background: The ACUPCC and JMU

The ACUPCC is an effort to make the U.S. Higher Education sector more sustainable, obtaining institutional commitments to "reduce and ultimately neutralize greenhouse gas emissions on campus" and "accelerate the research and educational efforts of higher education to equip society to re-stabilize the earth's climate" (ACUPCC, 2007).

Climate change poses a fundamental challenge to the way individuals and organizations use energy and resources. ***The ACUPCC presents an opportunity to lead by example, educating the next generation of national, business and media leaders on how to address this challenge.***

ACUPCC Commitment

"We believe colleges and universities must exercise leadership in their communities and throughout society by modeling ways to minimize global warming emissions, and by providing the knowledge and the educated graduates to achieve climate neutrality."

Over 650 colleges and universities have committed to being carbon neutral at some point in the future. ***In September 2007, JMU became a signatory of the ACUPCC.*** Becoming a signatory to the ACUPCC requires implementation of the following:

- Establishing an institutional structure to oversee the school's ACUPCC: *JMU has developed a comprehensive structure designed to engage all areas of the JMU community in collaboration and consensus building, including creation of the Institute for Stewardship of the Natural World.*

- Completing a GHG emissions inventory within one year: *JMU has prepared a baseline GHG inventory and publicly posted it on the ACUPCC online reporting tool (AASHE, 2009).*

- Developing a climate neutrality action plan – including a target date for climate neutrality and interim progress milestones – within two years: *An extension was granted to JMU for submittal of the Climate Action Report by January 15, 2010. The JMU Climate Action Report, which will be submitted in fulfillment of the ACUPCC Climate Action Plan requirement, has been developed in accordance with this timeline.*

- Choosing at least two of seven action steps towards GHG reduction: *JMU immediately adopted three tangible actions: 1) Adopt an energy-efficient appliance purchasing policy requiring purchase of ENERGY STAR certified products in all areas for which such ratings exist; 2) Encourage use of and provide access to public transportation for all faculty, staff, students and visitors at the institution; and, 3) Participate in the Waste Minimization component of the national RecycleMania competition, and adopt 3 or more associated measures to reduce waste.*

- Implementing the work products of the Climate Action Report.

- Integrating sustainability into the educational curriculum.

- Reports publicly available: *JMU's GHG inventory and Climate Action Report have been made available on the AASHE website http://www.aashe.org/.*

1.7. Overall Approach: Development of Climate Action Plan within the ACUPCC Framework

The requirements of the ACUPCC signatory letter include development of an institutional Climate Action Plan for becoming climate neutral (no net GHG emissions) by minimizing GHG emissions as much as possible through demand and supply side management and using carbon offsets or other measures to mitigate the remaining emissions. This Climate Action Report has been prepared to develop, implement, and demonstrate JMU's progress toward becoming climate neutral.

This Climate Action Report has been developed within the approved ACUPCC timeline and includes:

- A target date for achieving climate neutrality as soon as possible;
- Interim targets for goals and actions that will lead to climate neutrality;
- Actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students;
- Actions to expand research or other efforts necessary to achieve climate neutrality; and,
- Mechanisms for tracking progress on goals and actions.

In addition to GHG targets, JMU is committed to a broader set of environmental priorities which are discussed in Section 7. Specific strategies and targets are still under development for all of these priorities. Initial targets and strategies for all of these priorities have been drafted and will be analyzed to determine the costs benefit, and environmental, social, and financial impacts. Implementation will be a continuous process with the emissions inventory, strategies, and specific actions updated biennially.

1.8. Aligning the Climate Action Report with JMU's Future: University Planning Initiatives

Opportunities exist to align the goals and actions of the Climate Action Report with concurrent key initiatives driven by internal and external programs. The directives of these programs are summarized within the following plans and programs:

- JMU Strategic Plan and Six-Year Institutional Plan
- JMU Master Plan
- Virginia Energy Plan
- Commonwealth of Virginia Executive Orders
- Commonwealth of Virginia Climate Change Action Plan

Knowing what we know today, based on good science and good rules of stewardship, we have to change what and how we consume, how we respect what is around us, and how we manage our waste and by-products...

Sustainability is not one more initiative in a string of initiatives. It is not one more ingredient in our stew pot. Instead it is an approach to life. It transforms how we live and therefore everything about us is redefined.

- President Linwood H. Rose in the Faculty Address on August 21, 2009

Many components of these existing initiatives lend support to JMU's Climate Action Report or, in turn, can be supported and enhanced by the Climate Action Report as summarized below.

1.8.1. JMU Strategic Plan

In 1998, JMU's President Linwood H. Rose charged the Centennial Commission to define the characteristics that would ideally describe the university at its centennial in 2008. As the next phase in this comprehensive strategic planning effort, President Rose charged the Madison Commission in August 2005 to review the University's mission, vision and value statements to determine if they were appropriate to guide university planning beyond the centennial through 2012. The resultant report presented the following:

The six strategic emphasis characteristics of James Madison University's 2004-08 Centennial Strategic Plan

• Quality Academic Programs •Diversity •Professional Development
• Institutional Planning •Financial Support •Sufficient Resources

- JMU's mission statement, vision and values;
- Proposed 2006-2007 initiatives to achieve the six strategic emphasis characteristics and their 2008 performance indicators;
- A list of other characteristics; and,
- A summary of ways in which progress toward achieving the characteristics will be realized.

MISSION
We are a community committed to preparing students to be educated and enlightened citizens who lead productive and meaningful lives.

VISIONS
To be the leading comprehensive university.

VALUES
Our student-centered community values • Excellence • Integrity • Mutual respect.

The planning, implementation and positive evaluation of literally hundreds of new initiatives, achieved in the previous eight years and expected in the coming two years, have and will bring about significant change in JMU. Examples of goals developed under the strategic emphasis characteristics are listed below:

Goal: Establish a process to assess societal needs; recommend and implement new and innovative programs.

Goal: Enhance students' learning and development through attention to the university's curriculum, its classroom environments, its policies and procedures, faculty-sponsored activities outside of the classroom and other out-of-class activities.

Goal: Attain base adequacy funding, diversify the revenue profile, construct or renovate facilities, provide necessary technological resources and expand and support human resource development.

Goal: Develop, communicate and implement a comprehensive university planning process that integrates planning, budget allocation and assessment/evaluation.

The following actions ensure that significant progress is being made toward achieving the Centennial Strategic Plan:

- Specific, measurable, aggressive yet realistic objectives will be developed each year by the appropriate divisional vice president for all initiatives.
- Criteria for quality and success will be established for every priority.
- Detailed plans for the assessment or evaluation of all initiatives will be developed and implemented. Assessments and evaluations will include appropriate learning measures, surveys of constituents, financial analyses and the use of national and regional benchmarks or standards.
- Assessment or evaluation results will be utilized annually to modify existing initiatives.
- University constituents will be informed periodically about the progress being made toward the achievement of the *Centennial Strategic Plan.*

In addition, JMU developed the *Six-Year Institutional Plan* for meeting the standards developed by the State Council of Higher Education for Virginia (SCHEV). SCHEV, in cooperation with the public 2- and 4-year institutions, developed institutional performance standards to address state-wide priorities: access, affordability, academic offerings, academic standards, student progress and success, economic development, research, and enhancing K-12 education. Institutions that meet these performance standards will be granted greater management, curricular and fiscal autonomy. The SCHEV goals are listed below.

- ✓ SCHEV GOAL 1: Provide access to higher education
- ✓ SCHEV GOAL 2: Provide affordable higher education
- ✓ SCHEV GOAL 3: Offer broad range of mission-relevant academic programs
- ✓ SCHEV GOAL 4: Initiate continuous, rigorous assessment of academic programs
- ✓ SCHEV GOAL 5: Improve student retention
- ✓ SCHEV GOAL 6: Develop articulation agreements
- ✓ SCHEV GOAL 7: Stimulate economic development
- ✓ SCHEV GOAL 8: Engage in research

✓ SCHEV GOAL 9: Develop K-12 partnerships

1.8.2. JMU Master Plan

The *Master Plan* was adopted by the JMU Board of Visitors on January 9, 2009. The intent of the plan is to serve as a comprehensive guide for future campus development. However, specific building projects are defined within the University's six-year capital outlay plan that is submitted to the Commonwealth of Virginia on a biennial basis. The plan addresses:

- Traffic, transportation and circulation
- New buildings, roadways and green space
- New construction, including a dormitory village in the mid-campus area
- Renovations, including Bridgeforth Stadium
- Additions to Student Union
- Reallocation of existing space usage at Regional Cancer Center Building, West Tower and North Tower Buildings

The outcome of the Master Plan is intended to improve pedestrian access and to create a contiguous campus with improved transportation routes, well-defined green space, gathering spaces, enhanced way-finding and specialized program-driven facilities.

Master Plan Outcomes

✓ Building locations for approximately 2,135,000 square feet to support education and general programs;
✓ Locations for approximately 1,349,000 square feet for auxiliary student support programs;
✓ New auxiliary athletic facilities by approximately 640,000 square feet;
✓ Strategies to modernize the Village Residence Halls and meet JMU's housing targets; and,
✓ Parking opportunities to maintain current parking ratio.

1.8.3. Commonwealth of Virginia Energy and Climate Change Plans

The purpose of the *Virginia Energy Plan* (Commonwealth of Virginia, 2007a) is to chart a path for the Commonwealth of Virginia to provide for reliable energy supplies at reasonable rates and to increase the use of conservation and efficiency measures. State legislation passed in 2006 directed the Department of Mines, Minerals and Energy to develop this ten-year plan, which is to be updated every five years. The Plan's goals for 2017 are listed below.

Increase energy independence, with an emphasis on conservation and clean fuel technologies, including reducing the rate of growth of energy use by 40% and increasing indigenous energy production by 20%.	Capitalize on economic development opportunities through business expansion and increased research and development in areas of strength, including alternate transportation fuels, nuclear technology, coastal energy production, and carbon capture and storage.
Expand consumer energy education to overcome barriers to implementing energy-efficiency and conservation actions.	Reduce GHG emissions by 30% by 2025, bringing emissions back to 2000 levels.

Included in the *Virginia Energy Plan* was the recommendation that the Governor create a commission to address climate change and its possible impacts on Virginia. Governor Kaine responded by issuing Executive Order (EO) 59 (Commonwealth of Virginia, 2007b), establishing the "Governor's Commission on Climate Change." The Commission was comprised of more than 40 citizens of the Commonwealth, including scientists, economists, environmental advocates, and representatives from the energy, transportation, building, and manufacturing sectors. The Commission also included local government representatives and state lawmakers. EO 59 charged the Commission to create a Climate Action Plan that would do the following:

1. Inventory the amount of, and contributors to, Virginia's GHG emissions, and projections through 2025;

2. Evaluate expected impacts of climate change on Virginia's natural resources, the health of its citizens, and the economy, including the industries of agriculture, forestry, tourism, and insurance;

3. Identify what Virginia needs to do to prepare for the likely consequences of climate change;

4. Identify the actions (beyond those identified in the Energy Plan) that need to be taken to achieve the 30% reduction goal; and,

5. Identify climate change approaches being pursued by other states, regions, and the federal government.

Recommendations were provided in the 2008 plan to reduce GHG emissions, as well as strategies that will guide Virginia's response to climate change, including how the state should plan for and adapt to changes that are likely unavoidable. These state-wide recommendations are listed below.

Recommendations that affect GHG emissions	**Recommendations that address steps to plan for and adapt to climate change impacts that are likely unavoidable**
➢ *Increasing energy efficiency and conservation.*	➢ *Consider a more aggressive GHG reduction goal.*
➢ *Advocate for federal actions that will reduce net GHG emissions.*	➢ *Focus and expand state capacity to ensure implementation of the Climate Action Plan.*
➢ *Reduce GHG emissions related to vehicle miles traveled through expanded commuter choice, improved transportation system efficiency, and improved community designs.*	➢ *Educate the public about climate change and the actions necessary to address it.*
➢ *Increasing efficiency of the transportation fleet and use of alternative fuels.*	➢ *Continually monitor, track, and report on GHG emissions and the impacts of climate change.*
➢ *Reduce GHG emissions through accelerated research and development, including promotion of such research at Virginia's colleges and universities.*	➢ *Virginia state agencies and local governments will prepare for and adapt to the impacts of climate change that cannot be prevented.*

Recommendations that affect GHG emissions	Recommendations that address steps to plan for and adapt to climate change impacts that are likely unavoidable
➢ *Increasing the proportion of energy demands that are met by renewable sources.*	➢ *Undertake a thorough review of state agency and local government authority to account for climate change in their actions.*
➢ *Increasing the proportion of electricity generation provided by emissions-free sources of energy.*	
➢ *Protecting/enhancing natural carbon sequestration capacity and researching / promoting carbon capture and storage technology.*	
➢ *The Commonwealth and local governments will lead by example by implementing practices that will reduce GHG emissions.*	

Executive Orders Issued by the Office of Governor

EO 54: Energy Conservation by State Agencies (2003)
This executive order directs the Governor's Secretaries and all executive branch agencies to reduce energy costs and consumption in state government operations. This EO sets a short-term goal of all agencies to reduce energy consumption by at least seven percent by 2004, when compared to a 2002 baseline. An intermediate goal was also set to reduce energy usage by at least 10 percent by 2006 relative to a 2002 baseline, with a long-term goal of reducing energy consumption by the maximum event feasible.

EO 48: Energy Efficiency in State Government (2007)
This order directed all Governor's Secretaries and executive branch agencies and institutions to reduce energy consumption and costs in state government operations in the executive branch. EO 48 also set forth a process for coordinating energy policy development within the executive branch.

EO 82: Greening of State Government (2009)
This order rescinded EO 48 and directs the Governor's Secretaries and all executive branch agencies and institutions to increase the use of sustainability practices, as follows:

- Every executive branch agency shall develop an Environmental Management System or equivalent suite of policies no later than July, 1, 2010.
- Construction or renovation of certain buildings, based on size and cost, shall meet Department of General Services, Division of Engineering and Buildings "Virginia Energy Conservation and Environmental Standards" for energy performance and water conservation. In addition, all such buildings shall conform to LEED silver or Green Globes two-globe standards, unless otherwise exempted.
- The Department of General Services and Virginia Information Technology Agency shall establish specifications for use by state agencies and institutions subject to the Virginia Public Procurement Act in the procurement of commodities and services, encouraging environmentally beneficial choices.
- All agencies and institutions shall provide adequate management support to their energy-savings activities.
- All reports published by executive branch agencies and institutions shall be published in electronic form only, as appropriate. Agencies should maximize their use of post-consumer recycled paper and environmentally-friendly inks.
- All agencies and institutions shall implement transit and ridesharing incentive programs within Department of Human Resource Management's guidelines.
- **S**tate agencies and employees are challenged to see how many such deliberate, voluntary actions can be achieved from June 15 through November 15, 2009.
- The Governor's Energy Policy Advisory Council and the position of Senior Advisor to the Governor for Energy Policy established in Executive Order 48 are continued.

1.9. Summary

As mentioned previously, the development and implementation of this Climate Action Report provides opportunities for shaping existing internal and external initiatives. In turn, these initiatives provide guidance for the priorities outlined in this Climate Action Report. In summary, this Climate Action Report has been developed in the context of complementary objectives including:

- JMU's strategic academic vision
- JMU's sustainability vision and master planning objectives
- The Commonwealth of Virginia's sustainability objectives

These concurrent programs have the aim of making JMU a more vibrant, livable, and resourceful community that is committed to the principle of leaving our environment better than we found it.

2. Baseline Greenhouse Gas Emissions

As a signatory to the ACUPCC, JMU developed a baseline GHG inventory to establish a benchmark against which future progress towards carbon neutrality can be measured, and to help establish priorities with regard to the primary emission sources responsible for the bulk of JMU's emissions (JMU, 2009a). The baseline GHG inventory is an integrated measure of JMU's institution-wide energy and resource usage. The inventory was developed for the baseline year, FY 2005 (July 1, 2004 through June 30, 2005), and for subsequent years through FY 2008.

Through this Climate Action Report, JMU will establish a long-term plan for achieving carbon neutrality, which will include prioritizing emission reduction projects to achieve meaningful overall GHG emissions reductions. Prior to 2008, JMU had implemented a number of mitigation measures as part of its campus operations and administrative and academic programs, including the following:

- using alternate-fuel vehicles, including B5 biodiesel (5% biofuel) and B20 biodiesel (20% biofuel) in its fleet; recycling waste cooking oil into biodiesel; and purchasing electric vehicles
- purchasing steam from a municipal waste incinerator
- aggressive recycling of solid waste, as well as other waste minimization programs
- free transit bus access for JMU commuters
- building energy analyses from energy service companies for three campus buildings

Section 2.7 provides additional details on mitigation measures implemented by JMU.

2.1. GHG Inventory Methodology

JMU's GHG emission inventory was developed following the international consensus GHG accounting protocols developed by the World Resources Institute and World Business Council for Sustainable Development (WRI/WBCSD, 2004) in conjunction with the Clean Air – Cool Planet (CACP, 2008) Campus Carbon Calculator (V.6). Both programs are based on the IPCC guidelines for national-level inventories, and represent state-of-the-art scientific methods for calculating GHG emissions. Emissions were considered from the six categories of GHGs included in the Kyoto Protocol:

- CO_2
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Sulfur hexafluoride (SF_6)
- Hydrofluorocarbons (HFC)
- Perfluorocarbons (PFC)

2.2. Inventory Boundaries and Definitions

The establishment of inventory boundaries and definitions was the first step in developing a GHG inventory program. The two key inventory boundaries were:

- Organizational boundary – extent of the reporting organization defined on the basis of operational control, which includes all sources that JMU manages on a day-to-day basis.
- Operational boundary – the scopes of emission sources (direct and indirect) that were included in the inventory:

    - Scope 1: Direct emissions (within the organizational boundary) including stationary, mobile, process, and fugitive emissions.
    - Scope 2: Indirect emissions (outside the organizational boundary) from purchased electricity, steam, and chilled water
    - Scope 3: Other indirect emissions (outside the organizational boundary) from landfilled solid waste, employee and student commuting, business air travel, and transmission and distribution (T&D) losses from purchased electricity.

The following key definitions were established as part of the process:

- **Baseline year** – FY 2005, the earliest year for which comprehensive emissions data was available.

- **Reporting frequency** – at least every other year on a fiscal year basis, where the fiscal year occurs from July 1 to June 30.

- ***De minimis* threshold** – 5% (Climate Registry, 2007); emission sources that collectively contribute less than 5% of total GHG emissions were classified as *de minimis* and approximated using upper bound emission estimates in lieu of compiling detailed data. For JMU, the *de minimis* sources are solid waste, air travel, mobile sources, process sources, and fugitive sources.

- **Emission intensity metrics** – gross square footage (GSF), full-time equivalent (FTE) students, total population, heating degree days (HDD), and cooling degree days (CDD).

2.3. GHG Activity Description

A critical step in GHG inventory development was the identification of all activities that lead to GHG emissions from the organization. To identify these activities at JMU, a qualitative GHG activity description questionnaire covering Scope 1, 2, and 3 sources was distributed to JMU staff. The questionnaire yielded the following results:

- Scope 1 GHG emission sources
    - Stationary Sources: boilers, furnaces, generators, water heaters, and kilns burning natural gas, propane, diesel, #2 and #4 fuel oil
    - Mobile Sources: JMU fleet vehicles and equipment such as backhoes, mowers, and skid steer loaders burning diesel, B5 biodiesel (5% biofuel), gasoline, and ethanol
    - Fugitive Sources: refrigeration and air conditioning units using HFC-134a, HCFC-22, R-402, R-404a, R-401a, R-500, R-402b, and R-410a.

- Scope 2 GHG emission sources
    - Purchased electricity, steam, and chilled water.

- Scope 3 GHG emission sources

- Employee and student commuting
- Business air travel
- Landfilled solid waste.

2.4. GHG Data Collection

A quantitative GHG data collection scorecard was developed based on the emission sources identified in the questionnaire. The scorecard was distributed to JMU staff and filled out for fiscal years from the baseline year (FY 2005) to FY 2008.

2.5. Baseline year (FY 2005) carbon footprint

Total GHG emissions for the baseline year FY 2005 for JMU were 77,593 $MTCO_2E$. The primary emission sources were purchased electricity, stationary source combustion, purchased steam and chilled water, and commuting (faculty/staff and student). Together, these four source types accounted for 89% of total emissions, as shown in **Figure 2.1.** As JMU develops its long-term plan for achieving carbon neutrality, these sources will have to be prioritized in order to achieve meaningful overall GHG emissions reductions.

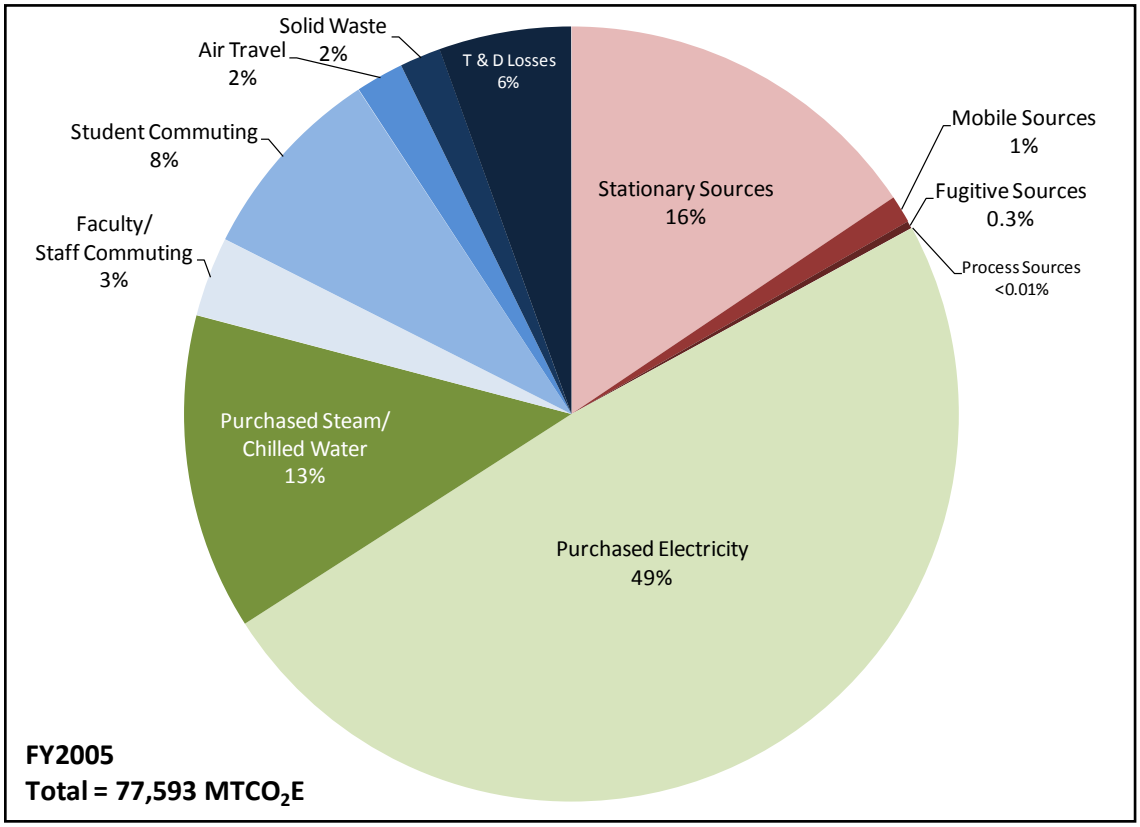


Figure 2.1 GHG emissions by source for FY 2005 (baseline year).

Purchased electricity represents the largest source of emissions associated with JMU. Based on USEPA's Power Profiler (http://oaspub.epa.gov/powerpro/ept_pack.charts) for JMU's zip code (22807), the fuel mix for sources used to generate electricity in JMU's region consists of the following:

Table 2.1 Fuel Generation Mix for Grid Electricity in Harrisonburg, VA.

Fuel Mix Type	JMU's Regional Fuel Mix	Average National Fuel Mix
Coal	50.5%	49.6%
Gas	4.9%	18.8%
Oil	1.7%	3.0%
Nuclear	38.7%	19.3%
Hydro	1.9%	6.5%
Non-Hydro Renewables	1.9%	2.1%

Based on this data, JMU's regional fuel mix is similar to the national fuel mix for coal, oil, and non-hydro renewables. JMU's regional fuel mix for nuclear is approximately two times higher than the average national fuel mix, and is approximately four times lower than the national average for gas. The Power Profiler report also indicates that the regional electricity emission factor for CO_2 is approximately 17% lower than the national average.

2.6. Historical trends in GHG emissions

JMU's total GHG emissions for FY 2008 were 11% higher than the FY 2005 baseline. The majority of this increase occurred from FY 2005 to FY 2006, during which time emissions rose 9%. For reference, the total population of JMU increased by 12% over the period FY 2005 to FY 2008. **Table 2.2** lists emissions and emissions intensity by scope and source type for FY 2005 through FY 2008.

Table 2.2 GHG Emissions and Emissions Intensity by scope and source, FY 2005 to FY 2008.

Scope	***Source***	***FY 2005***	***FY 2006***	***FY 2007***	***FY 2008***
Scope 1 Emissions ($MTCO_2E$)	Stationary Sources	12,089	11,012	9,594	5,420
	Mobile Sources	890	1,236	1,342	1,322
	Fugitive Sources	238	7	129	220
	Process Sources	1	1	1	1
	Total Gross Emissions	*13,218*	*12,255*	*11,066*	*6,962*
Scope 2 Emissions ($MTCO_2E$)	Purchased Electricity	37,924	42,195	41,573	44,235
	Purchased Steam/ Chilled Water	10,240	12,568	13,651	16,141
	Total Gross Emissions	*48,164*	*54,763*	*55,224*	*60,376*
Scope 3 Emissions ($MTCO_2E$)	Faculty/ Staff Commuting	2,584	2,730	2,840	2,992
	Student Commuting	6,458	6,761	7,009	7,265
	Air Travel	1,553	1,641	1,707	1,797
	Solid Waste	1,325	1,483	1,489	1,355

Scope	*Source*	*FY 2005*	*FY 2006*	*FY 2007*	*FY 2008*
	Scope 2 T & D Losses	4,290	4,835	4,830	5,224
	Total Gross Emissions	*16,211*	*17,449*	*17,875*	*18,633*
Scope 1 – 3 Gross Emissions ($MTCO_2E$)	***Total Gross Emissions***	***77,593***	***84,468***	***84,165***	***85,971***
	Gross Square Footage (GSF)	4,160,587	4,646,759	4,723,393	5,034,696
	Full-time Equivalent Students (FTE)	15,771	16,373	16,782	17,339
	Total Gross Emission Intensity per 1000 GSF	18.65	18.18	17.82	17.08
	Total Gross Emission Intensity per FTE	4.92	5.16	5.02	4.96
Scope 1 – 3 Net Emissions ($MTCO_2E$)	Purchased Offsets	0	0	0	0
	Carbon Sequestration*	-136	-136	-136	-136
	Total Net Emissions	***77,457***	***84,332***	***84,029***	***85,834***
	Total Net Emission Intensity per 1000 GSF	18.62	18.15	17.79	17.05
	Total Net Emission Intensity per FTE	4.91	5.15	5.01	4.95

*Carbon sequestration provided by forests at Edith J. Carrier Arboretum and Madison College Farm. See JMU (2009a) for calculation methodology.

On a normalized basis, JMU's institutional GHG emissions have been consistently lower than that of peer doctorate-granting institutions. For example, in the baseline year (FY 2005), JMU's GHG emissions ($MTCO_2E$) per 1000 gross square feet (GSF) of building space and per full-time equivalent student (FTE) were 18.65 and 4.92, respectively. These emission intensities are lower than the average values for United States doctorate-granting institutions of higher education (20.59 and 8.33, respectively; AASHE, 2009).

Figure 2.2 below shows that the increase in emissions from FY 2005 through FY 2008 is driven largely by the increase in purchased electricity, steam and chilled water. In contrast, emissions due to stationary combustion decreased by over 50% during this time period, due to declining natural gas usage. Emissions from other sources, such as mobile sources and commuting, show large increases on a percentage basis; however, the impact of these increases on overall emissions is small.

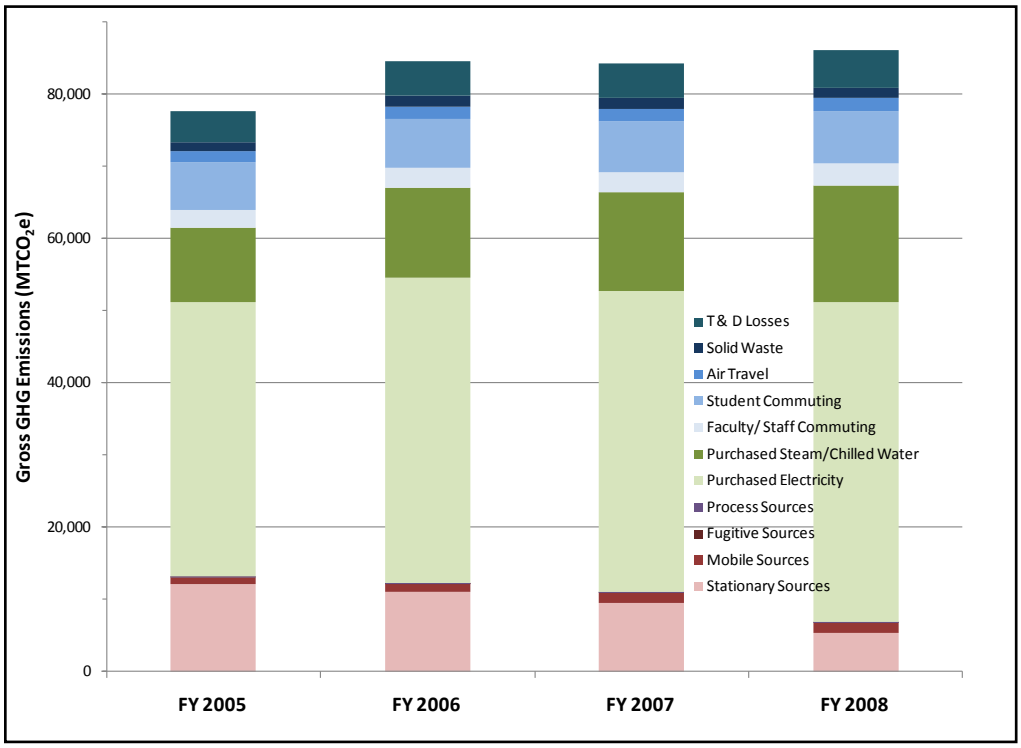


Figure 2.2 JMU GHG emissions by source for FY 2005 to FY 2008.

The number of HDD and CDD for a given geographic location can provide an indication of the impacts of weather on energy demand. **Figure 2.3** shows HDD and CDD over the period FY 2005 to FY 2008 for the Harrisonburg area. These values were fairly constant over the four-year time period, with the exception of CDD for 2006. Consequently, annual variations in temperature were not considered to exert a strong influence on GHG emissions.

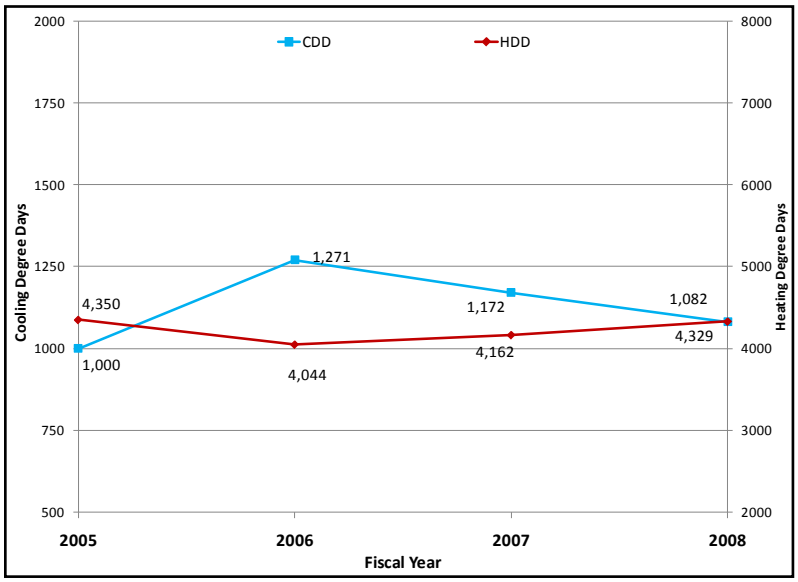


Figure 2.3 Cooling Degree Days (CDD) and Heating Degree Days (HDD) for Harrisonburg, VA.

2.6.1. Historical Trends in GHG Emission Intensity

GHG emission intensity (*i.e.*, GHG emissions normalized by an institutional metric such as FTE enrollment or GSF building space) is a useful performance indicator and facilitates internal and external benchmarking. As seen in **Figure 2.4**, JMU's gross emission intensity on a square footage basis ($MTCO_2E$/1000 GSF) steadily declined by 8.4% from FY 2005 through FY 2008. However, JMU's gross emission intensity on an FTE and total population basis has remained fairly constant over FY 2005 to FY 2008.

The period FY 2005 to FY 2008 was one of rapid institutional growth, with JMU's GSF of campus building space increasing by 21%, while total GHG emissions increased by 11%. Since emission intensity per FTE remained steady over this period, this suggests that FTE is a fairly reliable predictor of JMU's total GHG emissions, even in times of rapid growth. However, should JMU's student enrollment increase over time, emissions per unit population will have to decline in order for JMU to successfully meet its long-term commitment to carbon neutrality.

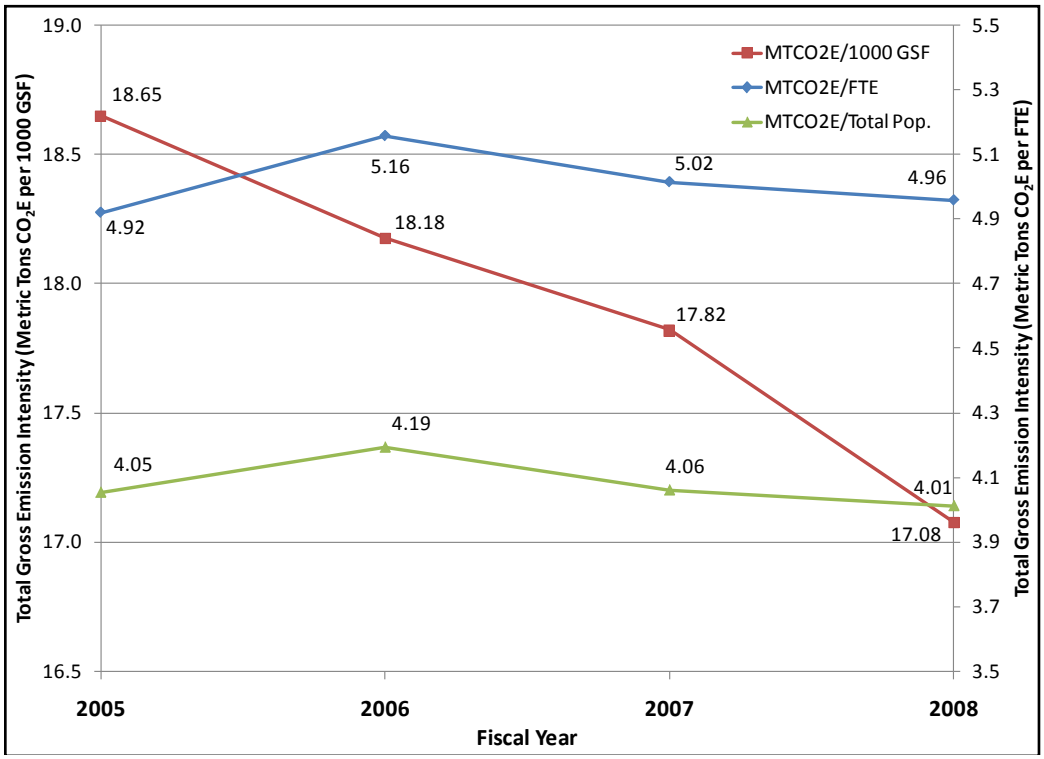


Figure 2.4 GHG gross emission intensity on GSF and FTE basis, FY 2005-2008.

JMU will use the GSF and FTE intensity metrics in subsequent sections of the Climate Action Report to analyze future emissions scenarios.

2.6.2. Data Uncertainty and Proposed Improvements

Uncertainty in GHG emission estimates is minimized for Scope 1 and 2 sources through the use of metered utility and resource data. However, emission estimates for Scope 2 purchased steam assumed a national average biogenic content of municipal solid waste (56%; Energy Information Administration, 2007). The uncertainty is higher for Scope 3 sources, which relied on a commuting

survey for commuting emission estimates and a limited (six-month) data set for business air travel emission estimates.

As part of the climate action planning process, JMU will work with the resource recovery facility to obtain a representative site-specific average biogenic content to incorporate into the emissions inventory.

Air travel is currently a *de minimis* source. However, JMU recognizes that the data available for use in the inventory was limited and therefore, air travel emissions could be underestimated. JMU will evaluate potential methods to improve the accuracy and availability of air travel records, thereby improving the quality of emission estimates for air travel. Since this evaluation will potentially impact multiple departments within JMU, a short-term solution may not be available.

2.7. Mitigation

JMU has conducted a variety of emission reduction activities in past years. One of the drivers of GHG mitigation are Virginia's Executive Orders 48, 54, 59, and 82, which mandate a reduction in non-renewable energy usage and the development of policies regarding energy use, water use, waste reduction, and travel that will reduce the environmental impacts and costs of those activities. JMU's past and current mitigation activities are summarized in Section 2.0 and below. JMU has also taken a leadership role in future mitigation activities, serving as the headquarters of the recently created Virginia 25×'25 State Alliance, a statewide effort to produce 25% of Virginia's energy from renewable resources by 2025 (JMU, 2009b).

2.7.1. Purchased Steam and Chilled Water

Purchasing steam and chilled water from a waste-to-energy facility reduces JMU's carbon footprint in two ways. The facility diverts solid waste from the landfill, thereby reducing methane emissions. Generating steam from waste incineration also decreases the need to use fossil fuels to produce steam and chilled water. In addition, the biogenic fraction (approximately 56%) of municipal solid waste is carbon neutral and lowers the footprint of steam production.

2.7.2. Demand-Side Management

JMU accomplished several facility upgrades that increased energy efficiency over the period FY 2006 to FY 2008. These include an energy audit, lighting retrofits, heating, ventilation, and air conditioning (HVAC) and chiller upgrades, and replacement of boilers, water heaters, and steam traps.

2.7.3. Alternative Fuels

JMU has a wind turbine, a hydrogen fueling station, and a demonstration of photovoltaic technology. While these projects currently demonstrate alternative energy technologies, they do not have a measurable impact on reducing JMU's energy usage. In addition, JMU's vehicle fleet has used B5 (5% biofuel) biodiesel fuel in the past few years and recently upgraded to B20 (20% biofuel) biodiesel fuel.

2.7.4. Recycling

JMU's recycling program has reduced GHG emissions by approximately 3,000 $MTCO_2E$ per year, by reducing the amount of landfilled solid waste available to produce methane. USEPA (2002) provides emission factors to quantify the greenhouse gas emissions avoided by recycling rather than landfilling solid waste. These calculations are shown for FY 2005 to FY 2008 below.

Table 2.3: GHG emissions avoided at JMU through recycling, FY 2005 to FY 2008.

Type	*Emission Factor*	FY 2005	FY 2006	FY 2007	FY 2008
	$MTCO_2E$ / U.S. ton	$MTCO_2E$	$MTCO_2E$	$MTCO_2E$	$MTCO_2E$
Waste Burned at R.R.F.	*-0.12*	-130	-116	-119	-88
Mixed Paper Recycling	*-3.54*	-517	-517	-566	-460
White Paper Recycling	*-2.85*	-94	-94	-111	-131
Newspaper Recycling	*-2.79*	-78	-78	-86	-75
Cardboard Recycling	*-3.11*	-538	-538	-575	-715
Plastic Recycling	*-1.49*	-60	-60	-97	-101
Mixed Metals Recycling	*-5.25*	-189	-189	-221	-168
Steel Can Recycling	*-1.79*	-23	-23	-36	-20
Tire Recycling	*-1.82*	-4	-4	-4	-5
Wood Recycling	*-2.46*	-1,048	-1,048	-1,387	-1,082
Other Comingled Recycling	*-2.91*	-847	-52	-58	-64
Total		-3,528	-2,719	-3,260	-2,909

2.7.5. Commuting

JMU encourages students to use the Harrisonburg bus system, which is free to anyone with a JAC card. Based on default emission factors for automobiles and transit buses (CACP, 2008), using the bus rather than personal vehicles reduces the GHG emissions associated with commuting to campus by approximately 36% per passenger mile. The Harrisonburg bus system has used B5 (5% biofuel) biodiesel fuel for several years, including the period considered for the GHG inventory.

2.7.6. Carbon Sequestration

The forests at the Edith J. Carrier Arboretum and the Madison College Farm are together estimated to provide a total of 136 $MTCO_2E$ sequestration annually, from 111 wooded acres. By maintaining these acres, JMU is preventing development that would likely result in reduction of woodlands and loss of sequestration (JMU, 2009a).

3. Forecasting Business-as-Usual Emissions

An initial step in Climate Action Report development is to forecast the "business-as-usual" trajectory for emissions if no action is taken. This business-as-usual trajectory allows JMU to account for organizational growth when considering its path to carbon neutrality. The forecast layers JMU's long-term plans for campus expansion onto its baseline GHG emissions on an intensity basis (*e.g.*, $MTCO_2E$ per GSF, or FTE students). Forecasted emissions will be considered in the goal setting steps to identify the emissions reductions required in the future for JMU to become carbon neutral.

The emissions intensity is assumed to be constant throughout the forecast period. As described throughout this Climate Action Report, JMU has already committed to a LEED Silver policy for new construction, as well as other planned environmental stewardship commitments for existing buildings that will result in improved efficiency and decreased resource usage relative to the current resource consumption and resulting emissions from campus. The potential impact of these policies on future emissions is discussed in the uncertainty analysis below (Section 3.4).

3.1. Available data sources

In order to forecast the business-as-usual trajectory, the following documents were considered:

- JMU (2009a) baseline GHG inventory, covering FY 2005 through FY 2008
- JMU (2008) Six-Year Institutional Plan to Meet the State Council of Higher Education for Virginia's (SCHEV's) Institutional Performance Standards (Six-Year Plan)
- Enrollment forecasts from the JMU Office of the President

3.2. Forecasting methodology

GSF and FTE are the emission intensity metrics required in ACUPCC reporting. The results of the GHG inventory indicated that FTE is a reliable predictor of GHG emissions, with emission intensity per FTE remaining reasonably constant even during periods of high growth. Emissions normalized by GSF decreased during the FY 2005-08 period, indicating more efficient building space management during a period of campus growth. The trend of efficient building space management is expected to continue (and likely improve) based on the programs already implemented by JMU. However, for the purpose of business-as-usual forecasting, a single average value for emission intensity per GSF over the baseline period is utilized.

Scope 1-3 emission sources were placed into two categories, based on which future changes would more likely impact the resulting emissions [building space (GSF) or population (FTE)].

- Sources dependent on GSF: stationary combustion, fugitive sources, purchased electricity, purchased steam and chilled water, process sources, and transmission and distribution (T&D) losses; these comprise approximately 84% of total GHG emissions
- Sources dependent on FTE: mobile sources, commuting, air travel, and landfilled solid waste; these comprise approximately 16% of total GHG emissions

Based on the emission profile, it is expected that GSF will be the dominant metric for the forecasting of future emissions.

The average GHG emission intensity (GSF and FTE basis) during the FY 2005-2008 period was calculated and combined with projected changes in GSF and FTE to forecast future GHG emissions. The table below provides the mean emission intensity for each emissions source from FY2005-08, along with the 95% confidence interval on the mean.

Table 3.1 Emissions Intensity by Emissions Source (FY2005-08 data).

Emission Intensity	Mean	95% Confidence Interval on Mean*
Sources dependent on GSF ($MTCO_2E$ per 1000 GSF)		
Purchased electricity	8.94	8.74-9.15
Fugitive sources	0.032	0.004-0.061
Purchased steam and chilled water	2.82	2.44-3.18
Stationary combustion	2.10	1.18-3.01
Process sources	0.000217	0.00019-0.00024
T&D losses	1.03	1.02-1.04
Sources dependent on FTE ($MTCO_2E$ per FTE)		
Mobile combustion	0.072	0.060-0.084
Faculty/Staff Commuting	0.168	0.164-0.172
Student Commuting	0.415	0.410-0.420
Air travel	0.101	0.098-0.104
Solid waste	0.085	0.079-0.092

* based on t-statistic for normally distributed data

After establishing baseline emissions intensity, the emissions intensity metrics can be forecast for the future based on master planning, linear regression of historical trends, and professional judgment.

Over the period FY 2005-08, FTE grew at a rate of approximately 523 students per year. While the trend in FTE can be approximated assuming linear regression, predictions based on JMU maintaining this rate of growth would likely overestimate future student populations. Best estimates from the JMU (2008) Six-Year Plan and from the Office of the President are for FTE to increase to 22,000 students by FY 2014, and later plateau at 25,000 students (by FY 2050). This corresponds to growth rates of approximately 777 FTE students per year through 2014 and 83 FTE students per year through FY 2050.

Over the period FY 2005-08, GSF grew at a rate of approximately 291,000 square feet per year. However, this rate of building growth is not expected to continue. On average, over the FY 2005-08 period, the GSF/FTE ratio was 280. Combining this ratio with the above enrollment forecast results GSF estimates of 6.3 million by FY 2020 and 7 million by FY 2050. The table below summarizes projected GSF and FTE estimates.

Table 3.2 Projections for Emissions Intensity Metrics.

Fiscal Year (FY)	1000 GSF	FTE
2008	5,035	17,339
2010	5,290	18,893
2020	6,300	22,500
2030	6,533	23,333
2040	6,767	24,167
2050	7,000	25,000

By multiplying the average emission intensity established for the Scope 1-3 emission sources by the projected future intensity metrics (GSF and FTE), future GHG emissions for the Scope 1-3 emission sources can be forecasted.

3.3. Results

Forecasted business-as-usual emissions show an increase in total $MTCO_2E$ emissions from 77,592 $MTCO_2E$ emissions in the baseline year (FY2005) to 112,941 $MTCO_2E$ in 2020, and 125,490 $MTCO_2E$ in 2050. This represents a 46% increase in emissions by 2020, and a 62% increase in emissions by 2050 compared to the baseline level.

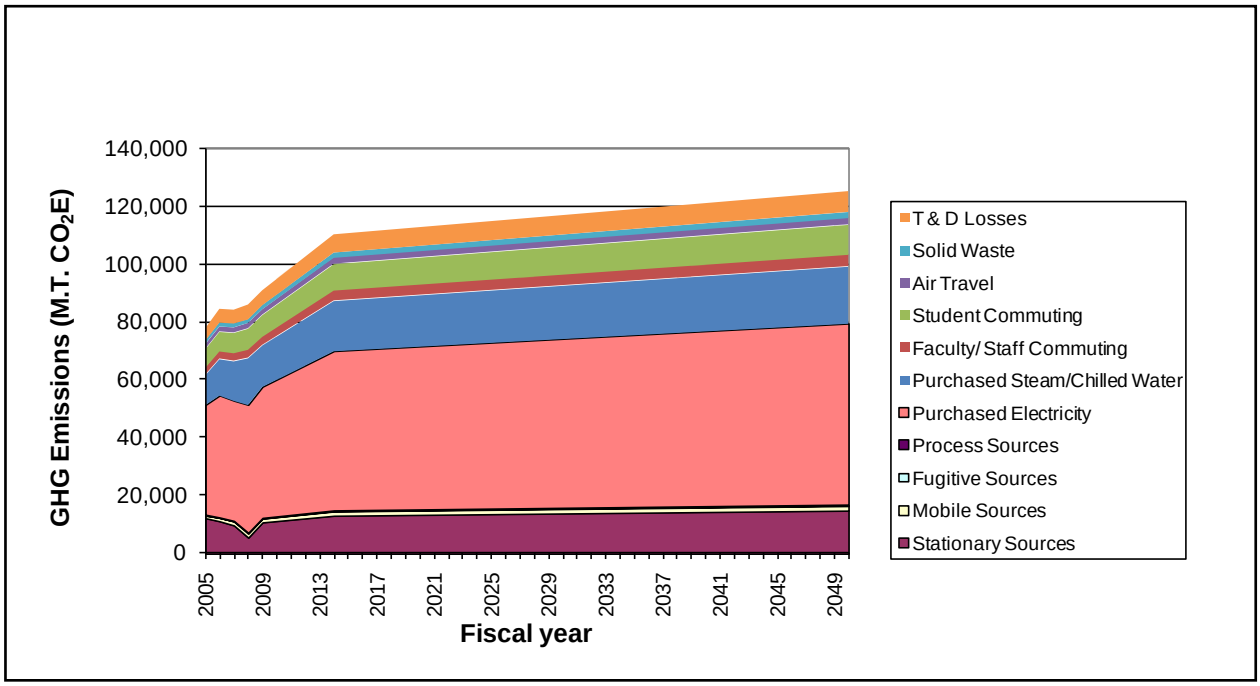


Figure 3.1 Forecasted GHG Emissions by Source through 2050.

In 2050, the forecasted relative contribution of each emission source to total GHG emissions is similar to that in the baseline year. This similarity exists because this is a business-as-usual forecast, in which the emission intensity present in the baseline inventory is assumed to remain constant into the future.

In order for JMU to achieve its long term commitment to carbon neutrality, it will need to depart from this business-as-usual scenario and aggressively reduce emission intensity over time. For reference, as described in Section 1.6.1, the emission intensity per GSF did decrease (by 8.4%) from FY 2005-08.

3.4. Uncertainty

The business-as-usual GHG emission forecast is based on the assumption that emission intensity remains constant. However, emission intensity is variable, and the above forecasts are based on the mean values for this parameter.

In order to evaluate uncertainty in the GHG emissions forecast, a sensitivity analysis utilizing the 95% lower confidence limit and upper confidence limit on the emission intensity can be utilized to estimate lower and upper bound future emissions, respectively.

This sensitivity analysis indicates that future GHG emissions are forecasted to be between 32 to 59% higher than baseline levels (FY 2005) by 2020, and 47% to 76% higher than baseline levels by 2050. This wide range of forecasts reflects the variability in the input parameters used to develop the business-as-usual emissions forecast.

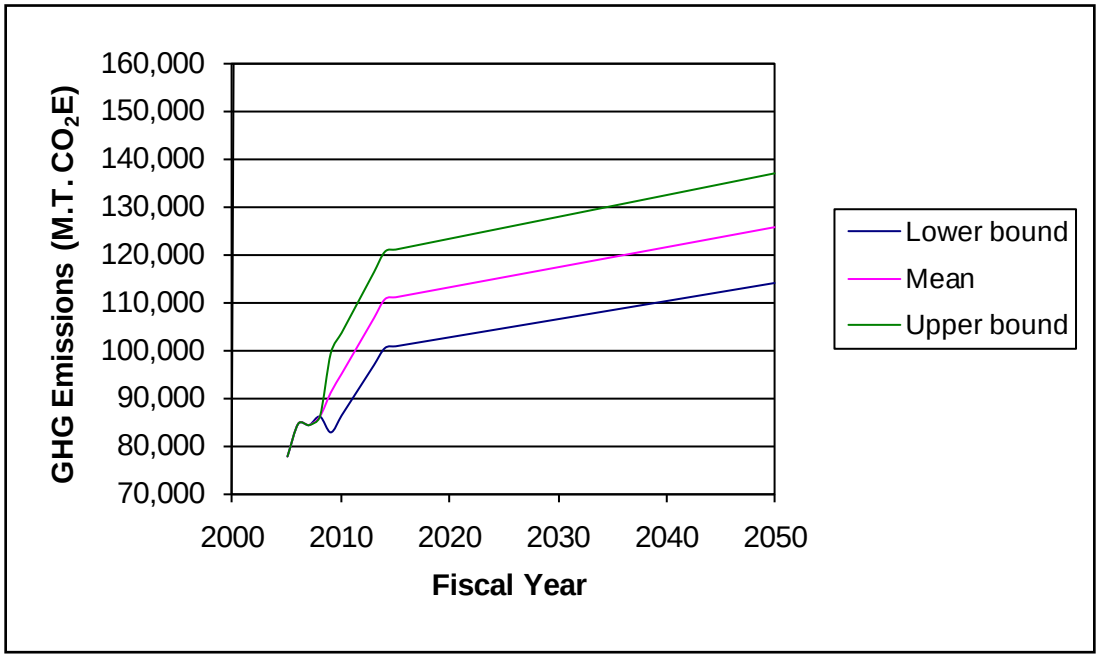


Figure 3.2 Upper and Lower Bound Forecasts of Future GHG Emissions.

As noted earlier, as JMU's campus grows, JMU will follow a LEED Silver policy for new construction. Based on case studies from the U.S. Green Building Council, LEED buildings can be 20-70% more energy efficient than traditional buildings. Since emission sources correlated to building square footage account for 84% of total GHG emissions, the LEED policy could significantly mitigate future growth in emissions.

If it is conservatively assumed that LEED buildings are on average 30% more energy efficient than traditional buildings, then mean forecast GHG emissions increases are 38% by 2020 and 50% by 2050 (see below).

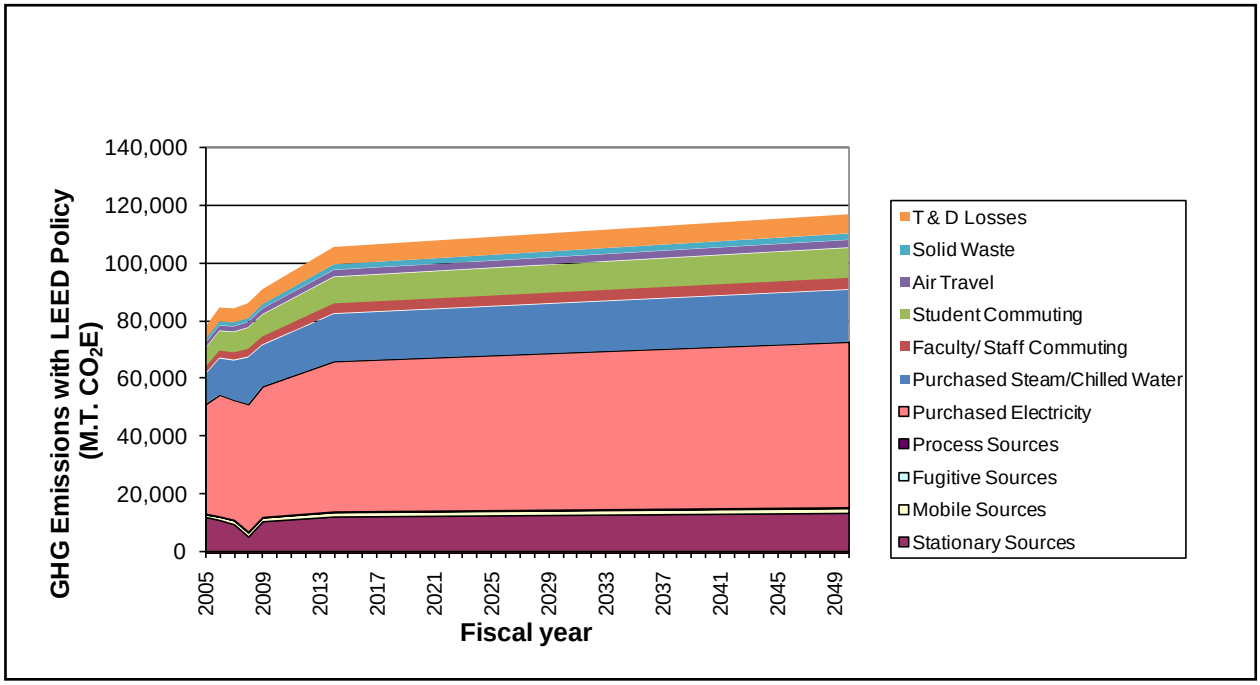


Figure 3.3 Forecasted GHG Emissions by Source through 2050 Accounting for LEED Policy for New Construction.

4. Potential Interim and Long-term Emissions Reduction Goals

4.1. Background

The ACUPCC provides no prescribed timetable for when each signatory must achieve its long-term commitment to carbon neutrality. It is common practice for institutions involved in climate action to establish interim and long-term emissions reduction goals as a critical planning step in achieving ambitious climate neutrality goals.

Internationally, the IPCC (IPCC, 2007) recommends that CO_2 concentrations in the atmosphere should be stabilized at 450 parts per million (ppm) – approximately double pre-industrial levels – to avoid dangerous anthropogenic interference with the earth's climate system. To stabilize at 450 ppm, GHG emissions must reach at least 25% below 1990 levels by 2020, and 80% below 1990 levels by 2050.

Nationally, the American Clean Energy and Security Act of 2009 (ACESA) is a proposed bill that has passed the U.S. House of Representatives and establishes a cap-and-trade system with mandatory targets of reducing GHG emissions relative to 2005 levels by 3% by 2012, 20% by 2020, 42% by 2030, and 83% by 2050.

For the Commonwealth of Virginia, the Department of Mines, Materials, and Energy released the Virginia Energy Plan in 2007. This Plan established goals to reduce statewide GHG emissions to 30% below business-as-usual projections by 2025, thereby bringing these emissions down to 2000 levels.

The table below summarizes these various proposed goals for GHG emissions reductions:

Table 4.1 Interim and Long-term Climate Action Goals.

Scope	***Organization***	***GHG Emission Reduction Goal***
International	IPCC, 2007[a]	• 25% below 1990 levels by 2020 • 80% below 1990 levels by 2050
National	ACESA (2009)[b]	• 3% below 2005 level in 2012 • 20% below 2005 level in 2020 • 42% below 2005 level in 2030 • 83% below 2005 level in 2050
State	Virginia Energy Plan (2007)	• 30% below business-as-usual 2025 levels by 2025 (*i.e.*, same as 2000 levels)

[a] – also recommended in the ACUPCC Implementation Guide

[b] – passed the U.S. House of Representatives on June 26, 2009

While the absolute targeted emissions reductions appear daunting when viewed over decades, the table below shows that they appear more achievable when viewed on an annual basis.

Table 4.2 Annual Emissions Reduction Goals.

Organization	Targeted Emissions Reduction (% below baseline level)	Target Year	Commitment Period[a]	Corresponding Annual Emissions Reduction (% per year below baseline level)
IPCC	25%	2020	15	1.7%
	80%	2050	45	1.8%
ACESA	3%	2012	7	0.4%
	20%	2020	15	1.3%
	42%	2030	25	1.7%
	83%	2050	45	1.8%
Virginia Energy Plan Targets	30%[b]	2025	20	1.5%

a – Target Year minus Baseline Year (JMU's baseline year is fiscal year 2005)

b – Virginia Energy Plan calls for reductions relative to 2025 business-as-usual projections.

The various goals above suggest that the range of "interim" goals (through and including 2025) require annual GHG emissions reductions of between 0.4 – 1.7%, and the range of "long-term" goals (beyond 2025 through 2050) require emissions reductions of between 1.7 – 1.8%.

For comparison, the Chicago Climate Exchange (CCX) – a voluntary GHG cap-and-trade program consisting of corporate, institutional and municipal organizations, including eight Higher Education institutions – requires members to reduce net emissions by 1% per year below baseline levels. From 2003 to 2006 CCX members collectively exceeded these emissions reductions goals in each year (CCX, 2007), indicating that the 1% per year emissions reduction goal is feasible on a large scale.

4.2. Methods

To determine potential future emissions reductions trajectories for the University, JMU applied the interim and long-term goals described above, substituting the baseline year of FY 2005 for goals that refer to 1990 as their baseline year. This provides a frame of reference for what could conceivably be the JMU's GHG emissions reduction trajectory.

For reference, the figure below includes the business-as-usual emission forecast for JMU developed in the previous section of this Climate Action Report (blue dashed line, trending towards the top right corner of the chart).

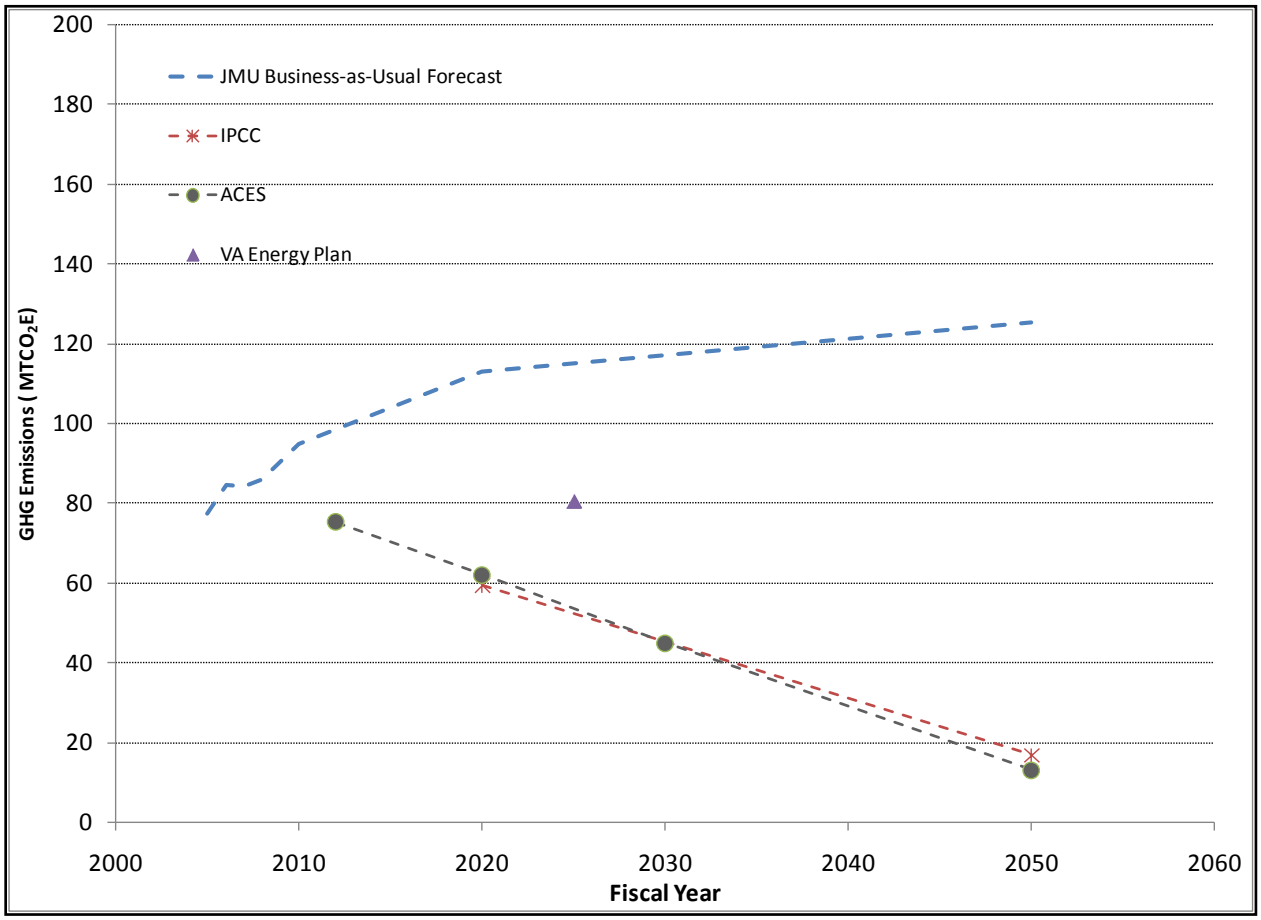


Figure 4.1 Potential JMU GHG Emissions Reduction Trajectory.

Using these goals as a frame of reference, JMU would need to decrease GHG emissions by approximately 50,000 $MTCO_2E$ by 2020 and by approximately 110,000 $MTCO_2E$ by 2050, relative to the University's business-as-usual trajectory. If JMU begins taking action in 2010, this would involve reductions of 3,000 to 5,000 $MTCO_2E$ annually.

4.3. Results

Table 4.3 shows how an annual GHG emissions reduction of 4,000 $MTCO_2E$ would translate into actual energy and resource usage reductions for various emission sources.

Table 4.3 Example Annual Usage Reductions Corresponding to a 4,000 $MTCO_2E$ Cumulative Annual Reduction (by Emission Source).

Scope	Source[a]	Annual GHG Emissions Reduction ($MTCO_2E$)[b]	Corresponding Annual Usage Reduction	Usage Units (substance used)
1	Stationary sources	640	12,096	MMBTU (natural gas)
	Mobile sources	40	4,482	gallons (gasoline)
2	Purchased electricity	1960	3,712,066	kWh
	Purchased steam	520	12,700	MMBTU (steam)
3	Commuting	440	1,089,631	vehicle miles
	Air Travel	320	792,459	passenger-miles
	Solid Waste	80	74	US tons
1-3	Total	4,000		

a - T&D losses, while listed as a contributor to the GHG inventory, are excluded from this table because the end-user does not have direct control over reducing these emissions, except through reduction in Scope 2 usage (which is already accounted for in this table). Process and fugitive emissions are also excluded from this table due to their small (< 1%) contribution to total emissions.

b - The target overall reduction of 4,000 $MTCO_2E$ is distributed among sources according to the percentage contribution of each source.

4.3.1. Economic Feasibility

In setting interim and long-term goals, it is necessary to consider the economic feasibility of achieving these goals.

From a macroeconomic view, a study of the economics of climate change and climate action (Stern, 2006) concluded that the cost of climate action by mid-century could represent as much as 5% of world gross domestic product (GDP) per year, with a best estimate of 1% of GDP per year. This cost assumes that climate action would begin immediately; if delayed, the costs would rise significantly. Roughly applied to JMU, which has an annual operating budget on the order of $400 million, this analysis implies that the cost of climate action for JMU could be several million dollars per year by mid-century.

With regard to estimating the costs of climate action, one of the key uncertainties is the future availability and cost of renewable energy, given the important role that renewable energy will likely play in achieving large-scale GHG emissions reductions. Currently, the cost of renewable power exceeds that of fossil fuel based power. However, if future costs of renewable power reach a break-even point or fall below that of fossil fuel based power, then energy switching and large-scale GHG emissions reduction projects will become more economical.

The Energy Information Administration (EIA, 2008) of the U.S. Department of Energy uses the National Energy Modeling System to project the production and cost of various energy sources

through 2030. The EIA projects a 32% increase by 2030 in the renewable electricity generation capacity in the U.S. The EIA also projects significant reductions in the capital costs of important renewable energy technologies.

Table 4.4 Projected Reduction in Capital Costs (2006$/kW) from 2010 to 2030 (%).

Biomass	Hydro	Landfill Gas	Offshore Wind	Solar PV	Solar Thermal
(19%)	(11%)	(6%)	(12%)	(25%)	(28%)

The EIA projects that capital costs of biomass and solar technologies – which may be particularly suitable for Higher Ed institutions – will decline by approximately 20 to 30% by 2030, increasing the likelihood that JMU will be able to utilize significant increments of renewable energy to help meet our emissions reduction goals.

The EIA also provides projections of unit costs of fossil fuel energy through 2030 (EIA, 2008). For petroleum, EIA projects increases of up to 50% in crude oil prices (in 2006$/barrel) from 2010 to 2030. For natural gas, EIA projects increases of up to 16% in prices (in 2006$/million BTU) from 2010 to 2030. While these are high-range price projections, even under medium range projections from the EIA, crude oil and natural gas prices remain essentially constant from 2010 to 2030 (in 2006$).

As renewable energy costs decline and fossil fuel energy costs potentially increase through 2030, switching from fossil fuel to renewable energy will become more cost-effective, and can be an important emission reduction strategy. In the meantime, JMU can also achieve significant GHG emission reductions through demand-side management, which involves reducing the consumption of energy through energy-efficient technologies and conservation-minded behavioral changes.

Establishing approaches to identifying and securing resources is a key element of this Climate Action Report. Although many demand-side management initiatives may have payback periods of 1-10 years, funds will still be needed initially. Preliminary estimates indicate an annual investment of $3-4 million dollars is needed and is desirable within the timeframe of the initial five years of the project.

Establishing approaches to identifying and securing resources is a pivotal element of this Climate Action Report. In addition to state funding allocations, grants, loans, and private sponsorship are possible mechanisms. The potential for loans is one of the project evaluation criteria. Addition of a dedicated grant writer position is planned as well as development of methods by which donors may contribute resources to this effort.

4.3.2. Regulatory Framework

Regulatory developments associated with climate change policy in the United States may also impact interim and long-term emission reduction goals.

In 2007, the Supreme Court ruled that the USEPA has the authority to regulate GHG under the Clean Air Act. The USEPA has responded with an advance notice of proposed rulemaking (USEPA, 2008). This has been followed by a series of key regulatory developments in 2009 under the Obama administration:

- March 10, 2009 - USEPA issues draft mandatory GHG reporting rule for large U.S. emitters (*e.g.*, facilities with annual emissions greater than 25,000 $MTCO_2E$ from direct stationary combustion)
- April 17, 2009 - USEPA releases finding that GHG endanger human health and welfare, officially recognizing them as pollutants
- June 26, 2009 - ACESA of 2009, which establishes an economy-wide GHG cap and trade program, passes the U.S. House of Representatives.
- September 22, 2009: USEPA finalizes GHG mandatory reporting rule.
- December 7, 2009: USEPA finalizes endangerment finding on greenhouse gases.

In summary, whether through the USEPA or the U.S. Congress, comprehensive U.S. Federal regulation of GHG is forthcoming.

5. Identification and Prioritization of GHG Emission Reduction Projects

5.1. Background

In the previous section, it was concluded that JMU would have to reduce GHG emissions by 1-2% per year below baseline (FY 2005) levels in order to meet potential interim and long-term emission reduction goals. This equates to a reduction of approximately 50,000 $MTCO_2E$ by 2020, and by 110,000 $MTCO_2E$ by 2050, relative to JMU's business-as-usual trajectory, and is equivalent to reductions of approximately 3,000 to 5,000 $MTCO_2E$/yr. JMU has begun prioritizing projects to achieve this. The process began with identification of strategies.

5.2. Emission Reduction Strategies

In order to identify potential emission reduction projects that could help realize the annual targets discussed in the previous section, the following strategies were developed:

Demand Side Reduction Strategies

Per the breakdown presented above, emissions at JMU are nearly entirely (with the exception of emissions associated with solid waste generation) associated with the consumption of fuels to heat, cool, light or power JMU facilities and/or facility related operations. Therefore, consideration was given to identify potential strategies to reduce the demand for fuel consumption and thereby reduce the resulting generating emissions. Considerations were made as to changes in:

- *Technologies*: Evaluation of existing facilities and operations for the identification of either changes to existing technologies or application of alternate technologies that could result in the reduction of fuel consumption demand and emissions.
- *Behavior/Policy*: Evaluation of the current stated or unstated behaviors and/or policies that could be changed to reduce fuel consumption demand and emissions

Supply Side Reduction Strategies

The ACUPCC recognizes emissions associated with emissions generated by others to supply the needs of JMU facilities and operations. Therefore, in addition to addressing the campus demand side of emission generation, consideration was also given to strategies that could alter how the demands are supplied and their associated emissions. Primarily, this strategy focused on examining opportunities to change the way utilities are supplied through the use of alternate fuels and/or technologies.

Offset Strategies

In addition to reducing JMU's emissions, emissions that are reduced elsewhere can be claimed as offsets if they are financed by JMU. These include the purchase of renewable energy certificates (RECs) for green power or carbon credits for external GHG emissions reduction projects. Local or community offset projects may be favorable because the benefits can be more tangible and immediate.

In this Climate Action Report, the project categories that were prioritized were: demand-side management with technology, demand-side management with behavior change, and supply-side management.

5.3. Identification of Potential GHG Emission Reduction Projects

Potential emissions reduction projects were identified in the following broad categories.

Demand-side management with technology

- **Facility Design/Control**: mandating LEED Silver or equivalent design for all new buildings; occupancy-based heating/cooling/ventilation control; expanding current retro-commissioning efforts to include comprehensive analyses for facilities with multiple renovations/reprogramming.

- **Mobile Combustion:** Use of hybrid/biodiesel vehicles; improvement of bike paths/ storage, and sidewalks; fleet reduction; purchase of more efficient vehicles (including Segway); car-sharing (*e.g.,* Zipcar); greater collaboration with regional transit; expanded routes; replacement of traditional grass with newer drought-resistant, low-maintenance (low-mowing) varieties; reduction of deciduous species.

- **Electricity**: Installation of energy-efficient fluorescent and LED lighting; building-level metering; energy capture from exercise equipment; installation of occupancy sensors in rooms; temperature control based on occupancy hours; purchase of ENERGY STAR equipment (*e.g.,* computers for labs, washer-dryers for dorms); replacement of inefficient fume hoods; window tinting; IT sustainability program.

- **Solid Waste**: Conversion of cafeteria food waste to energy; composting; working with Dining to get VA Green certification; reduction of paper – use of scanners/ electronic faxes; electronic administration (*e.g.*, billing, faculty/staff reviews).

- **Commuting**: Providing secure bicycle storage/ repair/ loan; online ridesharing board.

- **Water**: Use of low-water washers for dorms; green roofing.

- **Other**: Emails summarizing weekly energy consumption; electronic stewardship ads on campus screens; real-time energy and waste monitoring via Internet.

Demand-side management with behavior change

- **Utility Demand**: Plan and policy for reducing lighting at athletic facilities and events; ensuring appliances are equipped with, and switching to, idle/power-saving mode when not in use; turning off monitors and computers when not in use and on weekends; eliminating mini-refrigerators and space heaters; establish a campus wide policy on winter/summer temperature set-points for facilities, establish a campus wide policy for consolidating evening/weekend operations to increase facility utilization and reduce partial building occupancy; implement additional sub-metering to allow establishment of true utility cost allocation and tracking program including the broader publication and recognition of utility cost assignments to Colleges and Departments.

- **Mobile combustion**: Reduction of campus fleet use; institution of a vehicle idling reduction policy.

- **Solid Waste**: Online distribution of course catalogs, bills, etc.; increased recycling efforts; foodservice discounts for using own mugs and lunch kits; charging for disposable cups, bags, and utensils; joining USEPA WasteWise.

- **Commuting**: Limiting student vehicles through incentives and fees; closing campus to vehicles; providing shuttle to/from reduced-cost satellite parking areas; providing healthcare cost incentives for biking/walking.

- **Water**: Best practices for sprinkler and irrigation systems – avoiding watering pavement, watering during non-daylight hours, rain shutoff, repairing of valves.

- **Other**: Initiating Forest Stewardship Management Plan; obtaining Tree Campus USA certification; completion of East Campus Energy Education Pavilion – providing online tours; proposing 4-day summer workweek; telecommuting; turning President's home into eco-living showcase home; elimination of plastic bags.

Supply-side management

- **Stationary combustion**: Achieving 25% of onsite energy use with renewable energy sources; use of biofuels for campus boiler plant.
- **Mobile combustion**: Expansion of electric vehicle fleet; expansion of B5 fleet to use B20;
- **Electricity**: Generation of on-campus energy using solar PV panels and wind turbines; use of geothermal/fuel cell hybrid.

Offsets/RECs

- **Stationary combustion**: Price of carbon: $4-9 per $MTCO_2E$;
- **Electricity**: Purchase RECs through power company; $0.015 per kWh.
- **Carbon sequestration:** Continued sequestration provided by forests at Edith J. Carrier Arboretum and Madison College Farm (approximately 136 $MTCO_2E$ per year)

5.4. Prioritization of Potential GHG Emission Reduction Projects

A sequential process of engineering, cost-benefit, implementation, and funding analyses is planned to set targets and develop the strategies. Preliminary engineering analyses have been completed for some strategies and a possible set of GHG goals and near term and long term projects developed. These possible projects are summarized in Tables 5.1 and 5.2, respectively. Implementation of these projects will be governed by priorities established through future cost-benefit analysis.

Implementation of these projects will be governed by priorities established through future cost-benefit analysis and influenced by funding probabilities, including state and federal grant and loan opportunities.

Table 5.1 Possible Near Term (0-5 years) GHG Emission Reduction Projects.

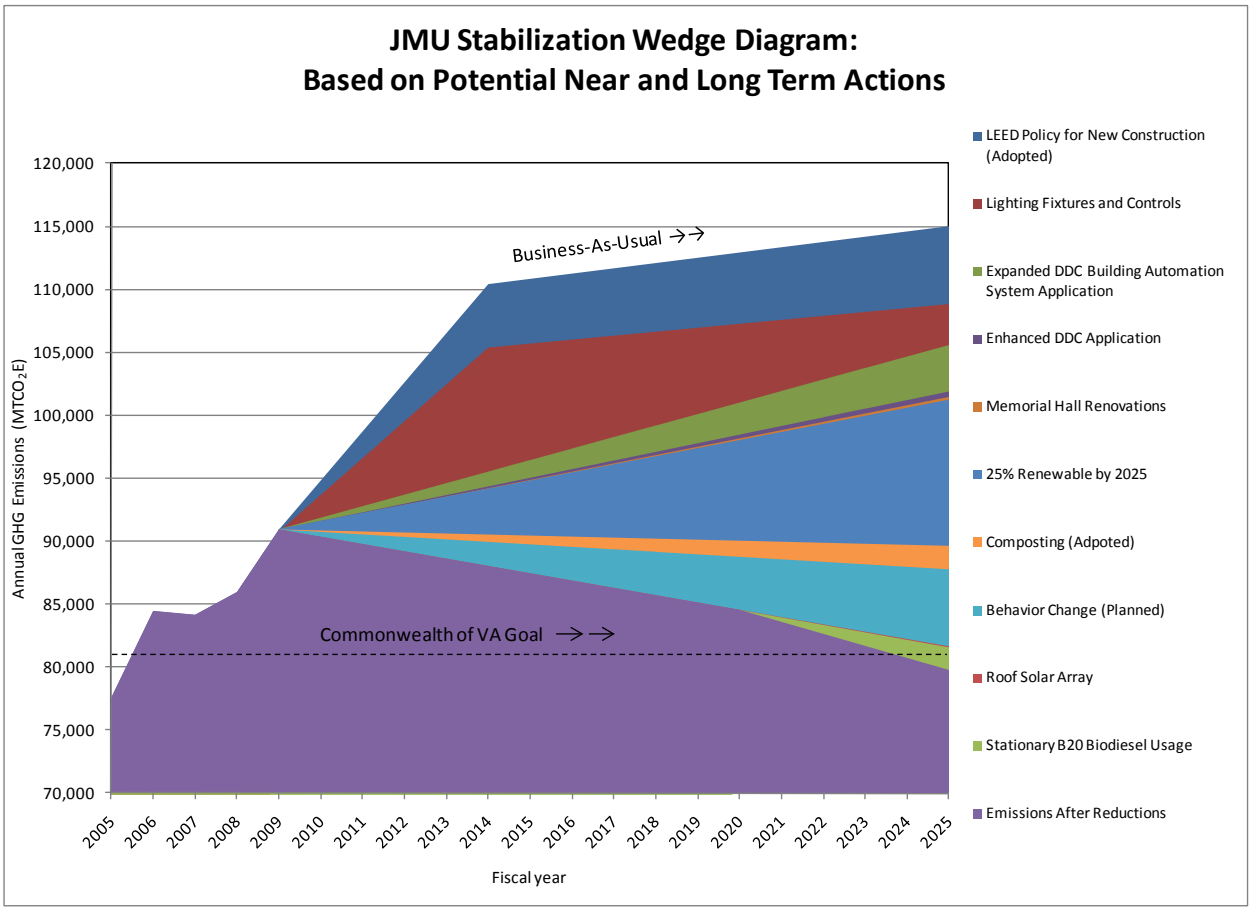
GHG Emissions Reduction Projects	Annual Electrical Savings (kWh)	Annual Fossil Fuel Savings (Therms)	Annual GHG Reduction (MT CO_2E)	Project Description
LEED Policy	-	-	1,100	LEED Policy for new construction resulting on average in 30% improvement in energy efficiency relative to standard construction
Expanded DDC Building Automation System Application	3,685,500	330,750	3,657	Currently, approximately 40% of the campus facilities are equipped with direct digital control (DDC) building controls. This project represents the application of DDC controls to the remaining facilities and utilizing the DDC controls to implement the application of improved economizer, night set-back and occupancy controls.
Lighting Fixtures and Controls	6,355,576	-	3,289	JMU is undertaking lighting upgrades on a proactive basis in addition to upgrades established as a result of new construction and broader renovation programs. Opportunities identified include reduction in night lighting, greater use of occupancy sensors, better controls and improvements at large event facilities and venues, improved use of day-lighting sensors and lighting controls, as well as continued re-lamping to higher efficiency fixtures.
Enhanced DDC Application	270,000	50,790	408	Of the existing facilities currently equipped with DDC controls (approximately 40%), most do not utilize functions for enthalpy based economizer control, demand based ventilation control and heating hot water temperature reset. This project represents the application of enhanced DDC controls to the existing facilities to further reduce their energy demand.
Memorial Hall Renovations	549,177	2,034	295	While some of the recommended improvements from the energy audit are addressed through the above projects, additional improvement are recommended including replacing existing single pane windows, further application of VFDs including AHUs for gym, auditorium, and stage; modification of Lab hood operation and comprehensive retro-commissioning following DDC implementation.
Totals	**10,860,253**	**390,624**	**7,686**	

Table 5.2 Possible Long-Term (within 15 years) GHG Emissions Reduction Projects.

Energy Efficiency Measure	Annual Electrical Savings (kWh)	Annual Fossil Fuel Savings (Therms)	Annual GHG Reduction ($MTCO_2E$)	Project Description
25×25 Program[a]	10,424,288	857,850	11,564	JMU will develop a 25×25 Plan in 2010 to both increase renewable energy usage (supply side management) and decrease total energy usage (demand-side management) to achieve the goal of 25% renewable by 2025. Although not all project metrics are not available at this time, potential projects for consideration in this program include biofuels, solar, geothermal, and waste-to-energy as well as the following: • ENERGY STAR equipment purchasing policy: An inventory survey of dining and kitchen equipment will be carried out at JMU. Information on existing equipment was noted, summarized, and categorized according to potential for energy savings using ENERGY STAR equipment. A phase-in schedule for equipment replacement will be recommended. • Algae Biofuel/Fish Farm Program: A program to promote the growth of algae using stack emissions and use the algae as both a biofuel for boilers as well as a food source for hydroponic plants and fish, will be considered for demonstration at JMU. A feasibility assessment will consider the existing boiler systems, available off-gas constituents and land use. This evaluation will also included initial discussions with JMU's Research and Public Services department to assess potential interest and participation by the surrounding community. • Hybrid/Biodiesel Vehicle Implementation Study: This program will identify campus fleet vehicles with the potential to be replaced by hybrid/biodiesel fueled vehicles, and the cost/benefits of replacing these vehicles before the end of their useful life. Fleet information will be captured using a survey; candidate vehicles were identified, and a replacement schedule will be recommended. • Assessment of Carbon Emission Trends following the Master Campus Transportation Plan: This program will involve the review of existing campus master planning data including transportation initiatives to inform quantification of potential annual growth rates and transportation mileage. • RRF Evaluation and Associated Steam/Chilled Water Assessment: This project will involve a comprehensive review of JMU's steam and chilled water demand, and scenarios for cost-effective utilization of the local Resource Recovery Facility (RRF) to meet this demand. Expansion of combined heat and power (CHP) activities and potential for biofuel use will also be investigated.
Composting[b]	-	-	1,865	Composting of cafeteria food waste currently sent to landfill. Composting of 1324 U.S. tons per year of food waste relative to landfilling results in both avoided landfill emissions and generation of emissions offsets through avoided use of synthetic fertilizer.
Conservation-Minded Behavior Change	7,182,470	492,486	6,114	As described in Section 5, JMU will provide seed money for education and outreach projects over a ten-year period that will result in conservation-minded behavioral changes.
Roof Solar Array	134,004	-	69	100 kW DC photovoltaic array (480 Kyocera Crystalline panels with 25-40 year life over 10,080 sq ft roof space.
B20 biodiesel	-	248,400	1,808	Using 100% of maximum permitted limit of B20 biodiesel usage (900,000 gallons per year).
Totals	**17,740,762**	**1,598,736**	**21,420**	

[a]Energy and GHG reductions for 25×25 program are based on target to reach 25% renewable usage by 2025 incorporating forecasted growth in energy usage discussed in Section 3. Note that as of 2008, JMU has already achieved 20% renewable usage.
[b]Composting of 1324 U.S. tons per year of food waste relative to landfilling results in both avoided landfill emissions and generation of emissions offsets through avoided use of synthetic fertilizer.

Based on the possible projects list above, it appears technologically possible for JMU to achieve emissions reduction targets established by state government. The Commonwealth of Virginia's Executive Order 59 has set a target of reducing statewide GHG emissions to 30% below business-as-usual by 2025. For JMU, this would correspond to an emissions target of 80,523 $MTCO_2E$ by 2025, or ~34,500 $MTCO_2E$ below business-as-usual emissions. The above portfolio of expected strategies would exceed this reduction target for state government, as represented in the figure below. This is under consideration as an interim goal toward achieving carbon neutrality. Final targets will be set based on the implementation and funding feasibility analysis which will occur next.



Conservation-minded behavior change is discussed in detail in the next chapter based on its relevance to JMU's mission, the potential for JMU to fund and implement actions immediately, and a preliminary analysis that indicates conservation-minded behavior change has the highest cost benefit index of any of the possible measures.

6. Conservation-Minded Behavior Change

6.1. Background

As noted previously, JMU has developed defining characteristics regarding the mission of the university. One of these includes a commitment to incorporate environmental stewardship within all activities of the University and especially JMU's core activities of education and research:

"The university will be an environmentally literate community whose members think critically and act, individually and collectively, as model stewards of the natural world."

Although formal climate action assessment and planning is a recent undertaking, JMU has been actively engaged in environmental stewardship for several years. Today, JMU's ISNW provides a central platform for coordinating and communicating stewardship efforts across the JMU community. The Institute is comprised of five standing committees: Education and Research; Awareness; Policies and Practices; Operations; and Campus Accessibility.

The Education and Research Committee is composed of faculty, staff and students charged with defining the current state of education and research activity on campus, and stimulating and promoting future activities that would both advance the University characteristic regarding environmental literacy and action and the mission of the University. To carry out this charge, the Committee is currently engaged in four primary groups of activities:

- Benchmark existing formal learning activities addressing stewardship of the natural world.
- Benchmark existing research activities addressing stewardship of the natural world. Also assess faculty expertise and interest for the purpose of compiling a listing for dissemination to promote collaborative scholarly activity.
- Operationally define environmental literacy by identifying learning outcomes to be mastered by all graduates of the University, faculty and staff. Once the outcomes are defined, then identify learning opportunities to ensure the outcomes are instructed and can be mastered, and define measurements to assess progress in achieving the goal of all community members attaining environmental literacy. Focusing initially on the student population, JMU's robust program assessment practice is typically based on measuring student learning in a random sample of students using a pre-test/post-test model, and the University expects to use a similar model in evaluating students' ability to think critically about the multi-disciplinary environmental problems and choices facing society.
- Identify general educational/training and community outreach efforts of faculty, staff and students as they relate to the JMU and broader community.

A summary of current efforts in education and research follows as a means of benchmarking the education and research efforts to date.

6.2. Education

Environmental stewardship themes are incorporated in a variety of courses and disciplines, such as the natural sciences, rhetoric, art, anthropology, and business. Educational opportunities incorporating

environmental stewardship themes are available on the University campus and in numerous international locations. Academic environmental offerings include seven majors/concentrations, four minors, and a College of Business Sustainability Certificate. Masters degrees are offered in international Sustainable Environmental Resources Management and a joint forestry program. Introductory courses with substantial content related to environmental issues are available to all students as options within the General Education Program and as electives.

The ISNW's Education and Research Committee conducted an online survey in November 2009 to benchmark education and research efforts at JMU (see Appendix A for a summary of results). The population invited to participate consisted of 1319 full and/or part-time instructional and administrative faculty. Four hundred-thirty-one (431) faculty responded to the survey. Results revealed that there are at least 287 courses representing thirty-two academic departments having to do with environmental stewardship, including courses in the natural sciences, engineering and applied sciences, communications, visual and performing arts, social sciences, humanities, health sciences, business, and teacher education.

There are also courses offered in the Honors Program and all areas of the General Education program (the core liberal arts and sciences program taken by all undergraduate students). Of the 85 general education courses offered at JMU, 26 (31%) were mentioned by faculty in the survey as having an environmental component. An additional 10 (12%) were identified through an academic catalog search, thus at least thirty-six courses (43%) in the general education program include some element of environmental stewardship.

The general education program is organized into five areas called 'Clusters'. The breakdown of each cluster and the number of courses with an environmental stewardship element is as follows:

Cluster One: Skills for the 21st Century: 4 of 9 courses (44%)
Cluster Two: Arts & Humanities: 2 of 24 courses (8%)
Cluster Three: The Natural World: 20 of 36 courses (56%)
Cluster Four: Social and Cultural Processes: 5 of 9 courses (56%)
Cluster Five: Individuals in the Human Community: 5 of 7 courses (71%)

The 2009 survey also asked faculty to indicate if environmental stewardship was a major or a minor focus of each course they taught. Table 6.1 outlines these courses across our academic disciplines:

Table 6.1 Academic Courses with Major or Minor Environmental Stewardship Focus.

Areas of Academic Interest	Number of Courses with a Major Focus	Number of Courses with a Minor Focus	Total
Business	1	8	9
Communication	7	3	10
Engineering and applied sciences	72	23	95
Health sciences	1	11	12
Honors	1	2	3
Humanities	9	8	17

Areas of Academic Interest	Number of Courses with a Major Focus	Number of Courses with a Minor Focus	Total
Natural science or science	59	34	93
Social science	8	18	26
Teacher education	4	8	12
Visual and performing arts	5	3	8
Grand Total	167	118	285

One-hundred thirty-six (136) faculty (32% of respondents) indicated having one or more classes with some element on environmental stewardship. These elements include assignments (n=85; 20%); modules (n=81; 19%); focus (n=74; 17%); lecture (n=73; 17%); field trip (n=37; 9%); guest lecture (n=28; 7%); class mention (27; 6%); and extra credit (n=23; 5%).

One-hundred forty (140) of the 431 faculty respondents (32%) listed one or more extracurricular educational activities that may involve environmental stewardship. Examples of these activities include professional organization (n=54; 13%); community service learning (n=32; 7%); learning communities (n=19; 4%); and departmental academic or honor organization (n=15; 3%). See a full listing in Appendix A.

In addition to instructional faculty and students, JMU has approximately 2,400 administrative/professional faculty, classified staff and wage employees. In February 2009, ISNW and the JMU Training and Development (T&D) Department of the Administration and Finance Division collaborated to initiate environmental stewardship educational opportunities for faculty and staff. Since that time, 105 (sums to 106 in table) individuals have attended environmental stewardship workshops through JMU T&D (Table 6.2). To ensure expansion of such offerings for faculty and staff, the JMU T&D Department has included an objective to develop at least one new environmental stewardship course per year while continuing to offer existing workshops to meet current demand.

Table 6.2 Administrative/Professional Faculty, Classified Staff and Wage Workshops.

Title	Target Audience	Offered By	Date	Number of Attendees
Campus Water Stewardship	Faculty & Staff	ISNW/JMU Training and Development	2/19/09	16
Greening Your Office	Faculty & Staff	ISNW/JMU Training and Development	3/24/09	35
Environmental Stewardship on the Road	Faculty & Staff	ISNW/JMU Training and Development	5/19/09	14
Greening Your Office	Faculty & Staff	ISNW/JMU Training and Development	10/8/09	22
Greener Virginia	Faculty & Staff	CommonHealth	11/18/09	19

6.3 Research

In the same faculty survey of November 2009, one hundred three (103) faculty reported 268 recent or on-going environmental stewardship scholarly projects of which 118 (44%) were student led projects and 150 (56%) were faculty led. Also, of these 268 projects, 154 (57%) are not funded; 85 (32%) receive external funds; and 29 (11%) have internal funding. Once again, research projects reported from the areas of health sciences, humanities, communications, natural sciences, engineering and applied sciences, visual and performing arts, business, and social sciences. Projects include many occurring in international settings. A full listing is presented in the appendix.

JMU's ***Center for Energy and Environmental Sustainability*** (CEES) is an interdisciplinary effort to promote sustainable lifestyle, community, and business practices. Examples of CEES faculty projects include the Virginia Wind Energy Consortium, the Shenandoah Valley Air Quality Initiative, and the Pure Water Forum, which educate decision makers and the public.

JMU is also taking the lead in a statewide effort to produce 25 percent of Virginia's energy from renewable resources by 2025 (JMU, 2009a). The Virginia ***25x'25 State Alliance***, modeled after a national organization with similar goals, will develop a new energy vision for the Commonwealth and will promote that vision to decision makers, opinion leaders and other stakeholders.

The University is currently initiating a new research institute that would integrate the existing efforts; identify strategic areas of pursuit for external funding; and further promote collaborative scholarly activity of faculty, students and staff; and enhance internal and external recognition of scholarly activities in environmental stewardship of the University. This new research institute would work collaboratively with ISNW in advancing activity related to the University's defining characteristic. This will address the Environmental Stewardship and Sustainability Commission recommendation of increased coordination and communication between the curricular units and among faculty in this area.

6.4. Awareness/Communications

Hands-on-learning

JMU's four university divisions collaborate to immerse students in a living laboratory. The campus has a wind turbine, photovoltaics, a bus system using biofuels, a green roof, a planetarium, Arboretum, Science on a Sphere (a spherical movie system that simulates Earth systems), and a farm internship program. Elliptical exercise machines have been outfitted to produce electricity in both the University Recreation Center and in the fitness labs used for a popular general education course focusing on wellness. Online-readings of energy consumption are produced for multiple buildings. JMU students compete annually in the RecycleMania waste minimization competition.

Communication and Coordination

The ISNW maintains a web site (JMU, 2009c) that provides a medium for receiving feedback and posting documentation and updates on stewardship activities. Through the ISNW, JMU also issues a quarterly environmental stewardship newsletter to highlight best practices, exemplary individuals, and news and events related to environmental stewardship. Further, there is an annual

interdisciplinary lecture. The ISNW also serves as JMU's liaison for Climate Action Planning for the ACUPCC. The ISNW Awareness Committee will present to selected departments an introduction to the campus environmental stewardship efforts. A comprehensive awareness campaign by JMU Communications and Marketing is proposed to begin in March 2010 in consultation with the Awareness Committee.

Possible additional actions for the campaign include: placement of a "stewardship" icon on the JMU web homepage, establishment of an alumni/student carbon offset donation campaign, hosting of an annual campus summit, creation of video information shorts, "Think Green Its Friday" notifications, rollout of bus-stop signs that track progress, information dissemination for new people on campus, policy dissemination, establishment of a community gathering place (such as a community garden), creation of a graduation pledge, organization of an environmental Climate Action Plan event (modeled after the University of Delaware or Miami Dade College), campaign for becoming a Tree Campus USA in collaboration with our alumni network, starting a student mini-grant contest, and tactics submitted by the Institute for Visual Studies class.

Below is a proposed organizational framework designed to launch and sustain an awareness campaign supporting the environmental stewardship action plan roll out early in the spring of 2010.

Campaign Management

- Establish a campaign chair and co-chair.
- Establish campaign managers responsible for guiding day-to-day operations.
- Campaign managers will provide campaign updates weekly to the managers' team in Communications and Marketing. This group will be responsible for guiding the execution of the campaign.
- Campaign managers will update the ISNW Awareness Committee monthly
- Establish a student advisory panel, which will act as an ongoing focus group. The core of this group can come from the students on the Awareness committee.

Campaign Timeline

- A comprehensive review of the student campaign projects is underway. The campaign plan will employ many of the concepts and tactics presented in these projects.
- Campaign plan development will begin early in January 2010. Goals and objectives in the awareness campaign plan will be devised to directly support the goals and objectives in the environmental Climate Action Report. Campaign metrics will interlock with environmental stewardship Climate Action Report metrics.
- Campaign will launch in March 2010.

Campaign Budget

- A budget will be created as the plan is designed.

6.5. Additional Future Strategies

With regards to JMU's long-term goal of achieving carbon neutrality, **increased environmental literacy through formal learning opportunities and general awareness activities is expected to help JMU reduce GHG emissions through conservation-minded behavior change.** As students, faculty and staff are able to better evaluate personal choices with regards to resource consumption,

transportation, and energy use, they are more likely to choose behaviors that align with environmental stewardship.

In order to promote environmental literacy and the behavior changes, and GHG emissions reductions and other benefits that may come from it, JMU will dedicate funds to serve as seed money for additional programs in the above four areas of environmental stewardship: course work, research, hands-on-learning, communication.

Possible strategies employed by other universities include:

- Foster undergraduate participation in environmental research
- Support junior faculty in new areas of environmental scholarship
- Foster collaborations between academic and administrative activities
- Enhance interdisciplinary environmental instruction
- Create working landscapes on and off campus that are living laboratories and demonstration sites for sustainable land use practices, water conservation, and biodiversity enhancement.
- Initiate an opportunity for JMU faculty for the purposes of (1) collaboration and support of scholarly endeavors, (2) internal curriculum coordination and planning, (3) sharing pedagogical innovations, and (4) round table discussions with practitioners on outreach and research agendas.
- Motivate engagement and innovation via a green fund or mini-grant competition.
- Develop appropriate reward and incentive systems.

Selection and prioritization of strategies and specific actions to fulfill them will need to be conducted after completion of the education and research benchmarking.

The funds will reflect the potential energy savings that may result from conservation-minded behavior change. Specifically, it is assumed that 10% of JMU's baseline GHG emissions from Scope 1 and 2 sources may be mitigated through behavior change. This could result in cost savings of approximately $1.4 million (Table 6.3).

Table 6.3 Potential Cost Savings from Conservation-Minded Behavioral Changes.

Scope	Source	GHG Emissions Reduction* ($MTCO_2E$)	Corresponding Usage Reduction	Usage Units (energy source used)	Unit Cost	Cost Savings
1	Stationary sources	1209	22,849	MMBTU (natural gas)	$ 13.72	$ 313,525
	Mobile sources	89	9,973	gallons (gasoline)	$ 2.69	$ 26,862
2	Purchased electricity	3792	7,182,470	kWh	$ 0.09	$ 610,510
	Purchased steam	1024	25,153	MMBTU (steam)	$ 16.16	$ 406,545
Total						$ 1,357,442

**10% of FY 2005 baseline emissions.*

Over a ten year period (FY 2010 to 2020), JMU will work to identify sources of $140,000 annually as seed money for programs that integrate environmental stewardship into education, research, and awareness. Examples of prior successful projects initiated through seed funding include JMU's arboretum collaborative and hosting of a visiting visionary (*e.g.*, Michael Singer in 2009).

7. Tracking and Assessment

7.1. GHG Tracking

A biennial update of the campus emissions inventory is required by the ACUPCC. JMU will publicly update the inventory biennially but will internally track GHG emissions annually. This will allow JMU to determine if progress is being made with regards to planned emissions reductions and adjust strategies accordingly. This will also be consistent with the tracking being conducted in other priority areas.

7.2. Assessment

Section 5 presented potential emissions reduction projects through 2025. A key strategy for assuring progress with regards to planned emissions reductions will be to assign sponsors for each emissions reduction project proposed. Divisions within JMU will take responsibility for selected projects and specific departments will be responsible for conducting the tracking and assessment. Tracking and assessment plans will be included in the JMU Planning Database. Comparisons to external peer groups are planned. One probable group is the Carnegie Classification.

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APPENDIX A

JMU Curriculum and Research Survey Results

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

	Considers Environmental Stewardship a Major Focus												
CATEGORY	CLASS NAME (Alpha by Abbrev)	CLASS TITLE	Responses (n)	Major focus (n)	Class Module (n)	Class Lecture/ Discussion (n)	Class Mention (n)	Class Assignment (n)	Class Extra Credit (n)	Class Guest Speaker (n)	Class Field Trip (n)	Other 1 (n)	Other 2 (n)
Business	MGT372	MGT 372. Entrepreneurship.	1	1	1	1	1	1	0	1	0	0	0
Communication	COMM300	COMM 300 ENVIRONMENTAL RHETORIC AND NATURE	1	1	0	1	0	1	1	1	0	0	0
Communication	GCOM123	GCOM 123. Fundamental Human Communication: Group Presentations.	3	1	1	1	0	3	0	1	2	1	0
Communication	GWRTC103	GWRTC 103. Critical Reading and Writing.	1	1	1	1	0	1	0	1	1	0	0
Communication	SCOM354	SCOM 354. Communication, Environment and Environmentalism.	1	1	1	0	0	1	0	1	1	1	0
Communication	SCOM490	SCOM 490. Special Studies in Communication Studies.	1	1	1	0	0	1	0	1	1	1	0
Engineering and applied sciences	ENGR112	ENGR 112. Introduction to Engineering (1,2).	2	1	2	0	0	2	0	1	0	0	0
Engineering and applied sciences	ENGR231	ENGR 231. Engineering Design I.	2	1	1	1	0	2	0	0	0	0	0
Engineering and applied sciences	ENGR232	ENGR 232. Engineering Design II.	1	1	1	0	0	1	0	0	0	0	0
Engineering and applied sciences	GEOG/GEOL310	GEOG/GEOL 310. Environmental Issues.	1	1	0	1	0	1	0	0	0	0	0
Engineering and applied sciences	GEOG/ISAT429	GEOG/ISAT 429. Sustainability: An Ecological Perspective.	1	1	1	0	0	1	0	0	1	0	0
Engineering and applied sciences	GEOG210	GEOG 210. Physical Geography (2, 2).	3	3	3	2	1	3	0	0	0	2	0
Engineering and applied sciences	GEOG280	GEOG 280. Human Geography: The Cultural Landscape.	1	1	1	0	0	1	1	0	0	0	0
Engineering and applied sciences	GEOG290	GEOG 290. Human Interactions with the Physical Environment.	1	1	1	0	0	1	0	0	0	0	0
Engineering and applied sciences	GEOG300	GEOG 300. Population Geography.	2	2	1	1	0	1	0	0	0	0	0
Engineering and applied sciences	GEOG315	GEOG 315. Field Studies in Geography.	2	2	1	0	0	1	0	0	1	1	0
Engineering and applied sciences	GEOG322	GEOG 322. Agricultural Systems.	1	1	1	0	0	0	0	0	1	0	0
Engineering and applied sciences	GEOG325	GEOG 325. Environmental Ethics.	1	1	1	1	0	1	0	1	1	1	0
Engineering and applied sciences	GEOG338	GEOG 338. Geography of the Philippine Islands: Problems and Possibilities.	1	1	0	0	0	0	0	0	0	1	0

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

	Considers Environmental Stewardship a Major Focus												
CATEGORY	CLASS NAME (Alpha by Abbrev)	CLASS TITLE	Responses (n)	Major focus (n)	Class Module (n)	Class Lecture/ Discussion (n)	Class Mention (n)	Class Assignment (n)	Class Extra Credit (n)	Class Guest Speaker (n)	Class Field Trip (n)	Other 1 (n)	Other 2 (n)
Engineering and applied sciences	GEOG340	GEOG 340. Biogeography.	1	1	1	0	0	1	0	0	0	1	0
Engineering and applied sciences	GEOG343	GEOG 343. Wildlife Management.	1	1	1	1	0	1	0	1	1	1	0
Engineering and applied sciences	GEOG349	GEOG 349: GEOGRAPHY OF EAST AND SOUTHEAST ASIA	1	1	1	0	0	0	0	0	0	0	0
Engineering and applied sciences	GEOG390	GEOG 390. Senior Project Design.	1	1	1	0	0	1	0	0	0	0	0
Engineering and applied sciences	GEOG441	GEOG 441, MANAGEMENT AND PROTECTION OF NATURAL RESOURCES	1	1	1	1	0	1	0	0	1	0	0
Engineering and applied sciences	GEOG450	GEOG 450, ADVANCED BIOGEOGRAPHY	1	1	1	0	0	1	0	0	0	1	0
Engineering and applied sciences	GEOG495	GEOG 495. Internship in Geography.	1	1	1	0	0	1	0	1	1	0	0
Engineering and applied sciences	GGEOG200	GGEOG 200. Geography: The Global Dimension.	6	5	4	2	0	3	1	1	0	0	0
Engineering and applied sciences	GISAT112	GISAT 112. Environmental Issues in Science and Technology (2, 3).	6	6	6	1	0	5	2	1	3	0	0
Engineering and applied sciences	GISAT160	GISAT 160. Problem Solving Applications in Science and Technology.	3	2	3	1	0	2	1	2	0	1	0
Engineering and applied sciences	ISAT231	ISAT 231. Political Economy of Technology and Science.	2	2	2	1	1	2	0	0	0	0	0
Engineering and applied sciences	ISAT252	ISAT, 252, ANALYTICAL METHODS IV: PROGRAMMING AND PROBLEM SOLVING	3	1	1	2	1	3	1	0	0	1	0
Engineering and applied sciences	ISAT302	ISAT 302. Instrumentation and Measurement of the Environment (0, 2).	1	1	1	0	0	1	0	0	1	0	0
Engineering and applied sciences	ISAT311	ISAT 311. Role of Energy in Modern Society.	1	1	1	0	0	0	0	0	0	1	0
Engineering and applied sciences	ISAT320	ISAT 320. Fundamentals of Environmental Science and Technology I.	2	2	2	0	0	2	0	1	1	0	0
Engineering and applied sciences	ISAT321	ISAT 321. Fundamentals of Environmental Science and Technology II.	1	1	1	0	0	1	0	0	0	0	0
Engineering and applied sciences	ISAT411	ISAT 411. Energy Economics and Policy.	2	2	2	0	0	1	0	0	0	0	0
Engineering and applied sciences	ISAT420	ISAT 420. Environmental Analysis and Modeling.	1	1	1	0	0	1	0	0	0	0	0

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

	Considers Environmental Stewardship a Major Focus												
CATEGORY	CLASS NAME (Alpha by Abbrev)	CLASS TITLE	Responses (n)	Major focus (n)	Class Module (n)	Class Lecture/ Discussion (n)	Class Mention (n)	Class Assignment (n)	Class Extra Credit (n)	Class Guest Speaker (n)	Class Field Trip (n)	Other 1 (n)	Other 2 (n)
Engineering and applied sciences	ISAT421	ISAT 421. Environmental Policy and Regulation.	2	2	2	1	1	2	0	0	0	0	0
Engineering and applied sciences	ISAT422	ISAT 422. Industrial Environmental Management.	1	1	1	0	0	1	0	0	0	0	0
Engineering and applied sciences	ISAT423	ISAT 423. Environmental Remediation.	1	1	1	0	0	1	0	1	1	1	0
Engineering and applied sciences	ISAT424	ISAT 424. Natural Resource Management.	1	1	1	1	0	1	0	0	1	0	0
Engineering and applied sciences	ISAT425	ISAT 425. Environmental Hydrology.	1	1	1	1	0	1	0	1	0	0	0
Engineering and applied sciences	ISAT426	ISAT 426. Environmental Information Systems.	1	1	1	0	0	1	0	1	1	0	0
Engineering and applied sciences	ISAT428	ISAT 428. Industrial Ecology.	1	1	1	0	0	1	0	0	0	0	0
Engineering and applied sciences	ISAT435	ISAT 435. Integrated Product and Process Development.	1	1	1	0	0	1	0	1	0	1	1
Engineering and applied sciences	ISAT480	ISAT 480. Selected Topics in Integrated Science and Technology.	2	2	2	2	2	2	0	1	1	1	0
Engineering and applied sciences	ISAT491,492	ISAT 491, 492, 493. Senior Thesis.	3	3	3	3	2	2	0	0	2	0	0
Engineering and applied sciences	ISAT545	ISAT 252 - ANALYTICAL METHODS IV: PROGRAMMING AND PROBLEM SOLVING	1	1	1	1	1	1	0	0	0	0	0
Engineering and applied sciences	ISAT580	ISAT 580/480 25X25 FOR THE SHENANDOAH VALLEY	1	1	1	1	1	1	0	1	1	0	0
Engineering and applied sciences	ISAT620	ISAT 620 (@JMU AND @MALTA)	1	1	1	1	1	1	0	0	0	0	0
Engineering and applied sciences	ISAT680	ISAT 680. APPROPRIATE TECHNOLOGY AND SUSTAINABLE DESIGN	1	1	1	0	0	1	0	0	0	0	0
Health sciences	HTH352	HTH 352. Environmental Health.	1	1	1	0	0	1	1	0	0	0	0
Honors	HON301	HON 301, THE NUCLEAR AGE	1	1	0	1	0	1	0	0	0	0	0
Humanities	ENG302	ENG 302. Special Topics in Literature and Language.	1	1	1	1	0	1	0	0	0	0	0
Humanities	ENG371	ENG 371. Literature and the Environment.	1	1	1	1	0	1	0	0	0	0	0
Humanities	ENG496	ENG 496. Advanced Topics in Creative Writing.	1	1	1	0	0	1	1	1	1	0	0

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

	Considers Environmental Stewardship a Major Focus												
CATEGORY	CLASS NAME (Alpha by Abbrev)	CLASS TITLE	Responses (n)	Major focus (n)	Class Module (n)	Class Lecture/ Discussion (n)	Class Mention (n)	Class Assignment (n)	Class Extra Credit (n)	Class Guest Speaker (n)	Class Field Trip (n)	Other 1 (n)	Other 2 (n)
Humanities	GHUM200	GHUM 200. Great Works.	1	1	1	1	0	1	0	0	0	0	0
Humanities	HIST326	HIST 326. The Automobile in 20th Century America.	1	1	1	1	0	1	0	0	0	0	0
Humanities	HIST327	HIST 327. Technology in America.	1	1	1	1	0	1	1	0	0	0	0
Humanities	HIST337	HIST 337. Workshop in Local History.	1	1	1	0	0	1	0	1	1	0	0
Humanities	HIST427	HIST 427. U.S. Environmental History.	1	1	1	0	0	1	0	0	0	1	0
Humanities	ITAL446	ITAL 446. Special Topics in Italian Literature.	1	1	1	0	0	0	0	0	0	0	0
Natural science or science	ASTR120	*ASTR 120. The Solar System.	2	1	0	2	0	1	1	0	1	1	0
Natural science or science	BIO353	BIO 353. Basic Ecology (3, 3).	1	1	1	0	0	1	0	0	1	0	0
Natural science or science	BIO364	BIO 364. Human Uses of Plants (3, 0).	1	1	1	0	0	0	0	0	0	0	0
Natural science or science	BIO366	BIO 366. Plants and Environment (3, 3).	1	1	1	0	0	0	0	0	1	1	0
Natural science or science	BIO426	BIO 426. Topics in Biology.	2	1	1	1	0	1	0	0	0	0	0
Natural science or science	BIO427	BIO 427. Topics in Biology with Laboratory.	2	1	1	2	0	0	0	0	1	0	0
Natural science or science	BIO456	BIO 456. Landscape Ecology (3, 3).	1	1	1	0	0	1	0	0	1	0	0
Natural science or science	CHEM354	CHEM 354. Environmental Chemistry Field Camp.	1	1	1	0	0	0	0	0	1	0	0
Natural science or science	CHEM390A,B	CHEM 390 A,B. Problems in Chemistry.	1	1	0	0	0	0	0	0	0	1	0
Natural science or science	CHEM480	CHEM 480. Selected Topics in Chemistry.	1	1	1	0	0	0	0	0	0	0	0
Natural science or science	CHEM499	CHEM 499. Honors.	1	1	0	0	0	0	0	0	0	1	0
Natural science or science	ENVT200	ENVT 200. Environmental Systems Theory.	2	1	1	1	0	0	0	0	0	0	0
Natural science or science	GBIO103	GBIO 103. Contemporary Biology (3, 0).	2	1	1	0	0	2	0	0	0	0	0
Natural science or science	GEOL110	*GEOL 110. Physical Geology (3, 2).	4	2	2	3	1	3	0	0	2	0	0

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

	Considers Environmental Stewardship a Major Focus												
CATEGORY	CLASS NAME (Alpha by Abbrev)	CLASS TITLE	Responses (n)	Major focus (n)	Class Module (n)	Class Lecture/ Discussion (n)	Class Mention (n)	Class Assignment (n)	Class Extra Credit (n)	Class Guest Speaker (n)	Class Field Trip (n)	Other 1 (n)	Other 2 (n)
Natural science or science	GEOL110H	GEOL, 110H, PHYSICAL GEOLOGY HONORS	1	1	1	1	0	1	0	0	1	0	0
Natural science or science	GEOL167	GEOL 167. History & Philosophy of the Geosciences.	1	1	1	1	0	1	0	0	0	0	0
Natural science or science	GEOL340	GEOL 340. Soils and Land Use (2, 2).	1	1	1	0	0	1	1	1	1	0	0
Natural science or science	GEOL399	GEOL 399. Field Geology.	1	1	1	1	0	1	0	0	1	0	0
Natural science or science	GEOL477	GEOL 477. Contemporary Issues in the Geosciences.	1	1	1	1	1	1	0	1	0	0	0
Natural science or science	GGEOL102	GGEOL 102. Environment: Earth (3, 0).	2	2	2	0	0	1	1	0	0	0	0
Natural science or science	GGEOL115	GGEOL 115. Earth Systems and Climate Change.	4	4	3	0	0	4	4	1	0	0	0
Natural science or science	GSCI101	GSCI 101. Physics, Chemistry and the Human Experience (3, 0).	8	4	5	3	0	6	0	0	1	1	0
Natural science or science	GSCI104	GSCI 104. Scientific Perspectives (0, 2).	5	3	3	2	1	3	1	1	1	0	0
Natural science or science	GSCI165	GSCI 165. The Way Life Works.	2	1	2	0	0	1	1	0	1	0	0
Natural science or science	GSCI166	GSCI 166. The Environmental in Context	4	4	4	1	1	4	1	1	3	0	0
Natural science or science	MATH429	MATH 429. Research Project in Statistics.	2	2	1	0	0	0	0	0	0	2	0
Natural science or science	PHYS150	PHYS 150. College Physics II.	1	1	1	0	0	1	0	0	0	0	0
Natural science or science	PHYS215	* PHYS 215. Energy and the Environment.	2	2	2	1	0	2	0	0	1	0	0
Natural science or science	PHYS240	*PHYS 240. University Physics I.	1	1	1	0	0	1	0	0	0	0	0
Natural science or science	PHYS247	PHYS 247. Data Acquisition and Analysis Techniques in Physics.	1	1	1	0	0	1	0	0	0	0	0
Social science	ANTH373	ANTH 373. Anthropological Perspectives on Environment and Development.	1	1	1	0	0	1	0	1	1	0	0
Social science	ANTH395	ANTH 395. Special Topics in Anthropology.	1	1	1	0	0	1	0	1	0	0	0
Social science	ECON305Envi	ECON 305 Environmental Economics.	1	1	1	0	0	1	0	1	0	0	0
Social science	ECON340	ECON 340. Economics of Natural Resources.	1	1	1	0	0	0	0	0	0	0	0

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

	Considers Environmental Stewardship a Major Focus												
CATEGORY	**CLASS NAME (Alpha by Abbrev)**	**CLASS TITLE**	**Responses (n)**	**Major focus (n)**	**Class Module (n)**	**Class Lecture/ Discussion (n)**	**Class Mention (n)**	**Class Assignment (n)**	**Class Extra Credit (n)**	**Class Guest Speaker (n)**	**Class Field Trip (n)**	**Other 1 (n)**	**Other 2 (n)**
Social science	GSOCI110	GSOCI 110. Social Issues in a Global Context.	1	1	1	0	0	0	0	0	0	0	0
Social science	PSYC497	PSYC 497. Senior Seminar in Psychology.	2	2	1	0	0	1	0	0	1	0	0
Social science	WMST401	WMST 401 ECOFEMINISM	1	1	0	1	0	1	1	1	0	0	0
Teacher education	CROSS-LISTEDK	CROSS-LISTED KENYA SUMMER PROGRAM	1	1	1	0	0	1	0	1	1	0	0
Teacher education	EDUC499	EDUC 499. Honors.	1	1	0	0	0	0	0	0	0	1	0
Teacher education	IDLS400	IDLS 400. Seminar in Liberal Studies.	2	1	1	1	0	2	0	1	1	0	0
Visual and performing arts	ART106	ART 106. Three-Dimensional Design (0, 6).	1	1	1	0	0	1	1	0	1	0	0
Visual and performing arts	GRPH392	GRPH 392. Topics in Graphic Design.	1	1	1	1	0	1	0	1	1	0	0
Visual and performing arts	INDE300	INDE 300. Interior Design Studio III.	1	1	1	0	0	1	0	0	1	0	0
Visual and performing arts	INDE302	INDE 302. Interior Design Studio IV.	1	1	1	0	0	1	0	1	1	0	0
Visual and performing arts	INDE400	INDE 400. Interior Design Studio V.	1	1	1	0	0	1	0	0	1	0	0
TOTAL			**167**	**144**	**133**	**59**	**16**	**128**	**22**	**36**	**53**	**26**	**1**

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

	Considers Environmental Stewardship a Minor Focus												
CATEGORY	CLASS NAME (Alpha by Abbrev)	CLASS TITLE	Responses (n)	Major focus (n)	Class Module (n)	Class Lecture/ Discussion (n)	Class Mention (n)	Class Assignment (n)	Class Extra Credit (n)	Class Guest Speaker (n)	Class Field Trip (n)	Other 1 (n)	Other 2 (n)
Business	CIS301	CIS 301. Operating Systems and Server Administration.	1	0	0	1	0	0	0	0	0	0	0
Business	COB218	COB 218. Legal Environment of Business.	1	0	0	1	0	1	0	0	0	0	0
Business	COB487	COB 487. Strategic Management.	2	0	0	1	1	1	0	0	0	0	0
Business	HTM470	HTM 470. Catering Operations and Event Management.	1	0	0	0	1	0	0	0	0	0	0
Business	MBA652	MBA 652 TECHNOLOGY ASSISTED DECISION MAKING	1	0	1	0	0	1	0	0	1	0	0
Business	MKTG384	MKTG 384. Integrated Marketing Communications.	1	0	0	0	1	1	0	0	0	0	0
Business	MKTG385	MKTG 385. Buyer Behavior.	1	0	0	0	1	1	0	0	0	0	0
Communication	SCOM261	SCOM 261. Public Relations Techniques I: Written.	1	0	0	0	0	1	0	0	0	0	0
Communication	SMAD308	SMAD 308. Interactive Design for the Web II.	1	0	0	1	0	0	0	0	0	1	0
Communication	WRTC250	WRTC 250. Ethical and Legal Issues in Technical and Scientific Communication.	1	0	1	0	0	0	0	0	0	0	0
Engineering and applied sciences	GEOG161	GEOG 161. Geospatial Tools and Techniques.	1	0	0	0	1	1	0	0	0	0	0
Engineering and applied sciences	GEOG230	GEOG 230. Spatial Thinking and Problem Solving.	1	0	0	0	1	0	0	0	0	0	0
Engineering and applied sciences	GEOG245	GEOG 245	1	0	1	0	0	1	0	0	1	0	0
Engineering and applied sciences	GEOG285	GEOG 285, REMOTE SENSING	1	0	0	1	1	1	0	0	0	0	0
Engineering and applied sciences	GEOG344	GEOG 344. Economic Geography and Development Issues.	1	0	0	1	0	0	0	0	0	0	0
Engineering and applied sciences	GEOG350	GEOG 350. Topics in Geography.	1	0	0	1	0	1	0	0	0	0	0
Engineering and applied sciences	GEOG375	GEOG 375. Political Geography.	1	0	0	1	0	1	0	0	0	1	0
Engineering and applied sciences	IA200	IA 200. Introduction to National Security Intelligence.	1	0	0	0	1	0	0	0	0	0	0
Engineering and applied sciences	ISAT/CS344	ISAT/CS 344. Intelligent Systems.	1	0	0	0	1	1	1	0	0	0	0

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

	Considers Environmental Stewardship a Minor Focus												
CATEGORY	CLASS NAME (Alpha by Abbrev)	CLASS TITLE	Responses (n)	Major focus (n)	Class Module (n)	Class Lecture/ Discussion (n)	Class Mention (n)	Class Assignment (n)	Class Extra Credit (n)	Class Guest Speaker (n)	Class Field Trip (n)	Other 1 (n)	Other 2 (n)
Engineering and applied sciences	ISAT131	ISAT 131. Technology, Science and Society (1, 2).	2	0	0	2	1	0	0	0	0	0	0
Engineering and applied sciences	ISAT152	ISAT, 152, ANALYTICAL METHODS II: APPLIED PHYSICS	1	0	0	1	0	0	0	0	0	0	0
Engineering and applied sciences	ISAT211	ISAT 211. Issues in Modern Production (2, 2).	1	0	0	1	0	1	0	0	0	1	0
Engineering and applied sciences	ISAT212	ISAT 212. Energy Issues in Science and Technology (2, 2).	3	0	1	3	0	1	0	0	1	0	0
Engineering and applied sciences	ISAT280	ISAT 280. Projects in Integrated Science and Technology.	1	0	0	1	0	0	1	0	0	0	0
Engineering and applied sciences	ISAT340	ISAT 340. Software Development.	2	0	2	1	0	2	0	1	0	1	0
Engineering and applied sciences	ISAT350	ISAT 350. Biotechnology for the New Millennium I.	1	0	1	1	1	0	1	0	0	0	1
Engineering and applied sciences	ISAT413	ISAT 413. Options for Energy Efficiency.	1	0	0	1	0	0	0	0	0	0	0
Engineering and applied sciences	ISAT456	ISAT 456. Ethical, Legal and Social Implications of Biotechnology.	1	0	0	1	0	0	0	0	0	0	0
Engineering and applied sciences	ISAT477	ISAT 477. Complex Systems and How They Fail.	1	0	0	1	0	0	0	0	0	0	0
Health sciences	HTH330	HTH 330. Introduction to Human Disease.	1	0	0	0	1	0	1	0	0	0	0
Health sciences	HTH389	HTH 389. Practicum in Health Education.	1	0	0	1	0	1	0	0	0	0	0
Health sciences	HTH458	HTH 458. Health Program Planning and Evaluation.	1	0	0	0	1	0	0	0	0	0	0
Health sciences	KIN202	KIN 202. Biological Foundations of Kinesiology.	2	0	0	1	1	0	0	0	0	0	0
Health sciences	NURS674	NURS 674	1	0	0	0	1	0	0	0	0	0	0
Health sciences	NUTR446	NUTR 446. Experimental Foods (1, 4).	1	0	0	1	0	0	0	0	0	1	0
Health sciences	SOWK305	SOWK 305. Social Work Research Methods.	1	0	0	0	1	0	1	0	0	1	0
Health sciences	SOWK317	SOWK 317. Skills for Generalist Social Work.	1	0	0	0	1	0	1	0	0	0	0
Health sciences	SOWK487	SOWK 487. Special Topics in Social Work.	1	0	0	1	0	0	1	0	0	1	0
Health sciences	SOWK494	SOWK 494. Senior Seminar in Social Work.	1	0	0	1	0	0	0	0	0	0	0

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

	Considers Environmental Stewardship a Minor Focus												
CATEGORY	CLASS NAME (Alpha by Abbrev)	CLASS TITLE	Responses (n)	Major focus (n)	Class Module (n)	Class Lecture/ Discussion (n)	Class Mention (n)	Class Assignment (n)	Class Extra Credit (n)	Class Guest Speaker (n)	Class Field Trip (n)	Other 1 (n)	Other 2 (n)
Honors	HONORS200X	HONORS 200X BIOLOGY IN THE MOVIES	1	0	0	1	0	1	0	0	0	0	0
Honors	HONS200X	HONS 200X, BIOLOGY IN THE MOVIES	1	0	0	1	0	0	0	0	0	0	0
Humanities	GHIST150	GHIST 150. Critical Issues in Recent Global History.	1	0	0	1	0	1	1	0	0	0	0
Humanities	GHIST225	GHIST 225. U.S. History.	1	0	1	0	0	0	0	0	0	0	0
Humanities	HIST395	HIST 395. History Seminar.	1	0	0	0	0	1	0	0	0	0	0
Humanities	HIST443	HIST 443. Modern American Technology and Culture.	1	0	0	1	0	1	0	0	0	0	0
Humanities	HIST470**	HIST 470**. Modern Africa.	1	0	0	1	0	0	0	0	0	0	0
Humanities	ITAL375	ITAL 375. Business and Society in Italy.	1	0	0	1	0	0	0	0	0	0	0
Humanities	REL380	REL 380. Contemporary Theologies.	1	0	1	1	0	1	0	0	0	0	0
Humanities	SPAN375	SPAN 375 BUSINESS AND SOCIETY IN LATIN AMERICA	1	0	0	1	0	0	0	0	0	0	0
Natural science or science	ASTR220	ASTR 220. General Astronomy I: The Night Sky, the Solar System and Stars.	1	0	0	1	0	0	0	0	0	0	0
Natural science or science	BIO/PSYC395	BIO/PSYC 395. Comparative Animal Behavior (3, 0).	1	0	0	1	0	1	0	1	0	0	0
Natural science or science	BIO114	*BIO 114. Organisms (3, 3).	1	0	0	1	0	0	0	0	0	0	0
Natural science or science	BIO124	BIO 124. Ecology and Evolution (3, 3).	1	0	1	0	0	0	1	0	0	0	0
Natural science or science	BIO214	BIO 214. Cell and Molecular Biology (3, 3).	1	0	0	0	1	0	0	0	0	0	0
Natural science or science	BIO370	BIO 370. Animal Physiology (3, 3).	1	0	0	0	0	0	0	0	0	0	0
Natural science or science	BIO450	BIO 450. Evolutionary and Societal Impacts of Developmental Biology (3, 0).	2	0	0	2	0	1	0	0	0	0	0
Natural science or science	BIO472	BIO 472. Human Metabolism (3, 0).	1	0	0	0	0	0	0	0	0	0	0
Natural science or science	BIO475	BIO 475. Advanced Cell and Molecular Biology (3, 0).	1	0	0	1	0	0	0	0	0	0	0
Natural science or science	CHEM/GEOL355	CHEM/GEOL 355. Geochemistry of Natural Waters.	1	0	1	0	0	0	0	0	1	0	0

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

	Considers Environmental Stewardship a Minor Focus												
CATEGORY	CLASS NAME (Alpha by Abbrev)	CLASS TITLE	Responses (n)	Major focus (n)	Class Module (n)	Class Lecture/ Discussion (n)	Class Mention (n)	Class Assignment (n)	Class Extra Credit (n)	Class Guest Speaker (n)	Class Field Trip (n)	Other 1 (n)	Other 2 (n)
Natural science or science	CHEM131	*CHEM 131. General Chemistry I.	2	0	2	0	0	0	0	0	0	0	0
Natural science or science	CHEM131L*-13	CHEM 131L*-132L. General Chemistry Laboratories.	1	0	1	0	0	0	0	0	0	0	0
Natural science or science	CHEM136L	CHEM 136L. Special General Chemistry Laboratory.	1	0	0	1	0	1	0	0	0	0	0
Natural science or science	CHEM351	CHEM 351. Analytical Chemistry.	1	0	0	1	0	1	0	0	0	0	0
Natural science or science	CHEM370	CHEM 370. Inorganic Chemistry I.	1	0	1	0	0	0	0	0	0	0	0
Natural science or science	CHEM450	CHEM 450. Nuclear and Radiation Chemistry.	1	0	0	1	0	1	0	0	1	0	0
Natural science or science	CHEM470	CHEM 470. Inorganic Chemistry II.	2	0	1	1	0	1	0	0	0	1	0
Natural science or science	ENVT400	ENVT 400. Capstone Seminar in Environmental Problem Solving.	1	0	0	1	0	1	0	1	0	0	0
Natural science or science	GEOL211	GEOL 211. Introduction to Oceanography.	1	0	1	0	0	1	1	0	0	0	0
Natural science or science	GEOL301	GEOL 301. Earth Sciences for Teachers.	1	0	0	0	1	1	0	0	0	0	0
Natural science or science	GEOL365	GEOL 365. Structural Geology (3, 2).	1	0	0	1	0	0	0	0	1	0	0
Natural science or science	GEOL398	GEOL 398	1	0	0	1	0	0	0	0	1	0	0
Natural science or science	MATH103	*MATH 103. The Nature of Mathematics.	1	0	1	0	0	1	1	0	0	0	0
Natural science or science	MATH207	MATH 207. Fundamentals of Mathematics III.	1	0	1	0	0	1	1	0	0	0	0
Natural science or science	MATH220	*MATH 220. Elementary Statistics.	1	0	0	0	1	1	0	0	0	0	0
Natural science or science	MATH235	*MATH 235. Calculus I.	2	0	1	0	0	1	2	0	0	0	0
Natural science or science	MATH235*-236	MATH 235*-236. Calculus I-II.	1	0	1	0	0	1	1	0	0	0	0
Natural science or science	MATH237	MATH 237. Calculus III.	1	0	1	0	0	1	1	0	0	0	0
Natural science or science	MATH238	MATH 238. Linear Algebra with Differential Equations.	1	0	1	0	0	1	1	0	0	0	0

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

	Considers Environmental Stewardship a Minor Focus												
CATEGORY	CLASS NAME (Alpha by Abbrev)	CLASS TITLE	Responses (n)	Major focus (n)	Class Module (n)	Class Lecture/ Discussion (n)	Class Mention (n)	Class Assignment (n)	Class Extra Credit (n)	Class Guest Speaker (n)	Class Field Trip (n)	Other 1 (n)	Other 2 (n)
Natural science or science	PHYS270	PHYS 270. Modern Physics.	1	0	0	1	0	0	0	0	0	0	0
Social science	ECON201	ECON 201. Principles of Economics (Micro).	1	0	0	1	0	0	0	0	0	0	0
Social science	GPOSC200	GPOSC 200. Global Politics.	1	0	0	1	0	0	0	0	0	0	0
Social science	GPSYC101	GPSYC 101. General Psychology.	1	0	0	0	0	0	0	0	0	1	0
Social science	GPSYC160	GPSYC 160. Life Span Human Development.	1	0	0	1	1	0	0	0	0	0	0
Social science	INTA489	INTA 489. Seminar in International Affairs.	1	0	0	1	0	0	0	0	0	0	0
Social science	IS202	IS 202. Orientation to Career and Life Planning.	2	0	0	0	0	0	0	0	0	0	0
Social science	JUST235	JUST 235. Justice in the Global Community.	1	0	0	1	0	0	0	0	0	0	0
Social science	JUST377	JUST 377, GLOBAL FUTURES	1	0	1	0	0	0	0	0	0	0	0
Social science	POSC230	POSC 230. International Relations.	2	0	1	2	0	0	0	0	0	0	0
Social science	POSC350	POSC 350. Latin American Politics.	1	0	1	0	0	0	0	0	0	0	0
Social science	POSC370	POSC 370. U.S. Foreign Policy.	1	0	0	1	0	0	0	0	0	0	0
Social science	PSYC646	PSYC 646 THE AMERICAN COLLEGE STUDENT	1	0	0	0	0	0	0	0	0	0	0
Social science	SOCI/ANTH368	SOCI/ANTH 368. Contemporary American Culture.	1	0	0	1	0	0	0	0	0	0	0
Social science	SOCI/SOWK348	SOCI/SOWK 348. Introduction to Developing Societies.	1	0	0	0	1	0	0	0	0	0	0
Social science	SOCI336	SOCI 336. Race and Ethnicity.	1	0	0	1	0	0	0	0	0	0	0
Social science	SOCI358	SOCI 358. Sociology of Consumption.	1	0	0	1	1	1	0	0	0	0	0
Teacher education	ARED300	ARED 300. Art Activities in the Elementary School. (1, 4).	1	0	1	0	0	1	0	0	0	0	0
Teacher education	ARED302	ARED 302. Secondary Art Education Methods.	2	0	2	0	0	1	0	0	0	0	0
Teacher education	ARED400	ARED 400. Visual Arts Across the Curriculum (1, 4).	1	0	1	0	0	1	0	0	0	0	0

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

	Considers Environmental Stewardship a Minor Focus												
CATEGORY	**CLASS NAME (Alpha by Abbrev)**	**CLASS TITLE**	**Responses (n)**	**Major focus (n)**	**Class Module (n)**	**Class Lecture/ Discussion (n)**	**Class Mention (n)**	**Class Assignment (n)**	**Class Extra Credit (n)**	**Class Guest Speaker (n)**	**Class Field Trip (n)**	**Other 1 (n)**	**Other 2 (n)**
Teacher education	ELED432	ELED 432. Children and Science.	1	0	1	0	0	0	0	0	1	1	0
Teacher education	ELED510	ELED 510 CREATIVITY AND THE ARTS IN ELEMENTARY EDUCATION	1	0	1	0	0	1	0	1	0	0	0
Teacher education	MIED610	MIED610 COLLABORATIVE LEADERSHIP	1	0	0	1	0	0	0	0	0	0	0
Teacher education	MSSE630	MSSE 630 INQUIRY INTO THE CLASSROOM	1	0	0	0	1	0	0	0	0	0	0
Visual and performing arts	ART304	ART 304. Methods of Art Criticism.	1	0	1	0	0	1	0	0	0	0	0
Visual and performing arts	GART200	GART 200. Art in General Culture.	2	0	0	2	2	0	0	0	0	0	0
TOTAL			**118**	**0**	**33**	**62**	**26**	**44**	**17**	**4**	**8**	**10**	**1**

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

Areas of Academic Interest	Number of Courses with a Major Focus	Number of Courses with A Minor Focus	Total
Business	1	8	9
Communication	7	3	10
Engineering and applied sciences	72	23	95
Health sciences	1	11	12
Honors	1	2	3
Humanities	9	8	17
Natural science or science	59	34	93
Social science	8	18	26
Teacher education	4	8	12
Visual and performing arts	5	3	8
Grand Total	**167**	**118**	**285**

Appendix A. Table A1. Survey Results for JMU Courses with Environmental Stewardship as a Major Focus.

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Art & Art History	Gary	Chatelain	FULLY INTEGRATED GREEN DESIGN RESIDENCE	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Art & Art History	Gary	Chatelain	FULLY INTEGRATED GREEN DESIGN RESIDENCE	0	1	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1
Art & Art History	Gary	Freeburg	WILDERNESS PUBLICATION	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1
Art & Art History	Dawn	Hachenski	SOUTH RIVER SCIENCE TEAM EXHIBITION	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1
Art & Art History	Katherine	Schwartz	INTRODUCING STUDENTS TO THE WILDERNESS THROUGH THE EYES OF THE ARTIST	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1
Art & Art History	Katherine	Schwartz	ART AND THE SOCIAL ORDER: A THEME BASED APPROACH	0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	1
Art & Art History	Allyson	Taylor	WRITING OF "GREENING YOUR STUDIO" ARTISTS HANDBOOK TO BE PUBLISHED IN 2010	0	1	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1
Art & Art History	Allyson	Taylor	PERSONAL ARTWORK ALL USES HOMEMADE, NON-TOXIC, AND LOCALLY SUSTAINABLE MATERIALS	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Art & Art History Total				0	3	0	0	1	0	0	0	4	6	2	7	0	1	6	2	8
Biology	Wilbur Dean	Cocking	UPTAKE OF HG BY EARTHWORMS	0	0	0	0	0	1	0	0	0	0	1	0	0	1	1	0	1
Biology	Wilbur Dean	Cocking	AIRBORNE HG IN SHENANDOAH VALLEY	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	1
Biology	Wilbur Dean	Cocking	AIRBORNE HG IN SHENANDOAH VALLEY	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	0	1
Biology	Judith	Dilts	TIMBER HARVEST IMPACTS ON STREAMS	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Biology	Judith	Dilts	STREAM RESTORATION - SMITH CREEK	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Biology	Judith	Dilts	STREAM RESTORATION - BLACKS RUN	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Biology	Judith	Dilts	RIVANNA RIVER BASIN COMMISSION	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Biology	Judith	Dilts	EXPERIMENTAL FLOOD EFFECTS ON ENDANGERED SPECIES IN REGULATED RIVERS	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	0	1
Biology	Heather	Griscom	JMU FARM RESTORATION	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	1
Biology	Heather	Griscom	HEMLOCK DIE-OFF & RESTORATION	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	1	1
Biology	Heather	Griscom	CHESTNUT RESTORATION	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	1	1
Biology	Christopher G	Murphy	METHODS FOR MONITORING AMPHIBIAN POPULATIONS	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Biology	Michael H	Renfroe	CLONING VIRGINIA ROUND-LEAF BIRCH	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Biology	Michael H	Renfroe	CLONING ENDANDERED AFRICAN VIOLET PLANTS	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Biology	Grace A	Wyngaard	INTERNATIONAL WORKSHOP	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Biology Total				0	0	1	1	0	2	0	5	6	8	7	5	3	7	12	3	15
Chemistry & Biochemistry	Daniel	Downey		1	0	1	1	1	0	1	0	0	0	5	0	0	5	5	0	5
Chemistry & Biochemistry	Richard	Foust	REU: GREEN CHEM	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	1
Chemistry & Biochemistry	Richard	Foust	REU: GREEN CATALYSTS	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	0	1
Chemistry & Biochemistry	Richard	Foust	J PHYS CHEM	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	0	1
Chemistry & Biochemistry	Richard	Foust	ATMOSPHERIC CHEMISTRY	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1

Appendix A. Table A2. Survey Results for JMU Research with a Sustainability Focus.

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Chemistry & Biochemistry	John Winton	Gilje		0	0	0	0	0	0	1	1	0	0	2	0	0	2	0	2	2
Chemistry & Biochemistry	Kathryn	Layman	MAGNETIC IRON OXIDE COMPOSITES	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	1
Chemistry & Biochemistry	Kathryn	Layman	MAGNETIC IRON OXIDE COMPOSITES	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	1	1
Chemistry & Biochemistry	Kevin	Minbiole	WE HAVE HAD 4 SINCE 2008	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	0	1
Chemistry & Biochemistry	Kevin	Minbiole	TRAVEL AWARD TO CONFERENCE	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1
Chemistry & Biochemistry	Kevin	Minbiole	STUDENT POSTER AWARD	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	1
Chemistry & Biochemistry	Kevin	Minbiole	I HAD THREE STUDENTS EACH OF THA LAST TWO SUMMERS ON THE PROJECT	0	0	0	1	0	0	0	0	0	0	1	0	0	1	1	0	1
Chemistry & Biochemistry	Kevin	Minbiole	CHRISTIAN SCHWANTES	0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	1
Chemistry & Biochemistry	Kevin	Minbiole		0	0	0	0	0	0	1	1	0	0	2	0	0	2	2	0	2
Chemistry & Biochemistry	Barbara	Reisner	SYNTHESIS AND CHARACTERIZATION OF NOVEL ZIFS	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	1
Chemistry & Biochemistry Total				2	0	3	4	2	0	3	5	2	3	18	5	0	16	15	6	21
College Of Business	William	Grant	MBA INDEPENDENT STUDY	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1
College Of Business Total				0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1
College Of Business - Sponsored Programs/Cob Business Center	Lynn	Powell	INSTITUTE OF CERTIFIED PROFESSIONAL MANAGERS	0	1	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
College Of Business - Sponsored Programs/Cob Business Center Total				0	1	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1
Communication Sciences & Disorders	Lincoln	Gray	NIH GRANT ON EFFECTS OF LEAD POISONING ON CENTRAL AUDITORY PROCESSING AND ATTENTION DEFICITS.	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Communication Sciences & Disorders	Lincoln	Gray	EFFECT OF DIET ON HEARING	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	1	1
Communication Sciences & Disorders	Lincoln	Gray	AUD DISSERTATION ON EFFECTS OF LEAD-POISONING ON HEARING	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1	1
Communication Sciences & Disorders Total				0	0	0	0	1	0	0	0	2	1	2	1	0	2	1	2	3
Communication Studies	Peter	Bsumek	SCOLARLY PRESENTATION: CONFERENCE ON COMMUNICATION AND ENVIRONMENT 2009 (CLIMATE CHANGE, RESILIANCE AND PUBLIC LANDS ADVOCACY)	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Communication Studies	Peter	Bsumek	SCHOLALRY PRESENTATION: NATIONAL COMMUNICATION ASSOCIATION 2008 (WILDERNESS ADVOCACY AND SCIENTIFIC DEBATES OVER PREDATION 1920-1940)	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Communication Studies	Peter	Bsumek	RESERCAH GRANT: HISTORY OF WILDERNESS ADVOCACY IN US (1920-1964)	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1	0	1
Communication Studies	Peter	Bsumek	MELAODRAMA FORUM: ENVIRONMENTAL COMMUNICATION JOURNAL	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	0	1
Communication Studies	Gretchen	Hazard	GO GREEN JMU	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Communication Studies Total				0	0	1	1	0	0	0	1	2	4	1	4	1	0	5	0	5
Computer Information Systems & Operations Management	Faye P	Teer	GRADUATE CLASS RESEARCH PROJECT	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1
Computer Information Systems & Operations Management Total				0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1
Early, Elementary & Reading Education	Deborah	Carrington	STUDENT-DIRECTED RESEARCH INTO RECYCLABLES	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1
Early, Elementary & Reading Education	Deborah	Carrington	STUDENT-DIRECTED RESEARCH INTO 'GREEN' PREK-6 CLASSROOM MATERIALS AND SUPPLIES	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1
Early, Elementary & Reading Education	Margaret	Shaeffer		0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	1

Appendix A. Table A2. Survey Results for JMU Research with a Sustainability Focus.

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Early, Elementary & Reading Education Total				0	0	0	0	1	0	0	0	2	0	3	3	0	0	1	2	3
Economics	John Barkley	Rosser	POST KEYNESIAN PERSPECTIVES AND COMPLEX ECOLOGIC-ECONOMIC DYNAMICS, METROECONOMICA, FORTHCOMING	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	0	1
Economics	John Barkley	Rosser	OLDER ARTICLE, "INSTITUTIONAL EVOLTUION OF ENVIRONMENTAL MANAGEMENT UNDER GLOBAL ECONOMIC GROWTH," JOURNAL OF ECONOMIC ISSUES, 2006	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1
Economics	John Barkley	Rosser		1	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1
Economics Total				1	0	1	0	0	0	0	0	1	2	1	3	0	0	2	1	3
Engineering	Eric	Pappas	SUSTAINABILITY ARTICLES	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	1
Engineering	Eric	Pappas	NSF GRANT	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1
Engineering	Eric	Pappas		0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	1
Engineering	Eric	Pappas	FUNDED RESEARCH (NSF)	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	1
Engineering	Robert	Prins	EPA P3 PROJECT	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	1
Engineering	Bradley	Striebig		0	0	1	0	0	0	0	1	0	1	1	2	0	0	2	0	2
Engineering Total				1	0	2	0	1	0	0	3	0	2	5	4	0	3	6	1	7

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
English	Erica	Bleeg		0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	1
English	Erica	Bleeg	DEVELOPING FOOD WRITING COURSE, ABOUT FOOD: A CREATIVE NONFICTION WORKSHOP	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
English	Katey	Castellano	ROMANTICISM, CONSERVATISM, AND CONSERVATION	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1	0	1
English	Katey	Castellano	PRESENTATIONS AT ASSOCIATION FOR THE STUDY OF LITERATURE AND THE ENVIRONMENT	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	1
English	Katey	Castellano	FEMINISM TO ECOFEMINISM: THE LEGACY OF GILBERT AND GUBAR'S READINGS OF MARY SHELLEY'S FRANKENSTEIN AND THE LAST MAN	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	0	1
English	Katey	Castellano	DEVELOPED 3 NEW ENVIRONMENTAL LITERATURE/ ENVIRONMENTAL ETHICS COURSES	0	1	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1
English	Mark	Facknitz		0	0	1	1	0	0	0	0	0	2	0	2	0	0	0	2	2
English Total				0	1	2	2	0	0	0	1	2	7	1	6	2	0	5	3	8
Exceptional Education	Karen E	Santos		0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1
Exceptional Education Total				0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Foreign Languages, Literature, & Cultures	Giuliana	Fazzion	WORKING ON ARTICLE FOR CONFERENCE	0	1	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1
Foreign Languages, Literature, & Cultures	Giuliana	Fazzion	ITAL446/ENG437FINAL PROJECT	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Foreign Languages, Literature, & Cultures Total				0	1	0	0	0	0	0	1	0	1	1	2	0	0	2	0	2
Geology & Environmental Science	Steve J	Baedke	TWO GEOLOGICAL SOCIETY OF AMERICA AWARDS FOR STUDENT PRESENTATIONS	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1
Geology & Environmental Science	Steve J	Baedke	GREAT LAKES WETLAND HYDROLOGY	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	1
Geology & Environmental Science	Steve J	Baedke	GREAT LAKES WETLAND HYDROLOGY	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1	1
Geology & Environmental Science	Steve J	Baedke	GREAT LAKES WETLAND HYDROLOGY	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	1	1
Geology & Environmental Science	Anthony	Hartshorn	PYROMINERALIZATION OF SOIL PHOSPHORUS	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	0	1
Geology & Environmental Science	Anthony	Hartshorn	PHOSPHORUS FOOTPRINT OF THE SHENANDOAH VALLEY	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Geology & Environmental Science	Anthony	Hartshorn	NITROGEN FOOTPRINT OF THE SHENANDOAH VALLEY	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Geology & Environmental Science	Anthony	Hartshorn	MERCURY FOOTPRINT OF THE SHENANDOAH VALLEY	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Geology & Environmental Science	Anthony	Hartshorn	ECOLOGICAL FOOTPRINT OF THE SHENANDOAH VALLEY	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Geology & Environmental Science	Anthony	Hartshorn	CRITICAL ZONE WORKSHOP PARTICIPANT, CRITICAL ZONE INTERNATIONAL SCHOLAR	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1
Geology & Environmental Science	Anthony	Hartshorn	CARBON FOOTPRINT OF THE SHENANDOAH VALLEY	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Geology & Environmental Science	Elizabeth	Johnson	MN OXIDE MINERALS AS TRACERS OF MINE CONTAMINATION IN STREAMS IN TN	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	1
Geology & Environmental Science	Cynthia A	Kearns	ENVIRONMENTAL SCIENCE EDUCATION	0	1	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1
Geology & Environmental Science	Kristen	St John	UNDERGRADS HAVE WORKED ON PROJECTS IN MY ARCTIC CLIMATE RESEARCH PROGRAM	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	1
Geology & Environmental Science	Kristen	St John	TEACHING WORKSHOPS ON CLIMATE CHANGE AND EDUCATION	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1
Geology & Environmental Science	Kristen	St John	CLIMATE CHANGE, ESP IN HIGH LATITUDES	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	0	1
Geology & Environmental Science	Stanley L	Ulanski	BOOK ON THE GULF STREAM	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Geology & Environmental Science	Steven	Whitmeyer	PEER REVIEWED ARTICLES	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	1	1
Geology & Environmental Science	Steven	Whitmeyer	LED 3 WORKSHOPS OVER THE PAST 2 YEARS	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1
Geology & Environmental Science	Steven	Whitmeyer	FIELD RESEARCH EACH YEAR	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	0	1
Geology & Environmental Science	Steven	Whitmeyer	SENIOR PROJECTS	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1	0	1
Geology & Environmental Science	Steven	Whitmeyer	HONOR'S THESES	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1	0	1
Geology & Environmental Science Total				1	4	3	2	2	0	2	2	6	14	8	8	0	14	13	9	22
Graduate Psychology	Dena	Pastor	ASSESSMENT: WE'VE CONSIDERED ASSESSING THE ENVIRONMENTAL WELLNESS OF STUDENTS ON ASSESSMENT DAY FOR CLUSTER 5 WELLNESS DOMAIN	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	1
Graduate Psychology	Lee	Sternberger	RITUMA PATEL PSY.D. DISSERTATION ON ATTITUDES TOWARD THE ENVIRONMENT	0	0	0	0	0	1	0	0	0	0	1	0	1	0	1	0	1
Graduate Psychology	Lee	Sternberger	IAU LEADHER GRANT ON CAMPUS SUSTAINABILITY	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Graduate Psychology	Lee	Sternberger	GREENING OF JMU STUDY ABROAD FACILITIES	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	1

Appendix A. Table A2. Survey Results for JMU Research with a Sustainability Focus.

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Graduate Psychology Total				0	0	0	0	0	1	0	0	3	2	2	0	3	1	3	1	4
Health Sciences	Georgia	Polacek	TRANSPORTATION CHALLENGES AND SUSTAINABILITY	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	0	1
Health Sciences	Georgia	Polacek	TRAFFIC AT JMU	0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	1
Health Sciences	Georgia	Polacek	CLASS PROJECTS IN TRAFFIC AND PARKING	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1
Health Sciences Total				0	0	1	0	1	0	0	0	1	1	2	3	0	0	3	0	3
History	Kevin	Borg	CURRENTLY REVISING CONFERENCE PAPER ON PRODUCT DURABILITY, PUBLIC POLICY, AND SUSTAINABILITY	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
History	Kevin	Borg	CURRENTLY DIRECTING MA THESIS ON HISTOY OF AMERICAN VISCOSE/AVTEX PLANT IN FRONT ROYAL, VA	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	1
History	Jennifer	Connerley	QUAKERS/ENVIRONMENT	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	1
History	Daniel	Kerr	HELPED RESCUE AND SECURE IN JMU SPECIAL COLLECTIONS THE CHARLIE WAMPLER SR. PAPERS THAT ADDRESS THE HISTORY OF THE POULTRY INDUSTRY IN ROCKINGHAM COUNTY	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
History	Daniel	Kerr	ENVIRONMENTAL HISTORY OF NEW ORLEANS	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
History	Daniel	Kerr	COORDINATED UNDERGRADUATE AND GRADUATE ORAL HISTORIES WITH FARMERS AND POULTRY GROWERS ON THEIR CHANGING LAND USE PRACTICES	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1
History	Daniel	Kerr	CONDUCTED INTERVIEWS OF LOCAL POULTRY GROWERS AND ALTERNATIVE FARMERS	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
History	David	Owusu-Ansah	PERSONAL READINGS	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1
History Total				0	1	0	0	0	2	0	1	4	3	5	8	0	0	7	1	8
Institute For Infrastructure And Information Assurance (iiia)	Patty	Hale		0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	1	1
Institute For Infrastructure And Information Assurance (iiia) Total				0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	1	1
Integrated Science & Technology	Karim	Altaii		0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Christopher	Bachmann	WIREC, COVES, VAREC	0	1	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1
Integrated Science & Technology	Christopher	Bachmann	ISAT SENIOR PROJECT	0	0	0	0	0	0	1	0	0	0	1	0	1	0	1	0	1
Integrated Science & Technology	Christopher	Bachmann	HONORS THESES	0	0	0	0	1	0	0	0	0	0	1	0	1	0	1	0	1

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DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Integrated Science & Technology	Christopher	Bachmann	MASTERS THESIS	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	0	1
Integrated Science & Technology	Christopher	Bachmann	IIIA	0	0	1	0	0	0	0	0	0	0	1	0	1	0	1	0	1
Integrated Science & Technology	Christopher	Bachmann	CEES EDUCATION AWARD	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1
Integrated Science & Technology	Christopher	Bachmann	ALGAE, POULTRY LITTER, ALTERNATIVE FUELS	0	0	0	1	0	0	0	0	0	0	1	0	1	0	1	0	1
Integrated Science & Technology	Christopher	Bachmann	25X25	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Integrated Science & Technology	George H	Baker	IIIA RESEARCH ON ENERGY EFFICIENCY AND ALTERNATIVE FUELS	0	0	0	1	0	0	0	0	0	0	1	0	1	0	1	0	1
Integrated Science & Technology	George H	Baker	HAZMAT INCIDENT PREVENTION	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Morgan	Benton	VWEC ONLINE WIND ENERGY CALCULATOR	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1	0	1
Integrated Science & Technology	Morgan	Benton	VWEC ONLINE WIND ENERGY CALCULATOR	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Integrated Science & Technology	Morgan	Benton	SPOTARIDE ONLINE RIDESHARING APPLICATION	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Thomas R	Benzing	SOUTH RIVER WATERSHED RESTORATION PROJECT	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	0	1

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				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Integrated Science & Technology	Thomas R	Benzing	MONITORING WATER TEMPERATURE TO IDENTIFY STREAMS FOR NATIVE BROOK TROUT RESTORATION	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1	0	1
Integrated Science & Technology	Thomas R	Benzing	CISAT RAIN GARDEN: SITE ANALYSIS AND CONSTRUCTION DESIGN TO IMPROVE CAMPUS WATER STEWARDSHIP	0	0	0	0	1	0	0	0	0	0	1	0	1	0	1	0	1
Integrated Science & Technology	Thomas R	Benzing	CHESAPEAKE 2000 IMPLEMENTATION, SHENANDOAH VALLEY PURE WATER FORUM STAFF SUPPORT	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1
Integrated Science & Technology	Thomas R	Benzing	CERTIFIED NUTRIENT MANAGEMENT PLANNER IN VIRGINIA	0	1	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1
Integrated Science & Technology	Zachary	Bortolot	JMU SUSTAINABLE BUSINESS PLAN COMPETITION	1	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1
Integrated Science & Technology	Zachary	Bortolot	PAPER ON USING REMOTELY SENSED IMAGERY TO MAP INDIVIDUAL ANIMALS	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	0	1
Integrated Science & Technology	Zachary	Bortolot	DEVELOPED A FREE PROGRAM FOR EXTRACTING ENVIRONMENTAL DATA FROM REMOTELY SENSED DATA.	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1
Integrated Science & Technology	Zachary	Bortolot	USE LIDAR DATA TO PRODUCE HIKING DIFFICULTY MAPS OF TRAILS IN PURCELL PARK	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	1

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				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Integrated Science & Technology	Zachary	Bortolot	USE CURRENT AND HISTORICAL AIR PHOTOS TO MAP FOREST COVER AND IMPERVIOUS SURFACES IN HARRISONBURG OVER THE PAST 50 YEARS	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	1
Integrated Science & Technology	Zachary	Bortolot	PROJECT TO MAP RED SPRUCE ECOSYSTEMS.	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	1
Integrated Science & Technology	Zachary	Bortolot	EXAMINING THE EFFECTS OF HEMLOCK DEATH ON FOREST ECOSYSTEMS.	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Robert	Brent	TOTAL MAXIMUM DAILY LOAD DEVELOPMENT	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Integrated Science & Technology	Robert	Brent	IMPACT OF DAMS ON DOWNSTREAM AQUATIC LIFE	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Jennifer	Coffman	RITUMA PATEL (PSY.D.; 2008) ENVIRONMENTAL BELIEFS AND VALUES: ETIOLOGY, MAINTENANCE, AND TRANSFORMATION	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Jennifer	Coffman	RESEARCH IN KENYA	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1	0	1

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				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Integrated Science & Technology	Jennifer	Coffman	(ANTHROPOLOGY; FALL 2008: 2 CREDIT HOURS) MOVING MOUNTAINS, ETHNOGRAPHIC TREATMENT OF THE MOUNTAIN JUSTICE MOVEMENT AGAINST MOUNTAIN TOP REMOVAL; (ANTHROPOLOGY; SPRING 2009: 3 CREDIT HOURS) GROWING GREEN? COMPARIN FARM THROUGHPUT ON TWO SMALL-SCALE LOCAL FAR	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	1
Integrated Science & Technology	Jennifer	Coffman	IAU LEADHER GRANT, USDA-RMA GRANT	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1
Integrated Science & Technology	Jennifer	Coffman	2 PEER-REVIEWED CO-AUTHORED JOURNAL ARTICLES, 1 ESSAY, 15 ENCYCLOPEDIA AND GREEN SERIES ARTICLES, SEVERAL SHORT COLUMNS -- VARIOUS DEGREES OF FOCUS	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	0	1
Integrated Science & Technology	Michael L	Deaton	WISE COUNTY WATER SUSTAINABILITY	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Michael L	Deaton		0	1	0	0	0	0	1	1	0	1	2	3	0	0	2	1	2
Integrated Science & Technology	Michael L	Deaton	MS THESIS - SHEN RIVER PHARMACEUTICAL POLLUTION	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1

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				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Integrated Science & Technology	Michael L	Deaton	MS THESIS - BIODIESEL MARKET DYNAMICS	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1
Integrated Science & Technology	Michael L	Deaton	BIO CHAR EFFECTIVENESS	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1
Integrated Science & Technology	Steven	Frysinger	REFERENCE MODEL FOR THE ORCHESTRA ARCHITECTURE	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	1
Integrated Science & Technology	Steven	Frysinger	ENVIRONMENTAL INFORMATION SYSTEMS; INVITED CHAPTER IN THE HANDBOOK OF ENVIRONMENTAL MANAGEMENT SYSTEMS, CHRISTIAN MADU (ED.), IMPERIAL COLLEGE PRESS, LONDON (IN PRESS).	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Integrated Science & Technology	Steven	Frysinger	ENGAGING STAKEHOLDERS IN ENVIRONMENTAL DECISION SUPPORT SYSTEM DEVELOPMENT: KEY PRINCIPLES WITH WATER RESOURCE MANAGEMENT EXAMPLES.S. P. FRYSINGER, N. W. T. QUINN. ICT FOR NATURAL RESOURCE MANAGEMENT. AMMAN, JORDAN, NOVEMBER 2009.	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1

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				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Integrated Science & Technology	Steven	Frysinger	COMPARATIVE RISK ASSESSMENT OF FRONT-END FUEL CYCLE FOR A FOSSIL-FUELED POWER PLANT AND A NUCLEAR POWER PLANT.MATTHEW TAKANE AND REBECCA GAGLIOSTRO. SENIOR THESIS, MAY 2008 (PRIMARY ADVISOR).	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Steven	Frysinger	COATZACOALCOS RIVER INFORMATION SYSTEM.FRANKLIN TORRES, INSTITUTO MEXICANO DEL PETRÃ³LEO, MEXICO CITY, MEXICO, IN-PROGRESS (PH.D. CONSULTING ADVISOR).	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1
Integrated Science & Technology	Steven	Frysinger	A COMPARATIVE ANALYSIS OF PUBLIC ATTITUDES TOWARD WIND ENERGY IN GERMANY AND THE UNITED STATES.LAURA PAGLIARULO, JMU ISAT, MAY 2008 (COMMITTEE MEMBER).	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	John R	Gentile		0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	John R	Gentile	CONSULTANT WITH USFS	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1

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Integrated Science & Technology	Amy	Goodall		1	1	0	0	1	0	1	1	0	2	3	4	0	1	3	2	5
Integrated Science & Technology	Paul Bowman	Goodall	SOLAR COOKER FOR TANZANIA	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1
Integrated Science & Technology	Paul Bowman	Goodall	CELLULOSIC ETHANOL	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Ming	Ivory		0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Ming	Ivory	PHARMACEUTICALS IN WATER SUPPLY	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Cynthia A	Klevickis	SENCER FELLOWSHIP	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1
Integrated Science & Technology	Cynthia A	Klevickis	PRESENTATIONS AT SENCER CONFERENCES	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1
Integrated Science & Technology	Carole	Nash	VIRGINIA RENEWABLES SITING SCORING SYSTEM,	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Integrated Science & Technology	Carole	Nash		0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Carole	Nash	SHENANDOAH NATIONAL PARK/CULTURAL-ENVIRONMENTAL HISTORY AT MOUNT VERNON FURNACE	0	0	0	1	0	0	0	0	0	0	1	0	0	1	1	0	1

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				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Integrated Science & Technology	Carole	Nash	PHD DISSERTATION, ARCHAEOLOGY/LANDSCAPE ANALYSIS/LONG-TERM CULTURE-ENVIRONMENT INTERACTION	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Integrated Science & Technology	Carole	Nash	NATIVE AMERICANS, PLANTS AND MOUNTAIN EVNRIONMENTS	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Integrated Science & Technology	Carole	Nash	(GEOG 490), LIVING WITH LIONS: USING GPS TO TRACK LION MOVEMENT; (GEOG 490) DEER IN THE URBAN SETTING	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Carole	Nash	EXHIBIT: HUMAN-ENVIRONMENT INTERACTION AT WINTERGREEN	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Integrated Science & Technology	Maria C	Papadakis	VIRGINIA RENEWABLES SITING SCORING SYSTEM	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Integrated Science & Technology	Maria C	Papadakis	VIRGINIA PILOT FARM ENERGY PROGRAM	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Integrated Science & Technology	Maria C	Papadakis	SHENANDOAH SOUTH FORK RAPID WATERSHED ASSESSMENT	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Integrated Science & Technology	Maria C	Papadakis	ECONOMIC IMPACTS OF FISHKILL	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Integrated Science & Technology	Maria C	Papadakis	DORMITORY GREENHOUSE GAS MITIGATION PROJECT	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Integrated Science & Technology	Maria C	Papadakis	ISAT SENIOR PROJECTS	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	1

Appendix A. Table A2. Survey Results for JMU Research with a Sustainability Focus.

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Integrated Science & Technology	Maria C	Papadakis	MASTER'S THESES	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Mary	Tacy	OVERFISHING ON LA GONAVE, HAITI	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Integrated Science & Technology	Mary	Tacy	ALTERNATIVE ENERGY USE ON LA GONAVE, HAITI	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Integrated Science & Technology	Jeffrey	Tang	UNPEPP & ALTERNATIVE FUEL MINI BAJA VEHICLE	0	0	0	0	0	0	1	0	0	0	1	0	1	0	1	0	1
Integrated Science & Technology	Jeffrey	Tang	UNIVERSITY NATIONAL PARK EDUCATIONAL PARTNERSHIP PROGRAM (UNPEPP)	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1
Integrated Science & Technology	Jeffrey	Tang		0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Anthony A	Teate	WIRELESS SENSOR NETWORKS FOR ENVIRONMENTAL MONITORING	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1
Integrated Science & Technology	Anthony A	Teate	WIRELESS MONITORING OF ENERGY USAGE	0	1	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1
Integrated Science & Technology	Anthony A	Teate	USING RFID TECHNOLOGY TO DYNAMICALLY TRACK HARRISONBURG TRANSIT BUSES; GPS TRACKING SYTEM FOR THE HARRISONBURG TRANSIT BUSES	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1	0	1

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Integrated Science & Technology	Anthony A	Teate	USING RFID TECHNOLOGY TO DYNAMICALLY TRACK HARRISONBURG TRANSIT BUSES	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1	0	1
Integrated Science & Technology	Anthony A	Teate	SUSTAINABLE-RENEWABLE ENERGY AND ENVIRONMENTAL IMPACT; JMU RIDESHARE	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Anthony A	Teate	RFID TECNOLOGY - POST DISASTER RECOVERY	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1	1
Integrated Science & Technology	Anthony A	Teate	MINI-GRANTS	1	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1
Integrated Science & Technology	Wayne Stephen	Teel	LOCAL ALTERNATIVE AGRICULTURE	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1
Integrated Science & Technology	Wayne Stephen	Teel	KANAR HAMZA - DESERTIFICATION IN IRAQ, ONGOING	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Wayne Stephen	Teel	CHESAPEAKE BAY PROGRAM	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1
Integrated Science & Technology	Wayne Stephen	Teel	BIOCHAR - CARBON SEQUESTRATION	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1
Integrated Science & Technology	Wayne Stephen	Teel	SENIOR PROJECTS	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1	0	1
Integrated Science & Technology	Wayne Stephen	Teel	AFRICAN ENVIRONMENT	0	0	0	1	0	0	0	0	0	1	0	1	0	0	1	0	1
Integrated Science & Technology	William Gene	Tucker	TREATMENT OF ACID MINE DRAINAGE	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1	0	1

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Integrated Science & Technology	William Gene	Tucker	RADON IN HOMES	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1
Integrated Science & Technology	William Gene	Tucker	SENIOR PROJECTS	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1	1
Integrated Science & Technology	Mohamed Y	Zarrugh		0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Integrated Science & Technology	Mohamed Y	Zarrugh	SEVERAL PROJECTS WERE COMPLETED ON ENVIROMENTALLY-CONCIOUS MANUFACTURING	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1	1
Integrated Science & Technology Total				9	6	3	7	6	8	17	10	30	44	52	53	16	27	77	19	96
Kinesiology	Mikel Kent	Todd	ELECTONIC MEDIA IMPACT ON DIET AND EXERCISE BEHAVIORS	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	1
Kinesiology Total				0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	1
Management	William	Ritchie		1	0	1	0	0	0	0	0	0	2	0	2	0	0	0	2	2
Management	Qingjiu	Tao	IMVP RESEARCH	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	1
Management Total				1	0	1	0	0	0	0	0	1	3	0	2	0	1	0	3	3
Mathematics & Statistics	Hasan	Hamdan		0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Mathematics & Statistics	Hasan	Hamdan	CONSULTING	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Mathematics & Statistics	Nusrat	Jahan	UNDERGRADUATE BIO/MATH PROGRAM	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	1

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Mathematics & Statistics	Nusrat	Jahan	MICROARRAY PROJECT RELATED TO SALMONELLA	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1
Mathematics & Statistics	Samantha	Prins		0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	1
Mathematics & Statistics	Samantha	Prins	REU	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	1
Mathematics & Statistics	Charles David	Pruett	BOOK WRITING	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1
Mathematics & Statistics	James Stanley	Sochacki	REU	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	1
Mathematics & Statistics			SURVEY TO ASSESS USE AND FEATURES OF ELECTRIC-ASSISTED BICYCLES	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	1
Mathematics & Statistics			MULTI-DISCIPLINARY GROUP DESIGNED COMPETITION TO PROMOTE STEM AND USE OF ELECTRIC-ASSISTED BICYCLES	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	1
Mathematics & Statistics Total				0	0	0	2	0	0	1	2	5	3	7	4	0	6	4	6	10
Media Arts & Design	Dietrich	Maune	CREATIVE- PAINTING AND DRAWING	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	1	1
Media Arts & Design	Thomas J	McHardy		0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	1
Media Arts & Design Total				0	0	0	1	0	0	0	1	0	0	2	2	0	0	0	2	2
Music	Charles William	Rice		0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1
Music Total				0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1
Office Of Equal Opportunity	James	Robinson		1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Office Of Equal Opportunity Total				1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1
Philosophy & Religion	Iain	MacLean		1	0	1	0	0	0	0	0	0	2	0	2	0	0	0	2	2
Philosophy & Religion	Iain	MacLean	ENCYCOLPEDIA ENTRIES	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1
Philosophy & Religion Total				1	0	1	0	0	0	0	0	1	2	1	3	0	0	0	3	3
Physics & Astronomy	Gabriel	Niculescu	REMOTE TEMPERATURE MONITORING, DATA LOGGING AND ANALYSIS	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Physics & Astronomy	Gabriel	Niculescu	PORTABLE SYSTEM FOR DETECTING AND/OR MONITORING RADIATION PRESENCE AND/OR CONTAMINATION	0	0	0	1	0	0	0	0	0	0	1	0	0	1	1	0	1
Physics & Astronomy Total				0	0	0	1	0	0	0	1	0	0	2	1	0	1	2	0	2
Political Science	Jessica	Adolino		0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1
Political Science	Charles Henry	Blake	BOOK ON LATIN AMERICAN POLITICS	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1
Political Science	Charles Henry	Blake	BOOK ON COMPARATIVE PUBLIC POLICY	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Political Science	John	Scherpereel	STUDENT THESIS: EXPLAINING VARIATION IN ENVIRONMENTAL LEADERS, LAGGARDS	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	1	1
Political Science Total				0	0	0	0	1	0	0	0	3	3	1	4	0	0	1	3	4

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Psychology	Pamela R	Gibson	SEVERAL ARTICLES ON THE LIFE IMPACTS OF HAVING MULTIPLE CHEMICAL SENSITIVITY, A DISABILITY THAT APPEARS TO BE INITIATED BY CHEMICAL EXPOSURE	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	0	1
Psychology	Pamela R	Gibson	RESEARCH TEAM	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Psychology	Ulas	Kaplan		0	0	0	0	0	0	0	1	1	0	2	2	0	0	0	2	2
Psychology Total				0	0	1	0	0	0	0	2	1	1	3	4	0	0	2	2	4
Research And Public Service	Kenneth F	Newbold	VIRGINIA CLEAN CITIES	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	1
Research And Public Service	Kenneth F	Newbold		1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1
Research And Public Service	Kenneth F	Newbold	PROPANE CONVERSION PROJECT	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	1
Research And Public Service	Kenneth F	Newbold	25X'25 DEMONSTRATION PROJECT	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	1
Research And Public Service Total				1	0	0	0	0	0	0	0	3	1	3	0	0	4	4	0	4
Social Work	Karen A	Ford	THE RMH COLLBORATIVE AND THE "FARM"	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Social Work Total				0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1
Sociology & Anthropology	Benjamin	Brewer	STUDENT THESIS	0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	1
Sociology & Anthropology	Benjamin	Brewer	I READ IN THE AREAS OF ENVIRONMENT, DEVELOPMENT, FOOD AND AGRICULTURE (FOR POSSIBLE FUTURE RESEARCH)	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
Sociology & Anthropology	Joseph	Rumbo	ACADEMIC PAPER ON SUSTAINABLE CONSUMPTION GROUP	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	1	1
Sociology & Anthropology Total				0	0	0	1	1	0	0	0	1	1	2	3	0	0	2	1	3
Speech Communication Studies	Alison	Fisher	SOLAR INSTALLATION	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	1
Speech Communication Studies	Alison	Fisher	ROCKY MOUNTAIN COMMUNCATION REIVEW (OCT 2009)	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	1	1
Speech Communication Studies	Alison	Fisher	EARTH CLUB ADVISOR	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1
Speech Communication Studies	Alison	Fisher	DISSERTATION RESEARCH AWARD	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1
Speech Communication Studies	Brian	Kaylor		0	0	1	0	0	0	0	1	0	1	1	2	0	0	1	1	2
Speech Communication Studies Total				1	0	2	0	0	0	0	1	2	2	4	4	1	1	3	3	6
Student Health Services	Caroline	Campbell	UHC PROFESSIONAL DEVELOPMENT	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1
Student Health Services Total				0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1
University Studies	Johnathan	Walker	SOLAR ENERGY GENERATION	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	1
University Studies	Johnathan	Walker	RECYCLING RESEARCH	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	1
University Studies	Johnathan	Walker	RAINWATER COLLECTION SYSTEM	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	0	1

DEPARTMENT	FIRST NAME	LAST NAME	PROJECT	TYPE									STATUS		FUNDING			FOCUS		TOTAL
				AWARDS	PROFESSIONAL	JOURNAL	SUMMER	HONORS	MASTERS	SENIOR	UNDERGRADUATE	OTHER	FACULTY	STUDENT	NON FUNDED	INTERNALLY FUNDED	EXTERNALLY FUNDED	MAJOR FOCUS	MINOR FOCUS	
University Studies	Johnathan	Walker	POPULATION IMPACT STUDY	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1
University Studies	Johnathan	Walker	INVASIVE SPECIES IN AGRICULTURE	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1
University Studies	Johnathan	Walker	ECO-TOILET USE	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1
University Studies Total				0	0	0	0	0	0	1	1	4	0	6	4	2	0	6	0	6
Writing, Rhetoric, & Technical Communication	Katherine	Kessler	"A TASTE OF THE APPALACHIAN TRAIL" HONORS SEMINAR	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	1
Writing, Rhetoric, & Technical Communication	Elizabeth Ruth	Pass	ENVIRONMENTAL IMPACT STATEMENTS	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	1
Writing, Rhetoric, & Technical Communication Total				0	0	0	0	0	0	0	0	2	1	1	1	1	0	2	0	2
GRAND TOTAL				**19**	**20**	**24**	**22**	**17**	**13**	**24**	**38**	**90**	**118**	**149**	**153**	**29**	**85**	**188**	**79**	**267**