Unit Productivity Award Application
Academic Year 2001-2002

Academic Unit Name: Department of Geography and Geology
Department Head: David J. Keeling
Summary of Application (Key Indicators of Productivity for 2001-2002):

- Students and faculty published six GIS-related articles in a special peer-reviewed issue of the *Journal of Cave and Karst Studies*.
- Twenty students enrolled in the Department's first Study Abroad Program to study environmental issues in Australia during Summer 2002.
- Seven juniors and seniors participated in the Department's newly established Peer Tutor program, providing mentoring, tutoring, and academic assistance to over 250 students.
- The Department instructed the first group of 55 students in its new GIS-certificate program, using state-of-the-art instruction methods and the new GIS laboratory.
- The geology faculty submitted and won a $75,000 Kentucky EPSCOR grant to set up a mineralogy laboratory for a new faculty member.
- Identified program strengths and weaknesses from new Senior Assessment exams, and developed initiatives to enhance technical writing, critical thinking, and analytical skills.
- Developed a collaborative relationship with the Kentucky Geographical Alliance and the University of Louisville, and hosted 26 K-12 teachers for a June 2002 content workshop.
- A Master's program graduate was named Federal Engineer of the Year, another graduate was admitted to the highly competitive Ph.D. program at the University of Washington, and a geology undergraduate was admitted to Vanderbilt's geology Ph.D. program.
- A Masters student was awarded a highly prestigious and very competitive Cave Research Foundation grant from the National Speleological Society for her thesis research.
- Faculty and students convened and/or participated in over 25 professional workshops and presented over 40 papers at local, regional, national, and international conferences. Faculty also gave about 100 academic and community talks during the academic year.
- Over 30 students participated in conferences such as the annual AAG conference in Los Angeles, the regional GSA conference in Lexington, the annual Kentucky Academy of Science conference, and the annual Sigma Xi conference, among others.
- Faculty visited 12 overseas locations for research, professional development, meetings, and collaborative activities (including two trips to China) with other institutions.
- The Department completed its most comprehensive curriculum overhaul in decades.

FOR OFFICE USE ONLY: Data will be filled in by Institutional Research

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# of Graduates (Most recent 5-year data for August/December/May graduations)

# of Faculty: _____Full-time _____Part-time FTE

WKUSES Participation Rate
Department of Geography and Geology Unit Productivity Award Application

I. Increasing Student Learning

The Department of Geography and Geology continued its long-standing tradition of excellence in teaching, learning, and advising. Its primary objective during the year has been to improve retention, particularly in the lower-division courses that satisfy both general education and major requirements, as most students entering Western have very little preparation in the spatial sciences. Indeed, the majority of students are unable to find their own state or county on a basic map, and few are able to engage competently with the basic elements of geoscience. Consequently, the drop-out or failure rate in lower-division classes historically has been quite high. Effective the Fall 2001 semester, the Department introduced its Peer Tutor program designed to identify and help at-risk students. Seven juniors and seniors were recruited to serve as Peer Tutors. Their primary mission is to assist those students who are struggling in the introductory classes, to provide additional tutoring outside normal class hours, to assist in explaining key concepts, and to provide assistance to students who fail the first set of exams. Although this program is only in its infancy, early results are encouraging. Over 250 students sought assistance during the academic year, some on a regular basis, and the Peer Tutors logged over 500 hours of student assistance. The Department especially relies on the 6th-week Freshman assessment program to identify and assist at-risk students and to aid in their retention.

Our second challenge during the past year has been to engage students more successfully with the new technologies, theories, and applications that are demanded by employers and society. The Department's mission is to develop an interdisciplinary approach to Geographic Information Sciences (GIS) that provides learning opportunities for students across the university and from all disciplines. Over $250,000 in Action Agenda grant funds were approved last year to build an inter-departmental GIS laboratory, and the lab opened for students in January 2002. The first group of 40 students enrolled in the introductory GIS course in the Spring semester, with a further 15 enrolled in a special GIS workshop offered during the May session. The Department has hired a full-time GIS lab manager/instructor effective July 1, 2002, utilizing Action Agenda funds, and will provide GIS instruction to 100 students in the introductory courses and 40 students in the advanced courses during the Fall 2002 semester.

In conjunction with the now-operational GIS lab, the Department's 12-hour GIS certificate program is attracting new students to the discipline. The Department is also working closely with the Engineering and Architectural and Manufacturing Sciences departments to develop an interdisciplinary land-surveying certificate program incorporating GPS, GIS, and other land-mapping technologies. In addition, the Department is collaborating with the Agriculture, Biology, and AMS departments to develop specific data sets for these departments' majors to use in a GIS mapping environment. Increasing levels of inter-departmental collaboration are designed to enhance the learning opportunities for students and to promote a multidisciplinary approach to problem-solving strategies.

Throughout the year, the Department crafted a new curriculum, in consultation with graduate and undergraduate students in the program, and all changes now have been approved by the relevant university committees. Coupled with a redesign of the Department's core educational objectives, new and enhanced program tracks in geography now provide our students with a much higher level of intellectual and career development. Every student majoring in the Department takes six foundation courses that provide them with basic GIS, statistical, scientific writing, research methodologies, and critical thinking skills. This set of courses should prepare students more rigorously for the advanced courses and is designed to improve the retention rate of students in the program and to increase the graduation rate of majors. Over the past academic year, the average GPA of graduating seniors moved slightly upward from 3.03 to 3.05 for majors and nearly 20 percent of the Department's graduates in 2001-2002 had taken higher-level math, chemistry, and physics courses to support their major, especially those focusing on environmental
management, geology, and climatology. The Department's goal is to reach 50 percent by 2005 in this area.

Involving students in international educational, research, and travel activities is a priority for the Department and faculty have been proactive in recruiting for and encouraging participation in study abroad programs. Over 500 study abroad flyers were distributed during the Fall 2001 semester, and inquiries were fielded from approximately 75 students. The Department has established its own study abroad program, with courses focusing on the theory and practice of environmental management and sustainable development. Twenty students were recruited for the Department's first study abroad program in Australia, scheduled for July and August 2002, and $17,000 in scholarships have been raised from various sources to support these students. Most of the students participating in the program are geography, geology, or recreation majors. Faculty already are designing the next study abroad experience, for Summer 2003, that will take students to Portugal, Spain, and Morocco. The 2004 summer program likely will take students to China to participate in the Department's research collaboration with the Karst Dynamics Institute in Guilin.

Students and faculty also are participating in the Department's existing international research collaborations with institutions in Guilin, China; Oxford, England; and Mexico City, Mexico. A long-term goal for the Department is to have every major participate in at least one international activity (research, study abroad, independent travel, etc.) during his or her tenure at Western. At the end of this academic year, the Department had reached a participation rate of 22 percent of its majors in international activities, with a goal of 50 percent by 2006.

Engaging students in research activities, having them present papers at conferences, and encouraging the publication of their research results continues to be a major goal for the Department, as these types of activity are some of the best indicators of increased student learning. This past academic year, 46 students were actively engaged in research projects or other activities related to the ARTP and Programs of Distinction (Kentucky Climate Center, Hoffman Environmental Research Institute, Center for Cave and Karst Studies, and the Water Resources program), up by 7 percent over the previous year. In addition, dozens of students are employed by the Lost River Cave program every year as guides and assistants. This facility serves to educate K-12 visitors, the general public, and others about caves, wetlands, water resources, and the karst environment.

Several of our students and former students have gained national and international recognition (and publicity) for their research activities. Six students, former students, and a faculty member published several articles in a recent special issue of the Journal of Cave and Karst Studies focusing on GIS, cave mapping, and technological applications to cave management (see feature news article on WKU’s website). A current graduate student has been awarded a prestigious and competitive fellowship from the National Speleological Society for her thesis fieldwork; another graduate student has received international recognition for his cave exploration work; a former graduate student has been honored as Federal Engineer of the Year; two undergraduates have been admitted to highly competitive graduate programs; a graduate student has been admitted to a very competitive Ph.D. program at the University of Washington (with a full scholarship) based on her work at Western; and a graduate student and staff hydrologist (former graduate student) in the Department are featured in the July issue of Kentucky Living magazine for their cave exploration work.

As part of the Department’s commitment to enhancing the student learning environment, as well as addressing recruitment and retention issues, the faculty also have introduced a new initiative to improve the writing, critical thinking, and analytical skills of its majors and minors. Feedback from employers and community leaders about students generally (regardless of discipline) suggests that improvements are needed constantly in these three areas. Students may well graduate with sufficient content knowledge to function competently in their chosen profession, but they frequently demonstrate weaknesses in technical writing, critical thinking, and analytical skills. The Department's new Senior Assessment exams, coupled with data available from the WKUSES survey and from graduate-student comprehensive examinations, are providing evidence
of the strengths and weaknesses of our graduating seniors. The past year, over 40 examinations were administered, with results indicating that students need more training in the areas of technical writing, critical thinking, and analytical skills. Improvements to the curriculum in many of the Department’s courses are underway in order to address these needs.

II. Developing the Student Body

The majority of the Department’s majors and minors are recruited from general education service courses offered by the Department as, historically, few students arrive at WKU as pre-declared majors. Three initiatives underway have had a positive impact on the number of pre-declared majors since 1999. First, a new Advanced Placement (AP) test in Human Geography debuted nationally in 2001/2002 and this may stimulate greater interest in the discipline of geography at the 8-12 level. One of the Department’s faculty worked with the AP test at the national level by developing and testing sample questions and problems for the test. The Department is working closely with the Teacher Education program to develop an AP workshop at Western during the 2003 summer session to help develop and promote interest in this test.

Second, over the past three years, several faculty have developed contacts and relationships with area high schools, especially in those counties that traditionally have sent fewer students to university. As a result, the Department spent more than 50 hours in area schools this past academic year, educating students about science and about the exciting opportunities available through the Department’s programs. This past year, the Department experienced an increase of four students who pre-declared in geography (meteorology) and has experienced at least a 100 percent increase in major-specific inquiries. Through the Department’s website, various faculty answered 128 inquiries about programs and career opportunities in the geosciences, a 40 percent increase over the previous year. In addition, faculty in the Department are playing a more active recruiting role in organizations such as the Kentucky Geographical Alliance (KGA) and the Kentucky Geological Society (KGS).

For example, each year the KGA sponsors and runs the state-wide National Geographic Bee for grades 4-8, with four faculty involved in administering the event. In April 2003, this event will be held for the first time at WKU, with over 100 students and 150-200 parents and teachers in attendance. For the first time, the Department also developed a collaborative relationship with the Kentucky Geographical Alliance and the University of Louisville to host 26 K-12 teachers for a June 2002 geography content workshop. The workshop was designed to introduce “social studies” teachers and others who have had little exposure to geoscience methods and theories to new and exciting ways of engaging students with geoscience issues and problems. Two faculty from Louisville conducted the workshop, and three faculty from Western provided content lectures and field trip experiences. Faculty also are active in the KGS, developing statewide initiatives to introduce students to the geological sciences. Nationally, enrollment in science programs is static or declining, and WKU faces similar trends. The Department is hopeful that recruitment initiatives such as these will help to attract more students to the geosciences.

Third, the Department has participated in all of the WKU-sponsored recruitment fairs held around the state, and it continues to recruit students at state and regional scientific meetings and conferences. Moreover, the Department’s new Peer Tutor program is having a very positive impact on student retention and recruitment. Many of the students who fail in the introductory courses do so because of poorly developed study habits, poor training in the geosciences in high school, and large class sizes. The Peer Tutor program identifies these “at-risk” students and assigns them a mentor or tutor. This past academic year, the Peer Tutor program assisted over 250 students and probably “saved” at least 20 students from certain failure (based on the available statistical and anecdotal evidence of the average numbers of W and F grades per semester). In addition, through this program and due to the additional efforts of faculty who teach the introductory courses, 12 students declared geography or geology as their major during the Spring 2002 semester, up from five students in Spring 2001. The Department also offers one or two
sections of Freshman Seminar UC101 each Fall, depending on staffing availability, specifically for geoscience majors. Three faculty are in the rotation to teach this course. However, there is no specific evidence available to show that students completing UC101 are more motivated, better prepared, have better study habits, or are more academically successful than non-UC101 students, based on a cursory examination of data from 1993-1997 majors.

The Geography and Geology clubs play an important role in the recruitment, retention, and development of students. These two student-led organizations provide mentoring, peer support, research opportunities, seminars, and field-trip experiences for members. For example, through the efforts of the Geography club, six students traveled to Los Angeles in March to attend the annual conference of the Association of American Geographers, accompanied by three faculty. This is the largest contingent of students from the Department to attend a national geography conference in over a decade. Students raised money for this trip by holding a bake sale, by selling ice cream and sodas, and by soliciting support from faculty and other students. The Geology Club students raise money and foster interest in their activities through regular rock and gem sales, seminars, and tee-shirt sales, and regularly attend annual regional and national geology meetings and conferences. Overall this past academic year, over 30 students attended and/or presented research papers at local, regional, and national professional meetings, such as the annual AAG conference in Los Angeles, the regional GSA conference in Lexington, the annual Kentucky Academy of Science conference, and the annual Sigma Xi conference, among others.

Annual fluctuations in the number of majors and minors in the Department are normal and reflect the fact that many students discover the geosciences late in their college careers. Since 1996, the Department has averaged about 160 majors in geography and 35 majors in geology. The Department expects the number of geology majors to remain fairly steady over the coming years, as the program continues to provide students rigorous preparation for certification as a professional geologist. Given the national trend of declining interest in science programs, and despite the fact that the geology program is very difficult (it includes chemistry, biology, physics, and higher mathematics), an average of 35 majors in this program is exceptional. With the Department’s new initiatives in GIS and spatial technologies, there is an expectation that the number of majors in geography (especially those seeking a GIS certificate or GIS emphasis) will increase gradually over the coming years. This calendar year, over 200 students will have passed though at least one or more of the GIS courses. The Department has completely overhauled its geography curriculum for the 2002/2003 academic year, with new minor tracks in GIS, City and Regional Planning with a GIS emphasis, and global development, and completely revamped major tracks in seven specialties.

A key initiative in the recruitment, retention, and development of students is a focus on inter-disciplinary studies. One of the greatest barriers to increasing the number of majors is the very rigid disciplinary “box” demanded by the administration in terms of credit hour, teaching load, and major allocations. Human-environment issues and problems are not one-dimensional and cannot be addressed by a single discipline, yet that is how Departments and programs are forced to operate. Geoscience faculty are working with the departments of Biology, Agriculture, History, Business, Teacher Education, and AMS to find creative ways to engage students in interdisciplinary approaches to problem-solving. The Department sees GIS and spatial technologies as a central element in building collaborative and cross-disciplinary experiences for students. Quality rather than quantity is the driving ideology behind these initiatives, as it is better for society in general to have 20 well-trained scientists who can apply a broad interdisciplinary approach to problems rather than 50 narrowly trained specialists who (a) cannot find employment or (b) cannot adequately address a problem.

The Department also has developed a number of non-traditional courses to address the needs of graduate students and others. A special internet-based Geoscience and Development course was offered in Spring 2002, along with a web-based Geoscience Literacy course, and both attracted seven students. Efforts continue to improve timely graduation rates, with a “four-year program” guarantee in effect. Every undergraduate major and minor is required to meet with the
Department Head for advising and analysis of his or her program. If the student follows the program guidelines, graduation is possible within the four-year time period. This past academic year, the Department contacted 14 students who were “at risk” of not completing their degree program, either because of a missing required course or for other reasons. This outreach program is designed to ensure that every major ultimately graduates from the program. This year, four students responded positively and are completing or have already completed their degrees. The Department aims to reduce the delinquency or drop-out rate in the program to less than 5 percent of the total number of majors over the next five years.

III. Assuring High Quality Faculty and Staff

Three new faculty (two males (one from South Asia), one female) were hired in Fall 2001 with expertise in GIS technologies and with the potential to enhance the Department’s already excellent reputation in teaching, research, and service. Three new faculty were recruited for the 2002-2003 academic year to complete the generational restructuring of the Department. This new generation of faculty will strengthen the Department’s accomplishments in scholarship, creative activities, and externally-sponsored research and grants.

During the just-completed academic year, faculty submitted grant and contract applications worth over $3 million, an all-time record for the Department. Many of these grants and contracts have been submitted under the Programs of Distinction umbrella. The Department’s newest faculty member alone wrote five grant applications for over $1 million, most of which are awaiting a funding decision. The geology faculty wrote a competitive grant through the Kentucky EPSCOR program to fund start-up facilities for a new structural geologist, and $75,000 have been awarded for this project.

The Department’s senior geologist has been recognized as a Distinguished University Professor at Western and will hold that appointment until 2005. The Department’s junior geologist received the 2001-2002 Ogden College Outstanding Teaching Award in recognition of his excellence in working with and mentoring students. The Department Head has been elected to a two-year term as President of the Conference of Latin Americanist Geographers, and continues to serve as a national councilor and the webmaster for the American Geographical Society (www.amergeog.org). This latter project required an investment of over 300 hours of professional service during the academic year.

Faculty continued to excel in scholarship, research, and professional development, convening and/or participating in over 25 professional workshops (including three in China, two at the Wood’s Hole Oceanographic Institute, and two in Washington, DC) and presenting over 40 papers at local, regional, national, and international conferences. Faculty research articles appeared in such diverse outlets as the Journal for Cave and Karst Research, Climate Research, and Bulletin of the American Meteorological Society, and several chapters appeared in books such as Automated Weather Stations for Applications in Agriculture and Water Resources Management and Latin America in the 21st Century: Challenges and Solutions. Fifteen faculty research articles are either currently in review, revision, or awaiting publication. Faculty also gave about 100 academic and community talks during the academic year, including presentations at universities across the United States, in China, and in Europe. In addition, faculty visited 12 overseas locations for research, professional development, meetings, and collaborative activities (including two trips to China) with other institutions.
IV. Enhancing Responsiveness to Constituents

Public service continued to be a central pillar of the Department’s contributions, with activities in 2001-2002 reaffirming the faculty’s commitment to productive engagement with a wide variety of constituents. The Department, through the Center for Cave and Karst Studies, continues to pioneer interactive and demonstrative student and public learning activities at the Lost River Cave site. This valuable community resource has flourished over the past 12 months with additional funds from the State, community, Western, and other donors, and it has become one of the premier karst and wetlands educational resources in the region. Dozens of students and community activists are employed or volunteer time at the LRC site, providing learning opportunities for area P-12 schools, visitors, and post-secondary institutions. The Center for Cave and Karst Studies’ Director travels the state and surrounding region promoting both the LRC resources and the Department’s educational facilities.

The Kentucky State Climatologist serves the public from the Department’s Kentucky Climate Center and has provided invaluable service to the community over the past year in many different arenas. Utilizing new GIS visual technologies and drawing on the assistance and skills of six undergraduate and graduate research assistants, the State Climatologist provided climate-related data, expert testimony, prediction models, and other important information to myriad local and state constituents. The Kentucky Climate Center’s website provides both real-time and archival weather-related data to visitors and it recorded over 10,000 “hits” during the year.

Another initiative in enhancing responsiveness to constituents is the ongoing improvement to the Department’s website (www.wku.edu/geoweb). This website contains over 1,000 pages of information relating to the Department’s educational, research, and service activities and it receives several hundreds of visitors each month. One of the biggest informational challenges facing websites is the problem of “link rot” or the growing number of dead connections to other sites, as well as information that is outdated or erroneous. The Department regularly updates its site and makes every effort to ensure that all links are active and current. This has involved an investment of over 500 hours during the academic year. Students and other visitors have commented positively about the usefulness of the site’s material, especially links to course syllabi, descriptions of all courses offered by the Department, detailed information about the Department’s majors and minors, details about each faculty member’s research activities, links to faculty websites, links to the Department research centers, online versions of the Department’s alumni newsletter, and details of the Department’s annual strategic planning.

Faculty have cumulatively contributed thousands of hours to the educational, social, cultural, and economic development needs of the city, county, region, state, and other countries. Four faculty have been very involved in the region’s Transpark project, addressing issues of hydrology, environmental impacts, pollution, subsurface drainage, and other key problems. Faculty also serve on the city’s Storm Water Advisory Committee, and others have been involved in various community projects in advisory capacities. Two faculty members invested many hours in helping students at Warren East Middle School develop portfolios in science. As a result of their efforts, many students at Warren East improved their CATS scores and an unprecedented number received “distinguished” designations from the state reviewers on their science portfolios.

In collaboration with the Department of Modern Languages, faculty contributed to the development and submission of a Federal Department of Education grant to improve the Asian studies curriculum at Western. Although the grant was not funded, the collaboration helped faculty to focus on several important issues related to migrants in the community and it reinforced Western’s engagement with China from a multidisciplinary perspective. Many of the research questions and issues raised as a result of the Department’s collaborative research in China are applicable to south-central Kentucky, particularly in the area of water quality, tourism, and economic development in poorer counties. The Department’s Heritage Corridor project particularly will engage three graduates and four undergraduate students in research activities this coming year, with much of the information gleaned applicable to the study area in Guilin, China.
V. Improving Institutional Effectiveness

Over the past academic year, the Department has enhanced its operational structure in order to improve efficiency and productivity. Six permanent workgroups exist, with each faculty member serving on two workgroups for the academic year. Membership on the workgroups is rotated every year to expose faculty to all facets of the Department's operations. The Undergraduate Review workgroup is charged with the task of continually examining and revising the curriculum, course offerings, and program specialties in order to provide the best possible learning experience for the students. At the graduate level, the Graduate Review workgroup developed a geoscience-based curriculum designed to meet the demands of 21st century employers and to provide students with the skills necessary to be successful in their Ph.D. studies or in professional careers. *Both of these workgroups completed significant revisions of the Department's programs this year* (such as restructuring the MS program core) to position the Department on the leading edge of educational technologies and experiences.

Two workgroups addressed the physical, technological, and research needs of the Department. The Facilities and Technology workgroup revamped the Department's space utilization program, beginning a renovation of the old cartography lab and converting a small classroom into a student research lab. The Department office was renovated, with new carpet and furniture designed to improve the aesthetic environment. *Students especially have commented how much better the Department "looks" this year.* The Research Facilities workgroup, comprising the POD directors and key researchers in the Department, examined research synergies, funding needs, and student research opportunities and made recommendations concerning increased productivity and efficiency in research activities, along with significant collaboration with other academic departments and with external agencies. These recommendations are embedded in the Department's 2002-2003 strategic plan.

The last two workgroups encompass the promotion of the Department’s activities and the development of funds. Activities of the Marketing and Promotions workgroup last year included developing a central identity for the Department, promoting its educational opportunities among its constituents, and marketing the types of programs and research opportunities available to students and other constituents. Finally, the Funds Development workgroup implemented a program to identify sources of external funds, to identify funds to endow a Chair in Geoscience, to develop better relationships with alumni, and to identify creative ways to use available development funds to support student-learning activities. A spring 2002 contribution campaign to help raise funds for a Departmental van and for student scholarships proved moderately successful. *Gifts totaling nearly $12,000 were received during the academic year, double the amount received during the previous academic year.* The Department holds a competition to fund student research each year, with funds coming from the Department’s WKU Foundation accounts. *This past year the Department funded two research programs, provided new furniture for the student lounge, and provided enhanced study-abroad support for 20 students worth $17,000.* When university funds are unavailable, the Department also has utilized Foundation funds to help in the recruitment of highly qualified faculty.

In order to improve the efficiency and aesthetic quality of the Department office, a number of changes were made during the year. A new office manager took over on July 1, 2001, and she has completed a thorough review and reorganization of the Department’s administrative functions. The staff has been trained in all aspects of the Banner system, including requisitions, spreadsheet management, budget tracking, student payroll, and grant administration. The office environment has been physically improved, with new carpeting throughout and new furniture. Visitors and students alike have commented on how the Department is much more efficient and aesthetically pleasing today compared to one year ago. Finally, the Department’s thorough and comprehensive internal strategic plan, along with its detailed Continuation, Tenure, and Promotion Policy (both of which are available on its website), continues to provide a meaningful roadmap for the future growth and development if its programs and initiatives.