

**Campus Strategic Planning Phase III
Self-Assessment of the Department of Geosciences
University of Massachusetts, February 2015**

I. Introduction and Background

Defining the Geosciences Today

Where we live – our environment – impacts who we are, how we interact with other people and communities, and how we use and conserve resources. In the **Department of Geosciences**, we explore Earth’s past and present. We use relevant and rigorous skills to address the key environmental and economic challenges that human society is facing today. We study environments and structures on and in the Earth, how these formed, how they are changing and human’s role in change and its transformation. We examine the inter-relationships between the environment and human societies, economies, and cultures. Earth’s history, Earth’s future - together these define our academic/applied discipline and our place in it.

Faculty

The Department of Geosciences is home to established faculty with international reputations who work alongside talented “rising stars” who broadened our expertise, particularly in biogeochemistry, numerical modeling, seismology, modern processes, and Geographic Information Science. We now have the same number of tenure-track faculty (19) that we had a decade ago, but the research composition of the faculty has changed dramatically, influencing our program goals and our future trajectory. Our ranks now also include 3 Extension faculty and 2.5 lecturers. We are globally diverse with an exceptionally high percentage of female faculty (9 women : 17 men) in a field traditionally dominated by men. As a result of a 2012 AQAD review, we redefined our department into four fundamental, but exciting areas of expansion and strength in the Geosciences. These principal research themes maintain our national and international prominence as an outstanding faculty in:

(1) Earth Dynamics

(Cooke, Condit, Gao, Jercinovic, Rhodes, Seaman, Williams)

(2) Global Climate Change and Surficial Processes

(Bradley, Brigham-Grette, Burns, Castañeda, DeConto, Larsen, Leckie, Petsch, Rawlins, Salacup, Woodruff)

(3) Water and the Environment

(Boutt, Clement, Hatch, Mabee (state geologist), Petsch, Vogel)

(4) Geography, Society and Environment

(Gaubatz, Stevens, Vogel, Yu)

Our position within the College of Natural Sciences creates enormous opportunities for teaching and research synergies with other physical and, environmentally oriented departments, particularly Environmental Conservation. But we also share valuable collaborations with Chemistry, Computer Science and Civil Engineering. At the same time our Geography faculty share intellectual space with faculty in Economics, Landscape Architecture and Regional Planning, Anthropology, History, the Center for Public Policy and Administration, as well as Civil Engineering and Environmental Conservation. As a department we are proud of the success and visibility of the *Massachusetts Geological Survey*, the U.S. Department of the Interior-sponsored

Northeast Climate Science Center and joyfully anticipate the addition of the *State Climatologist office* to our home in Morrill Science Building. We value the prospect of forming a cross-campus *School of the Earth, Sustainability and the Environment* and are actively engaged in discussions to frame out the merits of this proposal.

The Department of Geosciences serves as an institutional home for two distinct academic fields, geography and geology, each of which has its own degree programs and faculty. The department offers PhD degrees in Geosciences, MS degrees in Geography and Geosciences, BS degrees in Geology, Earth Systems, and Geography and BA degrees in Geography, Environmental Geography, and Geology. The department also shares the Environmental Science BS program with the Department of Environmental Conservation. Geosciences also makes a substantial contribution to the university-wide general education program, with critical and high-enrollment Gen-Ed courses in oceanography (PS), geology (PS), physical geography (PS), world environmental issues (SB), human geography (SB,G), world regional geography (SB,G), natural disasters (SI) and urban geography (SB). Although there are fruitful synergies between these two fields that we maximize at UMass, these disciplines have separate cultures and measures of success and are usually housed in separate departments. None of the eleven peer institutions identified by the Provost have a joint geology-geography department. As one of the few ‘geology and geography’ programs in the country, the Department of Geosciences provides students of the University of Massachusetts with opportunities to explore some of these issues with a faculty who are actively engaged in research that is relevant to these issues.

Because the prompts for the “self study” ask us to evaluate “where we stand” as disciplines, the geographers have assessed the geography program separately from geology/geosciences, because they feel strongly that geography is a distinct and significantly different field from geology. ***Thus this document incorporates two distinct “Looks in the Mirror” and two distinct “Improving the undergraduate experience” sections.*** Moreover, geography is otherwise a stand-alone, PhD granting department in 10 of the 11 peer institutions identified by the Provost (the University of Michigan has neither a geography department nor geography degree programs). Importantly, research and scholarly productivity metrics provided by OIR do not make a distinction between our disciplines, rather we are shown as one Department of Geosciences.

II. The Geology Program “Look in the Mirror”

1. Investment of Choice – graduate education, intellectual mission & scholarly recognition.

A. Geology and Geosciences at UMass – our place in the discipline (not otherwise addressed above):

The Geology and Earth science faculty in our department are national leaders in the areas of Global Climate Change and Solid Earth Processes. Our faculty are unanimously active in research (no dead wood) and our grant funding has been steadily increasing. We are publishing in the best journals in our fields with very high citation indices. Many of our faculty serve in national and international leadership roles in organizations ranging from the National Academy of Sciences, the American

Geophysical Union to the Geological Society of America. Compared to 130 other PhD granting programs weighed nationally in these surveys toward geology and the geosciences (not geography), 84% of our UMass faculty hold grants compared to 71% nationally. This value of 84% is higher than any other department in CNS with the exception of Biochemistry with which we are on par. Our faculty also bring to campus on average \$258k/faculty member compared to \$185k among these other institutions. Likewise our citations/faculty member are stronger (174/faculty member vs 104) among this same cohort. US News & World Reports lists UMass Amherst Geosciences at 49th, equal with Rutgers, but superior to UConn (#117), Univ of Florida (#54), and a few others. Adjusted for inflation, our research expenditures are consistently about \$2.25M per year with most of our funding derived from a healthy mix of federal (NSF, DOE, NASA, NOAA etc) and State sources (Figure 1). The ratio of Ph.D. to M.S. students is rising, which strengthens our research portfolio, although the most marketable degree in the Geosciences is at the M.S. level in terms of hire numbers. We added a Professional M.S. degree in Geohydrology/Hydrogeology and plan for expanding that program to a sustainable level.

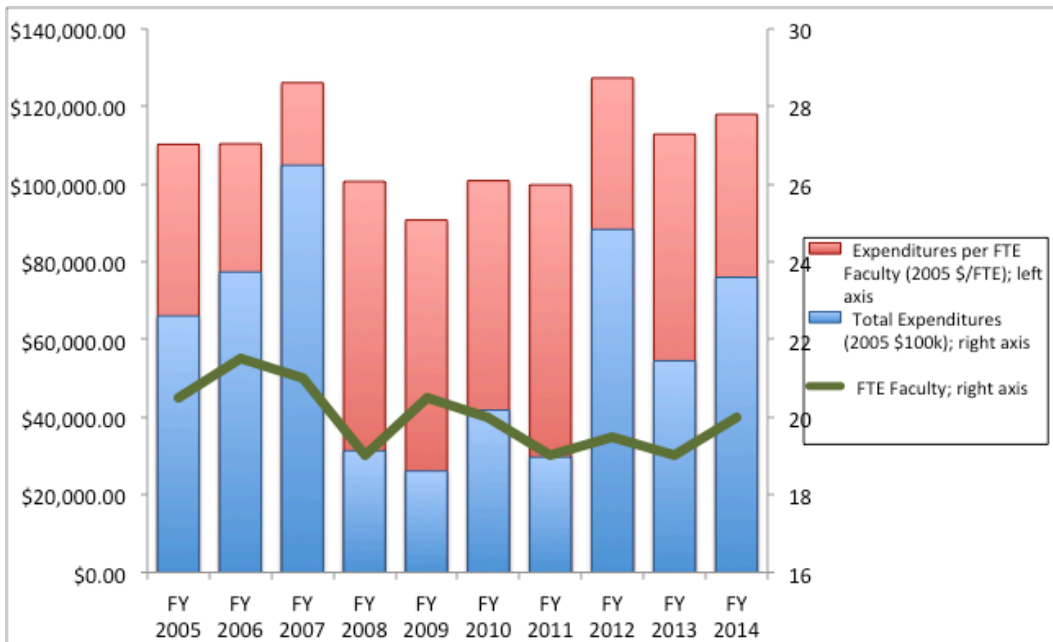


Figure 1. 10 year trend in Geosciences research expenditures and full-time faculty. Note that while expenditures have remained nearly constant, total FTE faculty has decreased.

The interest and need for Geosciences training and education is accelerating. A number of reports issued recently describe a trend of a growing job market, but not enough qualified people to fill the positions. The hydrocarbon industry, hydrogeology and environmental firms, and mining companies are all growing as the demand for natural resources are increasingly acute. Pressing global issues lie at the interface of geology, Earth system science and our colleagues in human geography, such as, 1) global climate change and its impacts on societies and the physical environment, 2) the quantity and quality of drinking water, 3) natural hazards in coastal and tectonically active regions, and 4) the impact of human activities on our environment, its sustainability, and human health. These are surging global concerns.

The department programs in geology and geosciences provide research and teaching synergies campus wide but particularly across most of CNS and Engineering including Environmental Conservation, Chemistry, Computer Science, Civil/Environmental Engineering, and Microbiology. We developed and now operate the world's most powerful electron microprobe to carry out new geologic dating techniques. We are soon to launch innovative new software for community based seismic fault prediction to better understand fault mechanics. We are world-renowned for paleoclimate and Quaternary research involving all aspects of the surficial Earth as a system. This specialty has been significantly enhanced in recent years to include major investments in biogeochemistry and stable isotope and sediment geochemistry, as well as climate modeling on all times scales. We aspire to be the new home of a major S&T center for Computational Paleoclimate Modeling. We are also home to a range of research areas focused on water resources, hydrogeology, and ground water modeling with strong connections with UMass Extension and the Massachusetts Geological Survey. Critical issues of sustainability and environmental quality lie at the interface of basic and applied research.

B. Attractiveness and Competiveness for Graduate Education – Students from across the US, Europe and Asia are attracted to UMass because of our outstanding reputations in structural geology, mineralogy, volcanology, speleothems, biomarkers proxies, paleoclimate reconstructions, climate dynamics and the history of the Polar regions. At the same time we are also balanced with world-class programs in paleoceanography, coastal processes and the geologic history of coastal flooding from tsunamis and hurricanes. As a bonus to all this expertise we are also proud of our authentic reputation for collegiality and a love of fieldwork. Prospective students who visit commonly say we seem like a happy department.

C. Admissions Target – Our targets for graduate admissions fluctuate but we typically aim for a new class of about 10-15 new graduate students per year depending on grant success rates and teaching assistantships. Ideally we aim for >50% Ph.D. students but this is rarely achieved. We also have a severe challenge related to the low number of teaching assistants we can support. This negatively impacts our undergraduate curriculum in class size, number of sections and possibilities for inquiry-based experiential learning. It also negatively impacts our capacity to attract and recruit highly qualified graduate students. Our 1-year masters program is still in its infancy with only 5-7 students enrolled without any concerted program advertisement.

D. Completion to Degree – We aim to graduate our M.S. students in 2-3 years. and our Ph.D. in ~5 years. We admit to having an annual faculty conversation about a small cohort of students who, for a variety of strong reasons, take 6-7 years. Those in the later category are typically students who leave campus to take a job before completion of the dissertation.

2. Destination of Choice – Undergraduate Education Mission

A. Program Attractiveness for Geology and the Geosciences

The Department of Geosciences at UMass hosts the premier undergraduate programs in geology and earth systems at a public university across New England. Undergraduates benefit from instruction and interaction with a large, diverse and

research-active faculty. The undergraduate Geology program at the University of Massachusetts Amherst is known for the breadth of its major course requirements, for its strong background in the supporting sciences, for its emphasis on field experiences, for its versatility in upper-level opportunities, and for its encouragement of all undergraduates to participate in research activities alongside faculty and graduate students. We are committed to providing a strong basic education that prepares our majors for either graduate study or for post-baccalaureate career paths that include environmental consulting, resource management and sustainability, hydro-geosciences, mining geology, and energy geosciences (hydropower, geothermal, fossil fuels). We have a highly successful program with a loyal and diverse alumni base that includes representatives from a remarkable variety of geology-related professions.

Few incoming undergraduates self-identify as Geology or Earth science majors. This is due in part to limited visibility for Earth Science both in the Commonwealth's grade school curriculum (student take Earth science in 8th grade or in 9th grade as part of an Environmental sciences course; c.f. STEM education in life science, physical science and math) and public perceptions of job and career potential in the discipline (few geologists in New England hold a job title that includes the word 'geologist'). However, there has been a steady increase since 2003 in the number of UMass applicants seeking to be geosciences majors, indicating that more high-school students are considering Geosciences majors at UMass. Early attraction and recruitment to the major is a common problem among geosciences programs nationally, especially in states such as Massachusetts without a strong history of careers in resource extraction (oil, coal, mining, etc.). Students "find" our majors during their first, second (or in rare cases) third years, commonly after taking one of our large-enrollment GenEd courses. It is in our introductory courses where students can first realize the career potential in the geosciences and the job satisfaction of working on a range of issues from geologic hazards to valuable resource extraction and sustainability. Once declared, our majors stay in their major.

The various disciplines of earth science have been challenged to reach out to diverse communities (URM, first-generation students, low SES, etc.), and the UMass Geosciences department is participating in national conversations about this (e.g. www.jsg.utexas.edu/events/future-of-geoscience-undergraduate-education/). There is an opportunity for Geosciences to better coordinate with CNS and UMass-wide leaders in diversity and recruitment about our message of an education that leads to professional careers in fields that support healthy environments and sustainable resources.

B. Overall Program Effectiveness

The undergraduate Geology program is extremely well regarded by both current and former students. Our undergraduate degree programs have among the **highest ratings UMass-wide** for the following: overall student satisfaction with their major; students' perceptions of meaningful contact with faculty; quality of teaching; and access to classes. Retention of our majors is well above the average among UMass science majors, as are our 4- and 6-year graduation rates. Nonetheless, recent meetings of the Geology Curriculum Committee, discussions during faculty meetings, review of OIR data, and advice from our alumni indicate several initiatives we can take to improve the undergraduate experience and success in the Geology majors. Ratings such as career preparation, writing preparation, and faculty accessibility provide opportunities for improvement. Specifically, Geosciences needs to re-evaluate its participation in the

JYW program and other avenues for integrating career preparation and writing preparation into courses across our curriculum. These improvements are also outlined in our “undergraduate experience” document.

C. Student Engagement

The geology major has a strong tradition of intensive, individualized advising of our majors with a focus on courses and scheduling, and less emphasis on career preparation and pre-professional training. This is reflected in very high ratings by students in quality of advising, interactions with faculty, and faculty concern for

academic progress. We are working to do more comprehensive advising that includes career preparation. Recent efforts through the alumni events, the State Geologist Office, geosciences extension faculty and the emerging State Climatologist Office serve to illuminate career paths and career preparation for our undergraduates, and we expect to see positive results of these efforts to make our advising efforts even stronger and more comprehensive emerge in coming years. One challenge that Geosciences faces is combining our competency in geology-major advising with a growing responsibility for advising and teaching in the Environmental Science major (Figure 2). In Fall 2014 there were 56 declared geology majors and 249 declared Environmental Science majors.

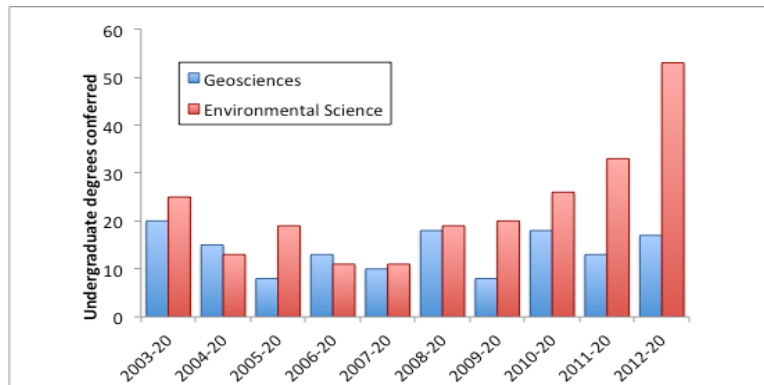


Figure 2. 10 year trend in number of undergraduate degrees awarded in Geosciences (combining geology, geography and earth systems) and in Environmental Science. Geosciences shares advising responsibility with Environmental Conservation for the Environmental Science majors.

Geosciences teaches proportionally more sections of upper-level courses relative to lower-level courses compared to other UMass departments. Other departments in CNS and UMass seem to teach more sections of lower-division courses with fewer students per section, while Geosciences focuses on single, large-enrollment sections of our introductory and service courses. This creates a large division in the student experience in Geosciences between majors and non-majors. **Our majors receive most of their instruction in the major in courses with much lower student:faculty ratios than is typical for UMass.** Over 85% of our General Education “service” courses, however, are taught to non-majors, primarily in large enrollment courses. Geosciences has a much greater reliance on single-section large-enrollment introductory/service courses than is typical for UMass and for other geoscience programs at peer institutions. Moreover, **Geosciences relies much less on non-tenure-track faculty (i.e. lecturers)** for undergraduate teaching than other CNS departments and other geosciences programs at peer institutions. While most UMass departments have increased their teaching by non-tenure track faculty from 2004 to 2013, Geosciences has not. Thus our priority for upper-level courses characterized by small-class-size; hands-on, experiential and field-based learning; with many opportunities for student engagement with faculty in research have yielded a majors population very satisfied with their experience. Geosciences needs to consider how to translate this very effective experience for our majors into service/Gen-Ed education in lower-level courses; increasing instructional staff (i.e. lecturers) whose primary focus is introductory teaching may be a possibility.

D. Teaching Effectiveness

We are a department of excellent, award-winning teachings employing evidence-based approaches for effective pedagogy and engaged in national conversations about undergraduate geoscience education. Undergraduate student satisfaction with our teaching is very high. Students rate the **quality of teaching** in their Geosciences major higher than one standard deviation above the UMass mean in the 2013 Senior Survey; this rating has routinely been higher than one standard deviation above the UMass mean (7 of 10 years) since 2004, and is **also commonly the highest rating for any program in CNS**. One challenge faced by Geosciences is to ensure that this high satisfaction extends throughout our undergraduate offerings. Geosciences contributes activity to the general education program, offering each year approximately 12 class sections enrolling an average of 1700 students.

E. Student Outcomes

Students, especially geoscience majors in upper-level courses, rate their learning experience very highly “faculty accessibility”, “quality of teaching”, “faculty concern for progress”, “access to classes”, “connections to rest of academics”, and “overall experience”. Students have identified that connections of their education with job- or work-related skills could be strengthened, as could technical writing preparation. Student engagement in research activities is very strong and encouraged in Geosciences, with approximately 1/3 of all majors enrolled in formal 496 research-based independent studies each semester. Compared to other CNS majors, Geosciences majors are slightly less likely to report continuing with graduate school following graduation and have slightly lower percentages with secured employment following graduation. The Geosciences curriculum committee is making efforts to ensure that learning objectives that connect with career preparation and real-world skills are articulated in each of our course offerings.

F. Effective Use of Resources.

Geosciences faculty teach more class sections and larger numbers of students than is typical for either other CNS departments (Figure 3) or for Geosciences programs at peer institutions. While reducing class size and numbers of class sections to be more on par with our peers may improve the undergraduate experience and contribute to increased faculty research productivity and increased opportunities for student engagement in research, Geosciences is challenged as a small department in ensuring regular course offerings for our majors and GenEd population. Reducing our course offerings by tenure-stream faculty may need to be matched by an increased reliance on non-tenure-stream instructors. As described above, UMass Geosciences has been reluctant to have heavy reliance on non-tenure-track instructors, as we feel it is very important for students to engage in learning with active practitioners of the science (i.e. research-active, tenure-track faculty). However, this is an ongoing conversation, and we may find an evolution towards greater numbers of lecturers a necessity.

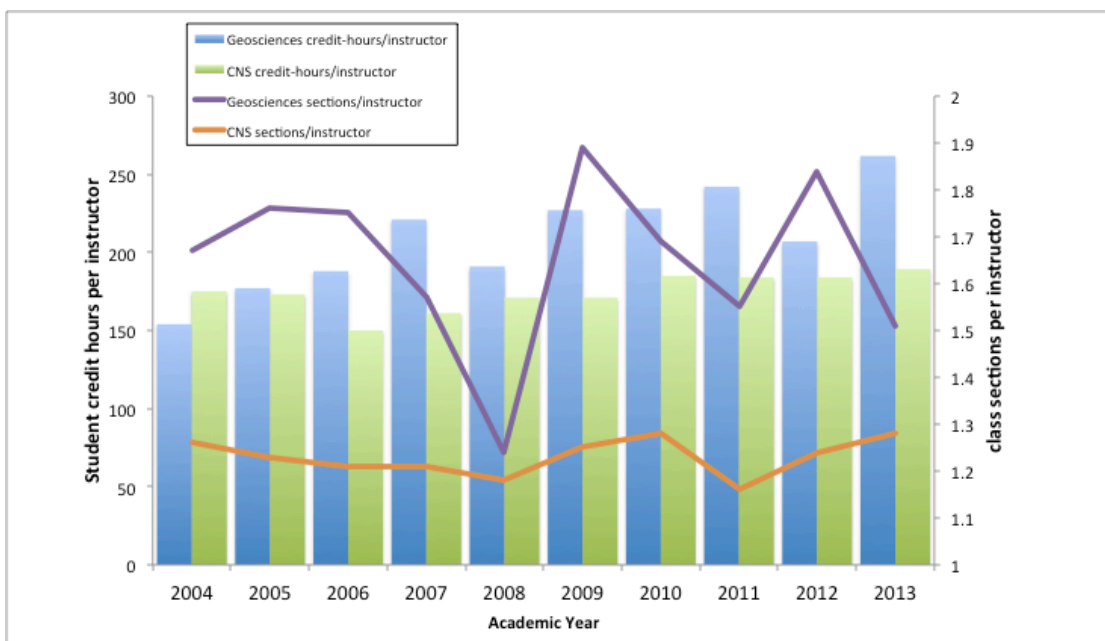


Figure 3. 10 year trend in student credit hours per instructor and class sections taught per instructor, comparing Geosciences with average for College of Natural Science (tenure-track faculty only). Geosciences consistently teaches more students and more class sections than our peer departments in CNS.

G. Diversity and inclusion

Entering students in Geosciences majors in 2013 (10 students total, 7 US resident, 2 non-resident alien, 1 not reporting) were 70% male/30% female, 71% white (29% underrepresented minorities). Entering students in CNS as a whole were 53% female, 69% white (14% under represented minorities, 16% other ALANA). Geosciences is similar to other physical sciences in gender distribution, and is highest in the college for % of underrepresented minorities.

Since 2004, the gender distribution of entering students has varied from a low of 17% to a high of 63% with no trend through time. The percent of students reporting ALANA has commonly been 0%, with the 2013 value of 29% being the highest the department has seen.

60% of entering students in Geosciences majors in 2013 were in-state, 30% out-of-state and 10% international. Compared to CNS as a whole, Geosciences has more out-of-state and international students as a percent of entering students. The percentage of total Geosciences undergraduates as in-state, out-of-state and international are similar to CNS and campus as a whole. There has been little variation or trend in Geosciences undergraduate residency since 2004.

III. Improving the Undergraduate Geology Experience

The undergraduate Geology program at the University of Massachusetts Amherst is known for the breadth of its major course requirements, for its strong background in the supporting sciences, for its emphasis on field experiences, for its versatility in upper-level opportunities, and for its strong encouragement of

undergraduates to participate in research activities alongside faculty and graduate students. We are committed to providing a strong basic education that prepares our majors for either graduate study or for post-baccalaureate career paths that include environmental consulting, resource management and sustainability, hydrogeosciences, mining geology, and energy geosciences (hydropower, geothermal, fossil fuels). We have a highly successful program with a loyal and diverse alumni base that includes representatives from a remarkable variety of geology-related professions.

The undergraduate Geology program is well regarded by both current and former students. Our undergraduate degree programs have one of the highest ratings of overall student satisfaction with their major on the UMass-Amherst campus, and among the highest ratings for students' perceptions of meaningful contact with faculty, quality of teaching, and access to classes. Nonetheless, recent meetings of the Geology Curriculum Committee, discussions during faculty meetings, review of OIR data, and advice from our alumni indicate several initiatives we can take to improve the undergraduate experience and success in the Geology majors. Ten of these are described below:

1. Strengthening connections between curriculum and careers.

Students have identified that career preparation and acquisition of job-related skills are high priorities, and in spite of extremely high overall satisfaction with their geology major, our program could do more to make explicit the connections between the skills, concepts and competencies in our curriculum, and application of these in geology-related careers. To that end we would like to better develop and formalize a network of successful alumni to engage with our undergraduates, through campus visits and career prep/guidance sessions, a database of internship and employment opportunities, and simple alumni modeling of successful geology scholarship and careers. We seek to procure funding that would allow us to invite successful alumni to campus to speak with our undergraduates, to review students' resumes, and to network with students. Increased networking with alumni might also open up new internship and employment opportunities for geology majors. This initiative will address Points #2 (overall program effectiveness), #3 (student engagement), #7 (diversity, inclusion and access), and #9 (outreach and community engagement) in establishing the UMass geology program as a "Destination of Choice: Undergraduate Education".

2. Improving practice of scientific writing skills.

The geology program currently participates the CNS college-based Junior Year Writing course, while in the past the program offered its own JYW writing course. Student feedback indicates geology majors would like to have a greater focus on geoscience-specific topics, skills and applications of technical/professional writing in the JYW and other courses. We do not currently have the available faculty to committee to teaching a geology-only writing course. We have discussed the possibility of creating a 1-credit course geared toward geoscience-specific skills and topics that could emphasize geology-oriented science writing, writing a press release, communication to the public, and career-related skills. It may also be beneficial to have increased interaction with the instructors of the CNS writing course and possibly have a geology faculty member participate in the course during part of the semester. This initiative will address Points #2 (overall program effectiveness), #3 (student engagement), #4 (teaching contributions and effectiveness), #5 (student outcomes), #6 (effective use of resources) in establishing the UMass geology program as a "Destination of Choice: Undergraduate Education".

3. Upgrading introductory teaching laboratory facilities.

Expansion of research labs in Morrill South has consumed former classroom space. While our research breadth and power have expanded, the space occupied by our department has not expanded, and as a result, we have lost three classrooms. We have been forced to move our introductory geology laboratory, from which we gain most of our majors, to a very substandard classroom in Hasbrouck. This room, while adequate for a small-enrollment lecture or discussion section, is inappropriate for a teaching laboratory in a physical science course! Moreover, its location in Hasbrouck separates the 100-level student experience in geology from the remainder of the program located in Morrill. And finally, one single teaching laboratory reduces student access to introductory geology courses, limiting opportunities for student participation in the major and importantly, in the general education curriculum our program offers. We are now soliciting donations from alumni for refurbishing the furniture in our introductory geology lab, but for the continued recruitment of majors, for better integration of the curriculum, it is essential to move our introductory teaching back to Morrill to an exciting teaching laboratory. This will once again allow for integration of the introductory course with the current research laboratories, mineral gallery, hallway displays and importantly, with department vans for field trips. We are desperately seeking new introductory classrooms that accurately demonstrate geology to students as a modern and high-tech field. This initiative will address Points #1 (program attractiveness and competitiveness), #2 (overall program effectiveness), #3 (student engagement), #4 (teaching contributions and effectiveness), #5 (student outcomes), and #7 (diversity, inclusion and access) in establishing the UMass geology program as a “Destination of Choice: Undergraduate Education”.

4. Expanding and improving upper-level classroom and teaching laboratory facilities.

Expansion of research labs in Morrill South has consumed former classroom space. While our research breadth and power have expanded, the space occupied by our department has not expanded, and as a result, we have lost three classrooms. Upper-level geology courses are commonly now taught in one of two classrooms. We also resort to using research laboratory space (for instance, the digital mapping laboratory and the microscopy laboratory) as teaching spaces. High-quality teaching space is key to fostering an atmosphere of learning. Even beyond the introductory labs, one of our most pressing needs is for proper classrooms. The lack of appropriate space for upper-level teaching has limited our ability to provide as full as student experience as we could. As we work to develop a curriculum that meets career and post-graduate needs of a well-prepared geology undergraduate, our courses seek to demonstrate and practice computer-based skills in programming, modeling, geospatial analysis, and problem-solving. However, space for even a 20-person computer exercise is generally not available inside or outside of the department. Several upper-level geology undergraduate courses (environmental geochemistry, hydrogeology, isotope geology, etc.) require wet-laboratory experiments. Wet-lab teaching classrooms are a critical need; without these, we cannot provide students with an undergraduate experience in these courses that practices the skills and emphasizes the concepts of an effective geology education. One possibility is to construct some shared teaching laboratories for use by microbiology, biology, and geosciences. This initiative will address Points #1 (program attractiveness and competitiveness), #2 (overall program effectiveness), #3 (student engagement), #4 (teaching contributions and effectiveness), #5 (student

outcomes), and #6 (effective use of resources) in establishing the UMass geology program as a “Destination of Choice: Undergraduate Education”.

5. Enhancing capstone teaching and strengthening of undergraduate cohesion.

The Geology program has initiated a capstone (Integrative Experience) course that is based on a current hot topic in geology. During the present semester the focus of the capstone course is Living on Earth – The Geology (and associated issues) of Shale Gas Extraction. The issue is being examined in the class in terms of the geologic engineering that allows the process to be applied, as well as seismic and groundwater contamination aspects, biogeochemistry of fluids associated with the practice, and environmental impacts. Themes explored in other semesters in this course include: hydrogeology and groundwater resources; natural hazards and hazard mitigation; and the use and impacts of hydroelectric power. We are pleased with the success of our capstone course, but in addition we would like to initiate a one-credit course that would be mandatory for juniors in the program. This course would again provide an additional opportunity for mentorship and for exploration of possible career paths. We are convinced that cohesion as a department is built by maintaining groups of students at a similar level through the program. This initiative will address Points #2 (overall program effectiveness), #3 (student engagement), #4 (teaching contributions and effectiveness), #5 (student outcomes), #7 (diversity, inclusion and access), and #9 (outreach and community engagement) in establishing the UMass geology program as a “Destination of Choice: Undergraduate Education”.

6. Expanding careers preparation and peer/alumni mentoring.

The Department has traditionally hosted a series of evening mentoring events, casually called “Ducks in a Row” focusing on graduate school, internships, etc. These events have been well received, but the attendance has been only moderate. Our suggestion is to develop a new name for the series, one that better reflects the content and the intended audience. We also propose to establish a new committee consisting of faculty and undergraduates from several grade levels in the program. This committee would work to develop career-related talks, information sessions, alumni visits, and other career-related activities. The committee could provide new avenues to publicize events and also may encourage student-student mentoring. This initiative will address Points #2 (overall program effectiveness), #3 (student engagement), #4 (teaching contributions and effectiveness), #5 (student outcomes), #7 (diversity, inclusion and access), and #9 (outreach and community engagement) in establishing the UMass geology program as a “Destination of Choice: Undergraduate Education”.

7. Developing a RAP Program for Geology and Environmental Sciences.

One long-standing problem for geology and geography is that students tend to find these fields relatively late in their undergraduate careers. Recruiting new majors is difficult in fields like geology and geography where high school courses or programs are rare. The faculty would like to investigate the possibility of Geology/Environmental Science RAP programs or other in-the-dorm activities. Dorm-based programs may help to reach younger students and also emphasize the relevance of the geosciences as a major and as a career. This initiative will address Points #1 (program attractiveness and competitiveness), #2 (overall program effectiveness), #3 (student engagement), #4 (teaching contributions and effectiveness), #5 (student outcomes), #7 (diversity, inclusion and access), and #9 (outreach and community engagement) in establishing the UMass geology program as a “Destination of Choice: Undergraduate Education”.

8. Expanding web-based career and alumni resource networks for undergraduates.

The Department can expand use of the web-based resource networks for career advising and for interacting with the alumni. Possibilities include “Linked-in” pages for students and alumni, career-related blogs, “how-to” pages for students thinking of applying for jobs or for graduate school, etc. This initiative will address Points #1 (program attractiveness and competitiveness), #2 (overall program effectiveness), #3 (student engagement), #5 (student outcomes), #6, (effective use of resources), #7 (diversity, inclusion and access), and #9 (outreach and community engagement) in establishing the UMass geology program as a “Destination of Choice: Undergraduate Education”.

9. Formalizing the Undergraduate Geology Club.

The undergraduate Geology Club tends to wax and wane depending on the membership in any one year. In strong years, the club has sponsored talks, movie nights, and weekend excursions. The faculty may want to try to help maintain consistency from year to year, possibly providing some funding or other support to the Club. The faculty might try to be more involved with the process of selecting the Geology Club President and to increase the profile of this position within the department. Perhaps one or more graduate students could be selected (and compensated) to serve as advisors for the club. In addition, it has been proposed to establish a Chapter of the Association of Women Geoscientists within the department. This initiative will address Points #1 (program attractiveness and competitiveness), #2 (overall program effectiveness), #3 (student engagement), #7 (diversity, inclusion and access), and #9 (outreach and community engagement) in establishing the UMass geology program as a “Destination of Choice: Undergraduate Education”.

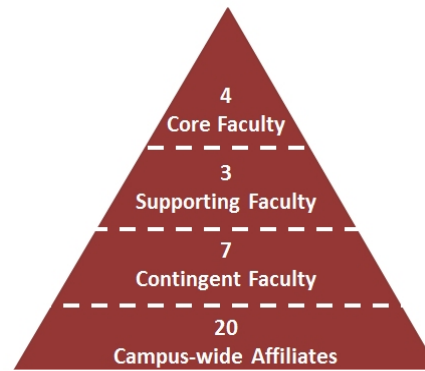
10. Addressing Geology Curriculum Issues.

Based on feedback from students and faculty there are issues within the geology curriculum that need to be addressed. First, there is an imbalance in the distribution of core courses: five in the fall and three in the spring. This leads to difficulty in scheduling and also in van availability for field trips. Second, it is increasingly difficult to maintain the Earth Systems program within the department both in terms of faculty staffing, advising, and recruiting students early enough to provide a meaningful program. One suggestion is to combine the Earth Systems and Geology majors and instead create tracks in these and possibly other subdisciplines. The Geosciences Curriculum Committee will review these issues in the near future. This initiative will address Points #2 (overall program effectiveness), #4 (teaching contributions and effectiveness), #5 (student outcomes), and #6 (effective use of resources) in establishing the UMass geology program as a “Destination of Choice: Undergraduate Education”.

IV. The Geography Program “Look in the Mirror”

What is Geography in the UMass Department of Geosciences?

Geography brings to the campus a field renowned for its unique integration of physical and social science perspectives and spatial technologies and its emphasis on understanding local, regional, and global human-environment interactions, coupled physical-social systems, and the human dimensions of global environmental, socio-economic, and political change. According to the National Research Council, “Geography’s long-standing concern with the changing spatial organization and material character of the Earth’s surface and with the reciprocal relationship between humans and the environment are becoming increasingly central to science and society.”¹



Geography Program Structure

Faculty: UMass Geography has an exceptional faculty from top-tier PhD programs, including both core faculty (n=4) and a network of affiliate faculty (n=20), who are actively engaged in cutting edge research on topics ranging from carbon cycling processes to urban public space. We have supported our research with funding from diverse sources such as NSF, the Army Corps of Engineers, the Henry Luce Foundation, the National Geographic Society, and the Paul K. Feyerabend Foundation. UMass geographers have published peer-reviewed scholarly books with presses including Routledge, University of Arizona, Stanford, Berkeley, and Island Press, and influential publications in journals such as *Remote Sensing of Environment*, *Urban Studies*, *Water Alternatives*, *Conservation and Society*, *the Royal Geographical Society’s Geographical Journal*, and *the Geographical Review*. UMass Geographers serve as leaders in international and national organizations devoted to conservation, urbanization and climate change.

After recent faculty losses, UMass Geography includes a core of 3 tenure system faculty and 1 full-time senior lecturer. Supporting faculty in Geosciences include two tenure system faculty and one extension professor.² We have one visiting 67% time lecturer, as well as six graduate/post-doc lecturers teaching on campus and CPE courses. In 2013-14 we added to this a network of 20 on-campus faculty affiliates from 8 other UMass departments who have formally agreed to work with our students and faculty to maintain and build a more robust geography program at UMass.

¹ The National Research Council, 2010 report, *Understanding the Changing Planet: Strategic Directions for the Geographical Sciences*, (http://www.nap.edu/catalog.php?record_id=12860)

² Supporting faculty: climatology is normally considered a geographic subfield, as it was at UMass for more than 30 years. Our 10 peer institutions average 3 tenure-system climate scientists per department. The University of Delaware Geography Department, which includes 8 tenure-system climate scientists, began a new PhD in Climatology in Fall 2014. UMass Amherst Geosciences includes two climate scientists with advanced geography degrees (one tenure system; one extension faculty). Recently these geographers prefer not to be counted as geography faculty, so we do not count them among our geography faculty in this self-study. However, their courses, along with those of a tenure-system geoscientist who specializes in climate modeling, remain central to our geography BS, BA, and MS degree programs. We have listed these faculty as “departmental supporting faculty.”

Degree Programs: UMass Amherst is the only campus in the University of Massachusetts system and the only public institution in western Massachusetts which offers undergraduate degrees in geography. We are one of only two public universities in New England, along with the University of Connecticut, which offer Ph.Ds for geographers. Our geography degree programs are distinctive in Massachusetts and in New England in the degree of their focus on environmental studies and sustainability. We also make strong campus contributions to GIS and remote sensing, international studies, and community engagement.

Goals and Strategic Planning: Due to the recent loss of more than half of our tenure system faculty to retirements/death, most of whom were directly engaged with research on sustainability, environment, and international themes, the program is in the third year of an intensive, ongoing self-evaluation and restructuring. In 2012, we identified the following overarching goals for UMass Geography:

- **Advance cross-cutting research and teaching on environmental issues, policy and sustainability** in the Geosciences Department, UMass, and broader scholarly community.
- **Expand environmental and sustainability course offerings** by increasing the number of classes, seminars and field-based experiences we provide for undergraduate and graduate students.
- **Contribute towards greater campus and public awareness of environmental issues, sustainability, and conservation** and support the university's role as a Community-Engaged University by expanding UMass geographers' research and engagement with community conservation, environmental awareness, and sustainable development around the world.
- **Increase our faculty size to better serve the campus and the community**, and to achieve the goals listed above.

Short term: Our immediate short-term actions have centered on maintaining and building our degree programs while continuing to advance high-quality scholarship in geography. Since 2011 we have more than doubled our majors, fostered the formation of a UMass Geography Club which has recently won a major regional competition, added a new gen-ed course to our teaching repertoire (Geography 220 World Regional Geography), secured faculty senate approval for four formerly "experimental" courses, secured approval for a new Environmental Geography concentration in the Geography BA degree, developed a just-submitted proposal for an undergraduate certificate in Geographic Information Science and Technology (GIST), facilitated a change in SPIRE designations for geography courses from Geosci to Geograph, and established a network of 20 faculty affiliates.

Long term: Our long term goal is to establish UMass geography as New England's premier public graduate/research program in environmental and sustainability-oriented geography. This goal is eminently achievable but requires institutional restructuring and support in the form of increased autonomy in order to make informed resource-allocation choices and to prioritize strategic hiring of tenure and non-tenure system faculty. We plan to re-structure the institutional setting of the Geography Program, preferably as a stand-alone program with distinct degree programs within a School of the Environment and/or the College of Natural Sciences.

Investment of Choice — Intellectual mission and scholarly recognition.

1. **At present, how would you describe your department's place in your discipline?** We are well-known as individual researchers in our fields. Our identity as a department/program within the field of geography is growing as we are working to publicize our restructured program. There are two ways to address this contextualizing prompt: (1) our place in our discipline in terms of academic reputation, and (2) our place in our discipline in terms of program size and structure.

(1) Academic Reputation

- Ours is the only geography program in New England centered on sustainability and environment. Our unique character is the result of recent restructuring of our faculty research and curriculum. This enables us to make a significant contribution to the College of Natural Sciences, to a possible future School of the Environment and Sustainability, and to campus-wide initiatives in the areas of sustainability and internationalization. It also guides our efforts to rebuild our faculty numbers and expand our visibility, programs, and contributions.
- Our highly-regarded faculty each engages with a very different subfield of geography, and has well-established or developing national and international reputations in those areas. Collectively, we serve leadership roles in international organizations devoted to furthering our understanding of urban change, finding better ways to carry out conservation efforts in partnership with indigenous peoples, and addressing a range of climate change issues. Nationally, we are actively involved in building geographic knowledge, theory and methods through our engagement with and leadership within the Association of American Geographers, from chairing national specialty groups to organizing sessions and conferences.

(2) Program Size and Structure

Our program compared to peer institutions (see Table 1): Nine peer institutions all have substantial, stand-alone geography departments whose tenure system faculty numbers range from 12 (Indiana) to 23 (North Carolina and Boulder); a tenth is within a School of Geography and Environment (Arizona). The average number of tenure system faculty is 18. All of these 10 peer institutions have Ph.D. programs. These departments average 128 undergraduate majors; 56 graduate students.

Normalizing these figures, the average undergraduate majors-to-tenure system faculty ratio at our peer institutions is 7; at UMass our growing undergraduate program currently has 9 majors per core tenure system faculty member. Our peer institutions average 3 graduate students per tenure system faculty member; UMass geography has 5.

Table 1. Comparison with 10 peer institutions (excluding University of Michigan)*

	Average** of 10 Peer Institutions	UMass Geography
Tenure-system (TS) faculty	18	3
Undergrad Majors	128	25 (+10 Environmental

		Science)
TS faculty: Undergrad Majors	1:7	1:9 (1:12)
Graduate Students	56	14
TS faculty: Graduate Students	1:3	1:5

*The peer institutions identified by the provost are University of Connecticut, University of Wisconsin Madison, University of Delaware, University of Florida, University of Maryland, University of North Carolina, University of Indiana, University of Santa Barbara, University of Arizona, University of Colorado Boulder, and University of Michigan.

Ten of these have stand-alone geography departments with PhD programs; the University of Michigan has neither a department nor any geography degree programs.

**all averages rounded to whole numbers.

2. Contributions of the faculty to the program's reputation:

- **Faculty “making their mark”** See above under “Faculty” – we have a high-achieving faculty and affiliate faculty in our discipline in terms of publications, grants and fellowships, and leadership.
- **How is your department doing in developing and sustaining its internal vibrancy?**
 - a. Despite the demoralizing impact of losing half our faculty since 2008, no faculty have left and all faculty remain highly productive in both research and teaching. Our losses have inspired us to look for creative ways to restructure – we are actively creating a new niche for ourselves through redesigning our major, establishing an affiliate faculty network, and prioritizing a set of proposals for new hires that would greatly increase our visibility nationally and our college and campus contributions. Our network of 20 on-campus affiliates is key to our continued sense of an academic home and interdisciplinary synergies. We have tried to keep each other going as a small community of geographers and to reach out across campus to colleagues in other departments who have backgrounds in Geography and/or cognate fields and who appreciate and support Geography. The affiliates should enhance our momentum while we build with new tenure system and lecturer positions.
 - b. One of the primary impediments to our productivity and vibrancy is the need for all of us as a small program to “wear many hats” in terms of program and departmental service and teaching. This demands substantial investments of time otherwise spent on research and writing.

3. Why should a top-flight faculty candidate with multiple offers join your department?

- This might seem challenging as our program is small and under-resourced in comparison to our peers. Yet we are confident that top-flight candidates will see joining our program with its environment and sustainability focus and its high-quality faculty as an opportunity to be part of a unique program in New England and to participate in shaping and building it.

- The top-flight people we have now came here because of the university's reputation and potential, the great opportunities for research, collegiality, and quality of life that living in this region afford us. Future hires might welcome the chance to be part of something new and dynamic -- creating a unique, high-quality geography program at the level of a Research 1 university department that is focused on environmental issues and sustainability and provides exceptional opportunities for learning and applying GIS and remote sensing.
- Regarding diversity, all of our three tenure-system core faculty are women; one is Chinese.

5. What is your department's role in your college and in the University?

- The geography program plays a strong role in environmental and sustainability studies within the college and the University, as well as providing important GIS and remote sensing teaching at both introductory and advanced levels. The program also has the potential to play an increasing role in the University's commitment to sustainability and internationalization in both research and teaching. Our faculty carry out cutting-edge research in both of these important missions of the university; our curriculum is designed to train the next generation of innovators in these fields.
- We are actively engaged in a number of research, teaching and administrative communities at UMass such as the 5 College Sustainability Certificate, the Environmental Working Group, Five College Native American and Indigenous Studies Committee, Asian/Asian American Studies program, HySAR–Combined Hyperspectral & multi-frequency Synthetic Aperture Radar working group, ACE joint task force on internationalization, and the Academic Priorities Council.

6. Research Strengths, Critical Mass:

- **Current research strengths that align well with federal, state, or regional priorities.** These include climate change/carbon system research (Yu), New England flood prevention and remediation (Vogel), political ecology, conservation, and rights (Stevens), environmental, sustainability and public space planning in cities (Gaubatz).
- **Are there unique niches we should preserve/strengthen/shift into?** We plan to preserve and strengthen our strong sustainability/environmental geography core of GIS/remote sensing/carbon cycle, political ecology, political geography of environmental management, and urban environmental planning and history. Specialties ripe for expansion which would align well for future funding include sustainability, natural hazards, human dimensions of global environmental change and environmental governance. Since 2012, we have been proposing the following positions to achieve this goal:

Tenure-system positions:

- (1) Sustainability and international development,
- (2) Human dimensions of global environmental change
- (3) Environmental governance/climate policy and implementation, and
- (4) Natural hazards and climate change (impacts, mitigation, and adaptation)

Lecturer positions:

- (1) Human geography (to teach large enrollment General Education global diversity and social and behavior courses including Introduction to Human Geography and World Regional Geography)
- (2) GIS/remote sensing (to expand the number and diversity of these courses we are able to offer on an annual basis, helping support a new GIST undergraduate certificate and a planned 5th year professional master's degree).

7. **Are we using our faculty to maximize their impact on our missions (teaching, research, engagement)?** All of our core faculty are research-active, yet we each must take on a sizeable component of service teaching in order to keep the degree programs healthy. Better teaching support through hiring lecturers and additional faculty would help with this aspect of the program.

Destination of Choice – Graduate education

1. **At present, what attracts graduate students to your department?** The geography program has limited graduate admissions in recent years in order to work within the limits of our faculty and financial resources. We have two sorts of applicants: those who come to work with specific faculty on the basis of their academic reputations, and those who are based locally and hope to earn a graduate degree at Massachusetts' flagship university. Gaubatz and Yu attract many more (especially Chinese) students than we are able to accept/support; Stevens receives a steady flow of inquiries from students interested in indigenous peoples and conservation issues; Vogel attracts applications from students interested in water and sustainability studies.
2. **What is your admissions target?** We are already heavily engaged with existing graduate students, including supporting legacy students from former faculty members, so we have been limiting our graduate admissions to no more than 2-3 graduate students per year, and expect those students to be ready to work closely in the areas of our current faculty research specialization.
3. **Time to completion and attrition:** The geography program has inherited several students from retired or deceased faculty who have taken a substantial amount of time to complete their degrees after needing to find new committees and restructure their research and writing. Most of these students have finished or are soon to finish their degree programs. Non-legacy students are, by-in-large, completing their degrees on time or making good progress toward that goal. We have had several students leave the program in recent years: two of these were legacy students who either did not pass the comprehensive exam or did not make progress toward the degree. A recent MS student left during the first week after realizing he needed time off before graduate school.
4. **What kinds of jobs are your graduate alumni getting?** A large portion of our PhD and MS alums go into academia. Recent alumni have academic positions at the University of Delaware, University of Connecticut, Southern Connecticut State University, Towson State University, Worcester State University, Westfield State University, SUNY Syracuse, Long Island University, and the University of Texas. Our MS graduates either move into PhD programs (such as University of Texas, Rutgers, and Australian National University) or find positions in government and private

industry ranging from the U.S. Census Bureau to AECOM (a multi-national engineering, planning and consulting firm).

V. Improving the Undergraduate Experience in Geography

Geography at UMass Amherst is a dynamic and growing program committed to environmental and sustainability education. Our undergraduate program is anchored by three degree options: BA-Geography, BA-Environmental Geography Concentration, and BS-Physical Geography; it is enhanced by a wide range of other engagement with students including second majors and minors, an active undergraduate geography club, research opportunities with faculty, and civic engagement opportunities through field and community-oriented coursework.

The geography program aims to strengthen and enhance the undergraduate experience at UMass by increasing program faculty and expanding program curriculum to provide the quality curriculum and teaching expected of a geography program at a major research university while maintaining a unique emphasis on environmental geography, sustainability, and high quality geographic information systems and technologies (GIST) courses. We are also committed to improving our career preparation and placement programs, and involving undergraduates in a diverse community of geographers and encouraging them in civic engagement. We look forward to partnering with other units in CNS to develop a School of the Environment.

Geography Program: Destination of Choice

UMass Amherst is the only campus in the University of Massachusetts system and the only public institution in western Massachusetts that offers undergraduate degrees in geography. Our geography degree programs are distinctive in Massachusetts and in New England in the degree of their focus on environmental studies. We also make strong campus contributions to GIS and remote sensing, international studies, and involvement with local communities and issues. We have an exceptional faculty, including both core faculty and a network of affiliate faculty, who are actively engaged in cutting edge research.

We are already engaged in a concerted effort to make UMass Geography a destination of choice for New England students. Our early success in this effort is demonstrated by our majors, one quarter of whom are out-of-state students. The undergraduate geography curriculum has been revised recently with a new focus on environmental studies in our BA concentration in environmental geography, our applied field-skills oriented integrative experience course, and our career-oriented junior year writing course.

However, lack of visibility and program identity in the past and a severe downsizing of our faculty over the last decade have left the program under-resourced in terms of core faculty and course offerings. This hampers our ability to implement our plans to enhance our program. Students perceive our major as a high-quality educational experience (one quarter of our majors are Commonwealth Honors College students), yet our small faculty size limits our ability to provide our core curriculum and general education courses. Students express concern about gaps and frequency in our core course offerings.

Geography at UMass today cannot offer students an educational experience that is comparable to that which they would have at other Research I universities, the peer

institutions identified by the Provost, or other New England state flagship universities. Most of these other institutions offer students a rich Geography curriculum in independent departments of Geography with faculties and core course offerings that are significantly larger than those at UMass Amherst. Indeed the UMass Amherst geography program is currently much smaller, in terms of faculty numbers and course offerings, than the undergraduate geography BA/BS programs at Salem State University, Worcester State University, Framingham State University, or Bridgewater State University. In other words, Massachusetts' flagship public university has the smallest geography faculty of any public institution in the state, despite providing undergraduate and graduate degree programs.

Action Items

1. Program Attractiveness and Competitiveness:

- invest in new core faculty who contribute to building-out our program design. (see Annex list of faculty positions and courses needed)
- offer foundation/Gen-Ed classes on a more regular basis, especially World Regional Geography (SB,G) and Natural Disasters (SI)
- restore key courses missing from the curriculum due to loss of faculty (see course list)
- provide new courses that strengthen UMass Geography's emphases on environmental geography and sustainability – in particular courses on globalization, sustainability, sustainability in New England, sustainable development in the Global South, climate change and society, climate policy, natural hazards, climate change and natural hazards, and additional GIS and Technologies courses and practicums that provide field experience (see course list).
- re-structure the institutional setting of the Geography Program for increased autonomy, preferably as a stand-alone program with distinct degree programs within a School of Earth, Sustainability and the Environment and/or the College of Natural Sciences.
- continue to implement our recruitment campaign to promote our degree programs.
- continue the development of our student-centered career guidance, mentoring and community-building programs.
- upgrade facilities for teaching GIS with a state-of-the-art GIS lab.

2. Program Effectiveness:

- increase faculty size and course offerings to fully implement our recent and continuing program re-design, making use of contributions by new Geography faculty and our new network of 20 affiliate faculty. (see attached list of faculty and courses needed)
- establish labs and discussion sections for all foundation/Gen-ed courses
- increase the number of TAs allocated to Geography from the current 2.5 per year.
- establish an evaluation system (undergrad/alumni surveys) for program effectiveness.

3. Student Engagement:

- establish labs and discussion sections for all foundation/gen-ed courses

- secure increased funding for TAs in order to facilitate these new labs and discussion sections
- encourage students to write senior honors theses in consultation with faculty
- expand the use of “real world” situation field exercises in our classes, building on our current practices in our Water Geographies, Urban Geography, and Field Methods courses.
- increase student opportunities in practicum courses, especially in GIS and applied geography
- offer a course in qualitative research methods to better prepare students to work on faculty research projects
- increase student involvement in faculty research
- encourage further collaborations between students and faculty in Geography Club activities.

4. Teaching Contributions and Effectiveness:

- fully integrate into our curriculum the contributions from our newly-established network of 20 affiliate faculty members drawn from 9 campus departments.
- expand our teaching in the following areas: international and regional studies; development, globalization and sustainability studies; climate change and society; meteorology and climatology; natural hazards; and field mapping (GPS/GIS linkages).
- integrate research experiences and a capstone course into the curriculum (see course list)

5. Student Outcomes:

- maintain and build our new initiative “UMass Geographers Make a Difference ... You Can Too” which highlights the achievements of our alumni and faculty in making the world a better place to live, from responding to natural disasters to finding homes for low-income families.
- additional action items for student outcomes are provided in #2 Program Effectiveness.

6. Effective Use of Resources:

- short-run: clarify sources of income and expenditures within the Geosciences department and identify what resources are available for the geography program.
- long-run: establish an autonomous program with consistent and clear control over its resources.

7. Diversity, Inclusion and Access:

- increase efforts to attract students from under-represented groups.
- invite diverse students participating in our general-education courses to events designed to inform them about geography.

8. Internationalization:

- encourage undergraduates to interact more with the steady stream of international scholars who visit our program
- offer World Regional Geography on a regular basis (it is now taught by a temporary lecturer) so that it serves as a key course in campus international studies

- re-establish regional courses that have been lost due to faculty downsizing, particularly Latin America, East Asia, and Anglo-America.
- encourage students to carry out international research for senior honors theses
- involve students more in faculty international research

9. Outreach and Community Engagement:

- develop additional experiential and service learning/civic engagement classes and independent study opportunities along the lines of our existing community-engaged courses (Water Geographies, Urban Geography, Field Methods)
- encourage internships and develop an alumni network to support these.
- encourage students to do senior honors thesis projects with local government and community organizations.
- increase student awareness of and participation in winter break, spring break, and summer service trips such as those organized by the Native American Indian and Indigenous Studies Certificate Program.

Annex: Geography

I. Priority Faculty Positions

Tenure-system positions	Lecturer Positions
(5) Sustainability and international development (6) Human dimensions of global environmental change (7) Environmental governance/climate policy and implementation (8) Natural hazards and climate change (impacts, mitigation, and adaptation)	(3) Human geography (Introduction to Human Geography and World Regional Geography) (4) GIS/remote sensing

II. New Courses to be developed and taught

World Regional Geography (Geography 220; currently taught by a temporary lecturer)	Sustainability and Sustainable Development
Globalization and Development	Sustainable Development in the Global South
Climate Change and Society	Climate Policy
Climate Change and Natural Hazards	Natural Hazards, Vulnerability, and Policy
Human Dimensions of Global Environmental Change (advanced course)	Qualitative Research Methods in Geography
Geography of New England	Capstone Course

III. Core Courses which are not taught on a regular basis due to loss of faculty

Geography 200 Geography of Anglo-America	Geography 220 World Regional Geography (Gen-ed SB,G)* taught in 2014 by a lecturer
Geography 250 Natural Disasters (Gen-ed SI)*currently in online CPE only	Geography 304 Historical Geography of the U.S.
Geography 320 Latin America	Geography 330 East Asia
Geography 340 Quantitative Methods in Geography	Geography 350 Map Appreciation and Design
Geography 360 Economic Geography	Geography 362 Conservation Geography
Geography 364 Geography of Development	Geography 530 Population and Environment