

Unit Productivity Award Application Academic Year 2000-2001

**Unit Name: Department of Geography and Geology
Department Head: David J. Keeling**

1. Program Enrollment Data and Relevant Facts:













Number of Undergraduate Majors: 180 Number of Graduate Majors: 19

Number of Graduates: 35 Majors, 23 Minors, 7 Masters.

Student Credit Hours Produced: 6,461 - Fall 2000 6,399 - Spring 2001

Number of Faculty: 15 Full-time, 3 Optional Retired

2. Summary of Application (Key Indicators of Productivity for 2000-2001):

-  Increased the average GPA of graduating seniors and maintained a total number of majors above the five-year average for the program.
-  Developed a 12-hour GIS-certificate program and began planning for an interdisciplinary Geographic Information Science instruction and production laboratory.
-  Fully implemented the computerized meteorology student learning laboratory.
-  Strengthened the Department's international education initiatives with study abroad programs, new collaborative research partnerships, and new opportunities for student research.
-  Fifty percent increase in the number of students working on POD-related and POD-funded research. Thirty students presented (or co-presented) the results of their research at local, regional, and national professional meetings.
-  Peer-Teacher program developed and instituted to help develop the student body.
-  Six new students attracted to the Masters in Geoscience as a result of a curriculum and content redesign, and a new partnership with the National Park Service.
-  Two new Distance-Learning initiatives implemented -- The Kentucky Earth System Science Education Project and a collaborative urban geography course with the University of Louisville.
-  Recruited two highly qualified faculty in GIS technologies to help build the new GIS certificate program and to enhance the learning opportunities of students.
-  Faculty convened and/or participated in over 20 professional workshops and presented over 50 papers at local, regional, national, and international conferences. Faculty also gave over 80 academic and community talks over the past year.
-  Faculty visited 15 overseas locations for research, professional development, conferences, and partnership-building activities with universities.
-  The Department has completely redesigned the undergraduate and graduate curricula, has introduced new technology courses, and has developed six workgroups for more efficient and productive management and planning of the Department's short- and long-term goals.

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. During the past year, two-thirds of the faculty ranked well above university core medians with respect to the four criteria that are most important to effective teaching: (1) a clear understanding of course topics, (2) interest in teaching the course, (3) being well-prepared for class, and (4) being actively helpful to the students.

Many undergraduates are unfamiliar with career opportunities in the fields of geography and geology, so faculty devote a disproportionate amount of time advising students with an interest in these disciplines. Professional geology certification and new opportunities in GIS technologies are two areas on which faculty spent significantly more advising time this academic year, identifying appropriate courses inside and outside the Department that will enhance the students' employment potential. Faculty also spent significant time advising students on career opportunities in their respective fields.

Employers increasingly are demanding a greater level of technological skill from our graduates, especially in the area of Geographic Information Sciences (GIS). As a result of this demand, the Department, in collaboration with Agriculture and Architectural/Manufacturing Sciences, developed a proposal to construct a state-of-the-art GIS instruction and production lab. The lab is scheduled to be operational by December 2001, with the first group of students instructed in advanced GIS techniques during the Spring 2002 semester. The GIS lab will provide substantially enhanced learning opportunities for students, not only from the Geography and Geology Department but also for programs across the campus. The interdisciplinary potential of the GIS project is unlimited, and the Department plans to implement a variety of collaborative strategies to encourage interdepartmental student learning activities.

In conjunction with the development of the GIS lab, the Department began a comprehensive review and overhaul of the entire undergraduate and graduate curricula. One of the keys to increased student learning is subject relevance and the Department recognizes that the demands of the 21st century require new and innovative courses and learning opportunities. Students are likely to engage more actively with material they find relevant to their intellectual and career development than with material that is outdated. Thus, the Department has designed a 12-hour GIS certificate program that will enhance substantially the competitiveness of graduates from the Department. Four new GIS-technology courses have been designed to support the GIS-lab initiative, and other core courses are being redesigned to incorporate new skills and technologies.

Coupled with a redesign of the Department's core educational objectives, these new and enhanced courses are providing our students with a much higher quality of intellectual and career development. Further changes to the core curriculum designed to enhance student learning involve the introduction of each student in the service courses to three key research skills: basic GIS mapping, basic statistical analysis, and basic research strategies. When fully implemented across the introductory curriculum, every student that takes a foundation course in the Department will have been exposed to basic GIS, statistical, and research methodologies.

One important measure of improvements to program quality is the average GPA score of graduating seniors. Over the past academic year, the average GPA of graduating seniors has moved upwards to 3.03 for majors and 3.07 for minors in the Department. The nature of the Department's programs is such that students are required to have a fairly broad, interdisciplinary background to achieve success in their chosen area of study. A growing percentage of the Department's students are taking higher-level math, chemistry, and physics

courses to support their major, especially those focusing on environmental management, geology, and climatology.

The Department has strengthened its international education initiatives over the past year. Four students from the geography program and one from the College of Business participated in a study abroad trip to Brazil last summer led by one of the Department's faculty. Two faculty members are developing a field research trip to Australia for Summer 2002 designed to focus on sustainable development and resource management techniques. One undergraduate visited Oxford University, England, last summer on a research scholarship to participate in a project designed to measure acid rain impact on public monuments (a faculty member is one of the project participants), and a graduate student visited China to lecture on GIS technologies at the Institute for Karst Studies in Guilin. Faculty have developed research relationships with universities in China, New Zealand, Argentina, Mexico, England, and Australia – all of which provide new and exciting research and study opportunities for students and faculty from other departments. This past June, for example, three students from the Instituto Tecnológico (ITESM) in Mexico City enrolled in a specially designed Advanced Planning course and an Environmental Planning course taught in the Department. This experience has encouraged planning for two or three special professional-level courses to be offered in Mexico City during the 2002 Summer semester.

A new initiative designed to increase student learning involves linking every undergraduate and graduate major to a Program of Distinction (POD) or other research project. Applied research should be a core educational experience in the geosciences. Therefore, every student declaring a major in the Department is being linked to a specific research project, either through the POD or through independent faculty research. The long-term goal is to develop in students the skills, experience, and knowledge needed to conduct meaningful applied research. Students are required to contribute to research projects, to prepare scholarly papers that summarize their research results, to present those results at local, regional, national, and international conferences and workshops, and to publish their work, where possible, in scholarly journals, books, or conference reports.

Since 1999, the Department has seen a 50-percent increase in the number of students working on POD-related research, and this number is growing as external grants, POD funds, and other sources of funding provide opportunities for student research. This past year seven students presented research papers at the annual Kentucky Academy of Science conference in Lexington, 16 students presented papers at the Sigma Xi research conference held at WKU in March, four students presented papers at the National Speleological Society conference this summer, and five students are working on research papers to present at national conferences this coming academic year.

This level of increased student learning contributes to the professional achievements of our program graduates. Data from the 2000 alumni survey ($n = 365$) show that over 100 of our graduates from the past two decades are employed as professional geologists, environmental managers, and hydrologists. Over 70 occupy positions as city and regional planners, GIS specialists, and cartographers. Many of the present employees of the Bowling Green/Warren County Planning Commission and of the Barren River Area Development District are graduates of the Department and make substantial contributions to the health and welfare of the community. Twenty-eight have gone on to careers as teachers in universities and the K-12 system. One of our graduates recently has earned an M.S. in Environmental Engineering from the University of Missouri, Rolla, and is pursuing a Ph.D. in Geological Engineering from the Missouri School of Mines. This graduate currently is the US Army's infrastructure manager for South Korea. Two other graduates from our undergraduate and M.S. program have recently completed a Ph.D. at Indiana State and have taken research and teaching positions in Florida.

Another key component of the teaching and learning experiences provided by the Department is the continuation and strengthening of a very active internship program. Fifteen

students completed, or are continuing, their internships with corporations, government agencies, and other businesses during 2000-2001. Internships with the local planning commission, BRADD, the National Weather Service, Mammoth Cave National Park, and local companies provided the Department's majors with invaluable learning opportunities and helped to prepare them for future careers in these areas.

II. Developing the Student Body

Many of the Department's majors and minors are recruited from the general education service courses offered by the Department as, historically, few students arrived at WKU as pre-declared majors. Since 1999, the Department has begun a program to recruit potential majors by building contacts with area high schools, with two faculty members designated to lead this initiative. As a result, the Department has experienced a 50-percent increase in freshmen pre-declaring geography and/or geology as a major, especially in the fields of meteorology and environmental geology. The Department's initiative in GIS technologies is expected to yield similar growths in pre-declared incoming freshmen. A special departmental workgroup has been established to focus on recruitment, retention, and graduation.

A new initiative designed to develop and retain the student body involves the use of Peer Teachers. The Department is recruiting 5-10 highly qualified seniors to serve as advisors, mentors, tutors, and teaching assistants. 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 Department's Peer Teacher program identifies these "at-risk" students and assigns them a tutor or mentor. The program is in its infancy, so outcomes assessment is not yet possible, but the Department anticipates significant improvement in the retention of students in these introductory classes over the coming years as the Peer Teacher program matures.

Another initiative to recruit and retain students in the Department involves the strengthening of the Geology and Geography student clubs. These two student-led organizations provide mentoring, peer support, research opportunities, seminars, and field-trip experiences for members. They raise money to support their programs from food sales, rock and gem sales, and other activities.

The number of majors and minors in the Department continues to fluctuate from year to year, but has averaged 164 majors in geography and 35 majors in geology since 1996. Although Fall 2000 numbers (173 majors in Geography and 28 in Geology) are down about 20 percent over 1996 numbers, the quality of incoming majors has increased over this same time. Moreover, the Department has shifted its programs to a more applied research and technology focus, which has had a short-term negative impact on the number of majors and minors in the Department. Graduates from the undergraduate program have average 37 over the past five years (30 in Geography and 7 in Geology), with 35 majors and 29 minors graduating from the Department during the past academic year. The redesign of the Masters program to a geoscience curriculum has spurred an increase in enrollment. Although the Department only graduated five Masters students in 1999-2000, twenty students were in residence during the 2000-2001 academic year, with seven of these graduating (four with theses). The Department anticipates that between 18 and 23 graduate students will be in residence during the coming academic year. Expectations are that this number will increase steadily over the coming years as the GIS facility comes online and new initiatives in the geoscience curriculum are introduced. For example, the Geoscience Masters attracted three geology undergraduates this past year, each of whom stated explicitly that they would not have enrolled in the former M.S. in Geography program.

One example of new initiatives in the Masters program is the partnership with the National Park Service (NPS) to train cave and karst resource managers. Students spend one or two semesters on campus with the financial support of the NPS and complete the rest of their program via distance-learning initiatives. Two students enrolled in this program during the past academic year, and two more students are anticipated for the coming year. Another initiative is the "Kentucky Earth System Science Education Project" designed to provide online professional development opportunities for Kentucky teachers. This collaborative project with Morehead State and NASA provides two online professional development courses for teachers via the Kentucky Virtual University (KVU). The Department also is offering an urban geography course online in partnership with the University of Louisville and anticipates developing distance learning initiatives in the GIS curriculum.

Technology plays an important role in the recruitment and retention of students. If the program is well supported with appropriate technologies, the student will have access to the tools necessary to succeed. The Meteorology and Climatology program has been strengthened by a National Science Foundation UNIDATA Equipment Grant that has provided 20 computers for the previously manual-based meteorology laboratory. The conversion of this lab to a computer-based learning environment is already paying dividends in student learning, recruitment, and retention. In this vein, the development of the interdepartmental GIS instructional and production laboratory will have a huge impact on the Department's ability to recruit, retain, and graduate students. The Department plans a significant recruitment effort for the GIS certificate program, both in the K-12 system and among the region's professionals.

The Department is cognizant of the increasing numbers of non-traditional students that are enrolling in the program and has made efforts to accommodate their schedules. Afternoon and evening courses have been scheduled, especially for graduate and senior-level courses, and web-based courses (offered primarily through email instruction and self-directed learning) are offered whenever possible. To improve timely graduation rates, the Department has introduced the "four-year program" guidelines for incoming freshmen and pre-declared majors. If the student follows the program suggestions, graduation is possible within the four-year time period, with the Department guaranteeing to offer the courses necessary for that student's program. A similar initiative is underway for the graduate program, where students can complete the M.S. program within two years if they follow the program guidelines.

III. Assuring High Quality Faculty and Staff

Over the past two years, the Department's faculty has changed dramatically as a consequence of retirements and the death of the long-time Department Head. The Department has recruited new faculty trained in the technologies of the 21st century and with the ability to generate external funds and recruit new students into the program. The Department also has expended much effort to improve the diversity of the faculty, including special recruitment efforts at national meetings and special mailings to identify a diverse pool of potential candidates. This past year, a highly qualified female geographer, with math and computer undergraduate degrees from Duke University and GIS experience, has been hired, as has a South Asian climatologist with skills in GIS and global climate change research.

The continuing professional development of the faculty is a high priority for the Department and faculty activities over the past academic year demonstrated significant improvement over previous years. Faculty convened and/or participated in over twenty professional workshops during 2000-2001 and presented over 50 papers at local, regional, national, and international conferences, both high points for the previous decade. Moreover, faculty gave in excess of 80 academic and community talks last year on a wide variety of topics at universities, service clubs, community organizations, and other groups locally, regionally,

nationally, and around the world. In large measure, this success resulted from the adoption of a more flexible policy on release and alternate assignment time, and from the provision of adequate support technologies. Where university funds proved inadequate to provide needed support, departmental funds were expended to facilitate faculty and staff development opportunities.

In the geosciences, a critical component of professional development is traveling to, and conducting research in, overseas locations and the Department long has been a leader on campus in supporting international experiences for its faculty. During the past year, faculty from the Department visited China, Korea, Japan, New Zealand, Hawaii, India, Egypt, Greece, Spain, Britain, Mexico, Panama, Brazil, Argentina, and Peru to conduct research, attend professional meetings, engage in collaborative projects, and to develop course content.

In terms of scholarship and creative activities, the Department also recorded many successes during 2000-2001, demonstrating to students, administrators, and constituents alike the high level of quality research and professional activity that occurs in the Department. Although the 2000-2001 activity reports detailing faculty scholarship and creativity have not yet been submitted, preliminary reports show that the faculty collectively published over 20 articles and book chapters, nearly 30 technical reports and editorials, three book reviews, and several commentaries. Creative professional activities include the design, development, and management of the website for the American Geographical Society (www.amergeog.org), the nation's oldest such Society and one of the most prestigious professional organizations in the world. This project required an investment of over 300 hours of time during the first half of 2001.

Securing internal and external grants continued to be a high priority for the Department over the past twelve months, with notable successes in both areas. External grants were awarded to the Department by the National Science Foundation, the Environmental Protection Agency, the U.S. Fish and Wildlife Service, the National Park Service, N.A.S.A., and the Institute for Global Environmental Strategies. Other grants came from local and regional agencies such as the Kentucky Water Resource Research Institute, the Kentucky Division of Parks, the Midwest Climate Center, and WKU's Office of Sponsored Programs. Exact grant-funding totals are not yet available in summary for the Department, but individual grant information suggests that the value of external grants continues to grow each year and has become an important component of the Department's funded-research initiatives. Over 30 students were employed in the Department in grant-supported positions for the 2000-2001 academic year.

IV. Enhancing Responsiveness to Constituents

Public service has been a central pillar of the Department's structure for the past two decades, with activities in 2000-2001 reaffirming the faculty's commitment to productive engagement with a variety of constituents. The Department, through the Center for Cave and Karst Studies, has pioneered interactive and demonstrative public learning activities at the Lost River Cave (LRC) site. This community resource has flourished over the past year with additional funds from the State, community, and other donors and has become one of the premier educational resources in the community. Dozens of students and community activists are employed at the LRC site, providing learning opportunities for area P-12 schools, visitors, and other post-secondary institutions. The Director of the Center for Cave and Karst studies travels the state and the surrounding region, promoting both the LRC resources and the Department's educational facilities.

The Department also had positive impacts on the social, cultural, and economic needs of the region and the Commonwealth through its research initiatives. Faculty and students working in the Hoffman Environmental Research Institute (a research group located within the Department) have addressed a variety of water quality, flooding, land-use management, and planning issues over the past year. In collaboration with the National Park Service and Mammoth Cave staff, the Department is conducting research on the impact of land development, global climate change related to karst landscapes, and tourism impacts. Other faculty have examined the environmental and economic impacts of census changes, transport infrastructure, and development projects in collaboration with local and regional planning agencies and municipal governments. A major project initiated over the past year involves the management of water quality for the region's citizens, an issue of critical importance to people's health and welfare, given the nature of the area's physical landscape.

The Kentucky State Climatologist serves the public from the Department's Kentucky Climate Center and has reinvigorated the public service contributions of the Center over the past year. Using new GIS visual technologies and drawing on the assistance of eight undergraduate assistants, the State Climatologist has provided expert legal testimony, climate-related data, prediction models, and other important information to a broad array of local and state constituents. The Climate Center's website draws thousands of inquiries every year concerning weather-related data and is a valuable public service tool.

Faculty in the Department have also contributed to economic and environmental development in other parts of the world over the past year. A collaborative agreement with the Institute for Karst Studies in Guilin, China, facilitated work last year on a project to tackle the negative environmental impacts of tourism development on karst landscapes. The Department, in collaboration with the Karst Institute in China, has also begun work on a Heritage Corridor project, designed to identify key elements of the social, cultural, physical, and economic landscapes in the immediate area (for Kentucky, it's the I-65/US31W/CSX Rail corridor between Elizabethtown and Bowling Green). In Mexico, a faculty member is working on examining the impacts of the North American Free Trade Agreement in a small coffee-growing town. This calendar year, a Mexican scholar is being hosted by the Department and WKU and is examining the migration trends of Mexicans in the central Kentucky and Tennessee region. The Department is also contributing to a study based at Oxford University in England designed to understand the impacts of acid rain on public monuments. A faculty member in the Department is a contributing researcher in the Globalization and World Cities group that is developing methodologies and theories to understand more clearly the growth of large cities and the global economic connections that drive such growth.

Faculty in the Department provide training and participate in myriad discipline-related partnerships that impact local and regional communities and professionals. For example, each May, the Department sponsors and co-teaches the OSHA "Hazwoper" 40-hour course for professionals in the environmental field. This on-campus training program addresses issues related to hazardous-material management and government regulations. The Department also co-sponsors and co-teaches an Environmental Protection Agency (EPA) course on environmental geophysics each summer. This past year, the Department received a \$50,000 grant from NASA and the Institute for Global Environmental Strategies to provide on-line professional development content and resources for Kentucky teachers. Both the Center for Cave and Karst Studies and the Hoffman Environmental Research Institute (housed in the Department) offer summer and regular-semester self-supporting courses on a variety of karst and hydrology issues. Professionals from around the region and across the country regularly enroll in these courses.

V. Improving Institutional Effectiveness

Over the past twelve months the Department has developed a new operational structure designed to improve its efficiency and productivity. Six permanent workgroups have been established, 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 has the task of developing 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 developed significant initiatives last year (such as the GIS lab and the GIS Certificate Program) to position the Department on the cutting edge of educational technologies and experiences.

Two workgroups have been developed to address the physical, technological, and research needs of the Department. The Facilities and Technology workgroup has conducted a thorough analysis of space utilization in the Department, has inventoried the Department's technology and its future needs, and has made recommendations concerning the physical environment within which the students work. As a result of its efforts, improvements in the utilization of classroom space have been made and previously under-utilized space has been identified and reassigned. The Research Facilities workgroup, comprising the POD directors and key researchers in the Department, has examined research synergies, funding needs, and student research opportunities and has made recommendations concerning increased productivity and efficiency in research activities. These recommendations are embedded in the Department's 2001-2002 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 has implemented a program to identify sources of external funds, to begin the process of identifying 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. For example, the Department has instituted a competition to fund student research each year, with funds coming from the Department's WKU Foundation accounts. This past year the Department funded three research programs. When university funds are unavailable, the Department also has utilized Foundation funds to help in the recruitment of highly qualified faculty.

For the first time in twenty years, the Department has developed a thorough and comprehensive internal strategic plan that details key goals for the unit, outlines development strategies, and sets a comprehensive list of achievement assessments. This comprehensive plan is the result of the efforts of the above-mentioned workgroups and provides the Department with a detailed roadmap for the coming academic year. The Department also has instituted a detailed and thorough Continuation, Tenure, and Promotion Policy designed to provide faculty with a clear sense of purpose and direction. In concert with the University's five strategic goals, the departmental policy sets out the performance measurement criteria by which faculty are assessed for merit each year and assessed for continuance, tenure, and promotion.