PROGRAM NAME: Masters in Geoscience
                  MAE in Education

WKU REFERENCE NUMBER: 072

DEPARTMENT NAME: Geography and Geology

NAME OF DEPARTMENT HEAD: David J. Keeling

NAMES OF FULL-TIME FACULTY WHO REGULARLY TEACH COURSES IN THIS PROGRAM:
Algeo, Katie   Foster, Stuart   Mahmood, Rezaul
All, John      Groves, Chris   May, Michael
Crawford, Nicholas Keeling, David Siewers, Fred
Deal, Richard Kenworthy, Stephen Trapasso, Michael
Kuehn, Ken     Wulff, Andrew

NAMES OF OPTIONAL RETIREE WHO REGULARLY TEACH COURSES IN THIS PROGRAM:
Petersen, Albert

NAMES OF PERSONS PRIMARILY RESPONSIBLE FOR PREPARING THIS REPORT:
David J. Keeling, with contributions from all the faculty

DATE OF SUBMISSION: December 1, 2003
OVERVIEW OF THE DEPARTMENT
The Department of Geography and Geology comprises 20 full-time faculty and serves about 210 undergraduate majors, 40 minors, and 28 graduate students in a variety of specializations. The Department offers a B.S in Geography, a B.S. in Geology, and an MS in Geoscience (with separate reports on each), as well as an AB in Meteorological Technology and a 12-hour GIS Certificate. Several educational, research, and public service facilities are housed within the Department that provide exciting opportunities for a combination of theoretical and practical work. A major goal of the Department is to involve undergraduate and graduate students actively in all aspects of research as an integrated part of their academic programs with the purpose of nurturing their intellectual growth, critical-thinking skills, and technical experience. The Center for Cave and Karst Studies serves as a major research center dealing with all aspects of cave and karst studies, with an emphasis on solving environmental problems associated with karst terrain. The Hoffman Environmental Research Institute, part of the Center for Water Resource Studies, another of the University's Applied Research centers, is a consortium of scientists and students dedicated to research and higher education at the cutting edge of environmental science. Its primary mission is to be a leader in the development of innovative, basic, and applied research programs aimed at understanding the dynamics of human-landscape-atmosphere interactions. The College Heights Weather Station maintains a fully equipped weather station with remote radar capability. The Kentucky Climate Center, directorship of the State Climatologist for Kentucky, is the certified state climate office for Kentucky and a member of the National Climate Services Partnership. The Center archives climatic data for Kentucky, provides access to state, national, and global climatic data, and is active in a wide variety of service, research, and educational outreach activities. The Department's new Geographic Information Science (GIS) Laboratory provides a state-of-the-art educational and research facility. The Lab maintains licenses for ArcGIS, ERDAS Imagine, and S-Plus software and provides access to a variety of spatial data, including digital geologic quads, digital elevation models, digital raster graphics, digital orthophotos, and other commonly used map data. Applied and basic field research by faculty and students is conducted continually in the local area, surrounding states, and throughout the world.

II.A. Mission Statement/Relation of the Program to the University Mission
The Department of Geography and Geology at Western Kentucky University offers the M.S. Degree in Geoscience and supports the MAE in Education (Geoscience major). The program prepares graduate students for careers in the geosciences and for further education at the Ph.D. or professional level. The Department offers an academically rigorous and flexible program of study that prepares students for success in a global society by providing training in the following areas: critical thinking and reasoning; geoscience analysis; global resource change; the geoscience contexts of
landscape development and change; planning; GIS-related analysis, and the physical and cultural contexts of social development, growth, and change (Figure 1).

MISSION STATEMENT

The Department aims to provide students with an outstanding and practical educational experience and it strives to achieve three fundamental goals: Excellence in Teaching, Excellence in Research, and Excellence in Service. The Department is committed to providing current knowledge and leadership development in the geosciences to enhance the career success of students, and to engage in scholarly activities that develop new information in the geosciences while providing services to constituents.

Figure 1. Discipline-Centered Graphic of the Department Mission
The Department’s fundamental philosophical goal is to instill in each of its graduates the following qualities:

<table>
<thead>
<tr>
<th>STUDENT ENHANCEMENT GOALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Openness to others and the ability to communicate with clarity and precision;</td>
</tr>
<tr>
<td>• Self-confidence and intellectual curiosity, with the geological and analytical skills required to satisfy both;</td>
</tr>
<tr>
<td>• A sense of scale and context in the worlds of nature and society;</td>
</tr>
<tr>
<td>• An appreciation for the richness and variety of human experience and expression;</td>
</tr>
<tr>
<td>• An intellectual mastery in and passion for the geosciences;</td>
</tr>
<tr>
<td>• A commitment to ethical and responsible citizenship, including respect for, and an ability to get along with, others;</td>
</tr>
<tr>
<td>• A sense of direction, with the self-discipline, personal values, and moral conviction to pursue life-long learning goals.</td>
</tr>
</tbody>
</table>

Vision and Mission of Western Kentucky University

• Western aspires to be the best comprehensive public institution in Kentucky and among the best in the nation.

• Western aspires to be the university of choice for students and faculty who are dedicated to academic excellence.

• True to the Western spirit, the University offers an inviting, nurturing, and challenging environment, which is responsive to the intellectual, social, and cultural needs of a diverse learning community. Western’s success is reflected in the success of its alumni, who are known for their leadership, adaptability, enterprise, and commitment to Western.

• Western aspires to produce nationally and globally competitive graduates and to provide optimum service and life-long learning opportunities for its constituents.

• Western aims to prepare students for success in a global society.

These qualities are achieved in the graduate program through a solid grounding in geoscience analysis, critical thinking and reasoning, written and oral communication, student-centered research, and quantitative interpretation. However, the program also offers sufficient flexibility in course offerings and program tracks to allow students to develop emphases in traditional geoscience, planning, education, environmental management, GIS analysis, meteorology/climatology, and sustainable development. The Department’s programs are critical to the institution’s mission of preparing students for success in a global society, as success is predicated on a clear understanding of our
global society, its mechanisms, structures, challenges, and opportunities. Programs and courses in the Department also clearly mesh with the vision and mission of Western Kentucky University:

Students in the M.S. in Geoscience must complete 30 hours at the graduate level. Every student in the Geoscience program must complete a 12-hour common core, and then must choose 12 hours of additional coursework based on the selected program track (see Appendix G for details). The common core in Geoscience includes a 4-hour Geoscience Research Methods and Literacy course, a 4-hour Field Methods course, and a 4-hour Advanced Spatial Statistics course. Each student completes a 6-hour thesis project or research paper of publishable quality based upon supervised original research in the chosen field.

In summary, the Department’s mission is to recruit the best students possible, to continue to provide an up-to-date and relevant program, and to review the program and its graduates regularly through ongoing assessment, appropriate capstone courses, internships, examinations, and surveys. The program is continually enhanced through the assessment process by “closing the loop” between student-centered outcomes and program purpose and quality. With its broad spectrum of geographically and geologically centered analysis, interpretation, practice, and communication, the Geoscience graduate program subscribes to the University’s aspiration to be the best comprehensive public institution in Kentucky and among the best in the nation. The Department reflects Western’s emphasis on rigorous academic standards, creative and diverse scholarship, and appropriate and relevant service to the community, region, and profession. Geoscience program graduates have a strong impact on the Commonwealth and nation in the fields of energy development and management, hydrology, planning, location analysis, environmental management and consulting, geophysics, teaching, GIS, and other professions requiring strong skills in spatial analysis, critical thinking, communication, and science-based reasoning. The Geoscience program prepares students for success in a global society.

B. Comments/Clarifications related to Institutional Research Data

Graduate program data provided by the Office for Institutional Research (OIR) generally reflect the situation for the program. The MS in Geoscience program is extremely cost effective, in that only 1.5 full-time equivalent faculty (FTEF) in the Fall semester and 1.0 FTEF in the Spring semester are required to run the program. However, all graduate-level faculty teach courses on a regular basis or supervise student research (theses and projects) beyond their official teaching load assignments. The program has averaged 5 geoscience graduates annually over the past five years (see Appendix F, Graduate Program Section 1.A.2). Enrollments have remained steady over the review period (see Appendix F, Graduate Section 1.A.1), with about 18 majors, but enrollment has jumped for Fall 2003. The Program currently has 30 students enrolled, with 22 full-time students and 8 part-time or non-resident students. Student credit hours in the graduate program are significantly underreported each semester, based on OIR data (see Appendix F, Graduate Section 1.A.4). For example, the program generated 154 student credit hours in Fall 2002, but the OIR data only show 80 SCHs (see Appendix E.3, Table E.3.2.1. and compare with Appendix F, Graduate Section 1.A.4). Average GRE and undergraduate GPA scores have remained consistent during the review period (see Appendix F, Graduate Section 1.B.1), although
GPAs have increased slightly from 3.03 in 1998 to 3.30 in 2002. On average, the program generates the second highest number of graduate SCHs in Ogden College (after Computer Science). Given the minimal resources provided and inadequate graduate assistantship support, the program remains quite healthy compared to other graduate programs in the state and around the country. At comparable institutions, geography, geology, and geoscience Master’s programs with 25-35 majors or more typically have at least 3-5 full-time equivalent faculty dedicated to graduate courses and assistantship stipends in the $10-12,000 range with full tuition waiver.

C. Teaching and Learning

1. Program Faculty:
   Fourteen full-time faculty in the Department of Geography and Geology teach courses in the Geoscience M.S. program, in addition to their primary teaching duties in the Geography or Geology programs.
   - Rank of full-time faculty: 5 tenured professors, 2 tenured associate professors, and 7 tenure-track assistant professors.
   - All the graduate Geoscience program tenured or tenure-track faculty hold Ph.D. degrees in Geography or Geology. One faculty member also holds the J.D. degree.
   - The Department currently employs one half-time optional retiree who teaches a graduate component of an undergraduate course.
   - The Department employs no adjunct faculty to teach graduate-level courses.

2. Program Students:
   a. Selectivity:
      The Geoscience program has no special requirements beyond the admission criteria established by the Graduate School. Typically, the program admits students who demonstrate an ability to conduct independent research and who are self-motivated for success. Approximately 40 percent of students who apply actually enroll in the program. Those who do not enroll are typically recruited by other institutions who offer much better assistantship packages than WKU (typically in the $10-12,000 range with a full tuition waiver). Students are required to take GEO500 Geoscience Research Methods and Literacy in the first semester. This course typically exposes those students who are academically or practically unprepared or ill-suited for graduate studies, with a failure or dropout rate of approximately 20 percent each year.

   b. Description of Students:
      Students come to the Geoscience program from a variety of disciplines, including geography, geology, political science, teacher education, history, sociology, biology, environmental studies, and agriculture. Seventy percent of the graduate students typically are enrolled full-time, with the remaining 30 percent part-time or in the thesis-completion stage. The Department has an agreement with the National Park Service that allows its full-time employees to take a one-semester paid leave of absence to complete the core Geoscience courses each Fall – five students have enrolled in the program under this agreement. Most students come to the program from WKU undergraduate programs, but the students enrolled in Fall 2003 also come from the following institutions: Rutgers University (NJ), Black Hills State University (SD),
Northwest Missouri State University, UT Knoxville (TN), Missouri-Colombia University, University of Washington, Franklin Pierce College (NH), Tennessee Tech, University of South Carolina, University of Evansville (IN), Austin Peay (TN), Southern Illinois University, University of Miami (FL), Shippensburg University (PA), Centre College (KY), University of Oregon, Middle Tennessee State, Vanderbilt (TN), and the University of New Hampshire. Many of the graduate students come to the program after at least 2-3 years of work experience in geoscience-related positions.

c. Information about Graduate Assistantships:
All of the students applying to the Geoscience program are encouraged to apply for an assistantship, with about 85 percent typically meeting the Graduate School’s GAP score requirements. Of those students eligible for an assistantship, typically half of those who actually enroll in the program are awarded some type of support, ranging from a basic academic-year stipend of $7,000 to approximately $10,000, part of which is provided through the ARTP research centers (Kentucky Climate Center, Hoffman Institute, and the Center for Cave and Karst Studies. For 2003-2004, seven students are receiving assistantship support ranging from $3,500 for one semester to $10,000 for the entire academic year. Two students are receiving part-time faculty (supervised graduate-student teaching) stipends.

3. Indicators of Teaching and Advising Quality:
From a philosophical perspective, the Department has articulated a set of program goals and outcomes related to teaching, advising, and learning.

**TEACHING GOALS AND OUTCOMES**

**PROGRAM GOALS:**
- To develop students' fundamental communication skills;
- To develop students' critical-thinking and problem-solving abilities;
- To instill in students core values and ethics for life;
- To instill in students an awareness of their social and civic responsibilities;
- To enable students to understand and engage with the concepts and practices of global interdependence;
- To promote in students a desire for continual personal development;
- To encourage students to enhance their aesthetic perception and ability;
- To develop students' professional proficiency.

**PROGRAM OUTCOMES:**
- Students have developed the knowledge, skills, and attitudes that lead toward life-long learning and enhanced life opportunities;
- Students understand and appreciate the diverse nature of people who live together in a world of diminishing distance;
- Students can apply the technological knowledge, skills, attitudes, and flexibility needed to succeed in a rapidly changing environment;
- Students have developed the cognitive processes and dispositions necessary to think critically, to analyze problems in context, and to make sound and intelligent decisions;
• Students have acquired and utilize the body of knowledge, and have developed the constellation of skills, associated with their discipline, interdisciplinary areas of specialty, or professional field;
• Students can gather and utilize information to enhance knowledge, and can use communication skills to convey meaning effectively and accurately;
• Students have developed fundamental skills in the geosciences, use geoscience in their chosen fields, and understand how the geosciences can be used in analysis and problem solving.

Teaching Quality:
Since 1998, four faculty have been nominated for College awards in teaching (Dr. Siewers in the Geology program won the Ogden Teaching Award in 2002). Four faculty were awarded sabbatical leaves to facilitate more in-depth research in their disciplines. Most faculty in the Department have incorporated digital technology and web-assisted learning into the curriculum, with several faculty using personal web pages to support their teaching. Faculty have developed new graduate courses in Advanced GIS, Global Climate Change, Environmental Ethics in Geography, Physical Climatology, and Dynamic Meteorology, and have taught one-time experimental graduate-level courses in World Music, Globalization, and Storm Water Management.

The Department of Geography and Geology is committed to ongoing faculty development in the area of teaching. Faculty members have attended 15 workshops or activities sponsored by the Center for Teaching and Learning, and the Department’s University Distinguished Professor has agreed to a half-time appointment with the CTL commencing during the 2003-2004 academic year to promote teaching quality. The Department strongly believes that a firm link exists between excellence in teaching and excellence in research. Faculty who consistently rank high on University S.I.T.E. evaluations for student engagement and excellence in teaching are typically productive researchers. Appendix A.3 details the scholarship produced by the graduate Geoscience faculty since 1998. Much of this scholarship is either a result of student-centered collaborative research or finds its way into the classroom as case studies, exemplars, or component parts of the course curriculum.

4. Indicators of Student Learning:

Currently-enrolled students:
Geoscience students engage in supervised course-centered and independent research, presenting posters and papers at local, regional, national, and international conferences. During the review period, over 30 student-authored papers and posters were presented at scientific conferences and other academic meetings. The Department assesses each graduate student through a comprehensive written exam that comprises a basic discipline-centered knowledge survey and written analytical and critical-thinking essays based on the student’s track in the program. Students also are required to complete a thesis derived from independent research or a research paper of publishable quality, with a public presentation of the research required by all graduate students in the Department’s faculty/student seminar series. Graduate student research typically is supervised by a committee of four faculty members, with one faculty member serving as the chair of the committee and the primary mentor. Data and student
feedback from the comprehensive written examination are used to enhance student learning through program and course revisions, thus “closing the loop” between student learning outcomes and program goals.

Many of the Department’s students choose an internship experience during their second year of graduate study, and many have participated in local, national, and international supervised research projects. Five graduate students have completed external internships or internal teaching practica since Summer 1999 (see Appendix K). Ten of the Department’s graduate students have participated in a study abroad or departmental field camp over the past five years. During the review period, sixteen Master’s Theses were produced addressing a variety of applied research issues locally, regionally, and internationally (see title details in Appendix E.3, Table E.3.4). Several graduate students have received awards or grants related to their research:

- Pat Kambesis, 2002, Cave Research Foundation Karst Research Fellowship ($3,500) for the Proposal *A Systems Approach to the Understanding of Agricultural Contaminant Sources and Transport Within a Karst Groundwater Basin*.
- Johnny Merideth, 2002, Outstanding Presentation, WKU Sigma Xi Student Research Conference for the presentation *Quantitative Evaluation of Vertical Shaft Evolution and Function Within the Mammoth Cave System, Kentucky*.
- Alan Glennon, WKU John W. Minton Award for Outstanding Contributions as a Graduate Student, 2000.
- William Curry, 2000, National Speleological Society Ralph W. Stone Award ($1,700) for the Proposal *Effects of Timber Harvest upon Sedimentation in Caves and Karst in Southeastern Alaska*.
- Jeff Timmons, 1998, National Speleological Society Ralph W. Stone Award for the proposal *Acidic Bog Drainage and Limestone Dissolution, Mammoth Cave National Park*.

Program Graduates

The majority of the graduates in Geoscience find employment in one of the many specialty areas of the discipline. A major barrier to successful career placement for many graduates is an unwillingness to seek employment beyond Kentucky. Moreover, a lack of career opportunities in location analysis, transportation planning, environmental management and consulting, city and regional planning, climate-related positions, and business enterprise within the state continue to limit the ability of graduates to find suitable employment beyond graduation. The Department is attempting to address this problem through program restructuring, a new focus on GIS-related courses, and more structured research-centered experiences that might better prepare students for career opportunities. Five program graduates have successfully completed the Ph.D. since 1998. According to data gathered through alumni surveys via the departmental GEOGRAM, over two-thirds of the respondents reported that they had found full-time employment in areas strongly or moderately related to their major focus within two years of graduation (see partial alumni data in Appendix G).
D. Research/Creative Activity

Faculty in the Department conduct applied and basic research in local, regional, national, and international environments on a wide variety of issues related to human-environment interactions. The Department aims to involve all of its students in applied research activities, facilitated through the activities of the Programs of Distinction and the research institutes, with particular emphasis on local and regional development issues. Appendix A.3 details the scholarship of faculty assigned to the Geoscience program (Appendix A.3 is a composite of Appendices A.1 and A.2). During the review period 39 articles, books, and book chapters were published in peer-review outlets, with another 176 articles, technical reports, book reviews, editorials, and comments published in other non-peer-reviewed forums. Appendices B.1 and B.2 detail the academic presentations made by the graduate faculty during the review period at conferences, university seminars, and other meetings locally, nationally, and around the world. For example, graduate faculty in the Department have presented 334 research papers and seminars in the United States, China, Britain, Spain, Mexico, Argentina, South Korea, New Zealand, Hong Kong, Belgium, and Greece, a remarkable global reach of scholarship! Dr. Chris Groves won the 2000 Ogden College Award for Research and Scholarly Activity.

E. Service

The Department strives to provide relevant, practical service to the university, the community, the Commonwealth of Kentucky, and to the disciplines of Geography and Geology. Both faculty and students are encouraged to serve on committees, to be active in their communities, to provide expertise and advice to a variety of constituents, and to work towards improving the human-environment condition. During the review period, literally hundreds of different types of service activities were recorded by the graduate faculty, and Appendices D.1 and D.2 detail the myriad institutional, community, P-12, and discipline-related service activities engaged in by departmental faculty during the review period. The quality and volume of service provided to the Department, college, institution, community, region, state, and nation distinguish this Department from many others on campus. Dr. Stuart Foster has served as the Kentucky State Climatologist since August 2000, replacing D. Glen Conner, who served in that position from 1978 with distinction until his retirement in 2000. Dr. Ken Kuehn (detailed in the Geology program section) received the Ogden College Award for Public Service in 1999 (and was also named University Distinguished Professor in 2001), and Dr. Nick Crawford received the same award in 1996. Both Drs Crawford and Kuehn have been recognized by the American Institute of Professional Geologists and the Kentucky Society of Professional Geologists respectively for distinguished service. Faculty have served with distinction in many professional organizations, including service as manuscript reviewers, officers, webmasters, grant proposal reviewers, paper-session coordinators at professional meetings, and spokespersons.

F. Grant Activity

Since 1998, faculty have been actively seeking grants and contracts from a variety of external and internal sources to support student-centered research. The Department has three research centers that function as part of Ogden College’s Applied Research and Technology Program: The Center for Cave and Karst Studies, the
Kentucky Climate Center, and the Hoffman Environmental Research Institute. Over the five-year period, graduate faculty applied for over $20 million in 246 individual grants and contracts and received total funding in the amount of $3.62 million (approximately an 18 percent success rate). Of this amount, $152,756 came from internal sources and $3.47 million came from external sources (see Appendix E.3, Table E.3.3, for summary details, and Appendices C.1 and C.2 for grants detailed by individual faculty members).

G. Other Indicators of Program Achievement and Contributions

1. Program Viability:
   The Geoscience program remains an important research-centered graduate major at Western, with the average number of students hovering between 25 and 30 over the past five years. Approximately half of the program’s students are recruited directly from Western’s undergraduate programs, and the other half come from a variety of regional and national institutions and are attracted to the specific research opportunities available in the program (see Section 2.b above). The strength of the program is based on student-centered learning, good advising, excellent teaching, and faculty/student research that is integrated into the curriculum. Although geoscience enrollments have suffered nationally over the past 25 years, some changes have occurred that are reinvigorating the discipline and drawing more students to the program. First, the development of advanced spatial mapping techniques, encapsulated in Geographic Information Science (GIS), and new satellite-based locational tools, such as Global Positioning Systems (GPS), have captured the imagination of the latest generation of students. This interest in advanced spatial mapping tools and techniques will translate into a growing demand for spatially centered courses and programs over the coming years, and the geoscience program has redesigned its curriculum to meet these changing demands. Tables E.1.6 and E.1.7 in Appendix E.1 detail the anticipated growth in demand for GIS-related courses and the 12-hour GIS certificate program.

2. Contributions to University Programs:
   The Department of Geography and Geology contributes to University programs by offering study abroad and geology field-camp opportunities. Study abroad programs help prepare students to participate in a global society. In July 2002, twenty students from five university programs (including geoscience) enrolled in courses offered by two Geography faculty (one of whom is a graduate faculty member) through the Department’s summer program in Australia. This study abroad experience exposed students to global issues like World Heritage Site management, the effects of tourism on sensitive environments, deforestation, air and water pollution and planning issues in a way that is impossible to duplicate in the classroom. In summer 2003, eight students and two faculty toured the southwestern United States as part of a geoscience field camp. Students actively engaged in experiencing different cultures and physical landscapes, which broadened their understanding of national and regional peoples and lands. In 2004, the Department is offering study abroad courses in the Bahamas (Spring Break Geology program directed by a graduate faculty member) and in the British Isles (field-based geoscience program). Approximately 40 students have expressed interest so far in these programs. Although geoscience undergraduates constitute the majority of the students that participate in these programs, they are open to all students at WKU,
including graduate students. Each summer, the Center for Cave and Karst Studies offers a series of workshops based at Mammoth Cave National Park. Now in its 26th year, this program offers both university credit and continuing education credit courses. These opportunities play a significant role in Western Kentucky University’s Quality Enhancement Plan as they enhance student “engagement” and prepare students to live and work in a global society. Graduate students from other Master’s programs, such as Public Health, Biology, and Computer Science, take graduate-level GIS courses offered by the Department. The Department also contributes graduate courses to the Leadership Studies Certificate Program, and supervises graduate student research for the capstone course in the Leadership Studies Certificate Program.

3. Use of Technology:

Technology has been thoroughly incorporated into the teaching, research, and service strategies of the Department during the review period. The major teaching tools are computers connected to digital projectors, which are used by faculty for teaching and by students for presentations, and web-based technologies (Blackboard, etc.). Through institutional Action Agenda funds, the Department developed, in partnership with the Agriculture and Architectural and Manufacturing Sciences departments, a state-of-the-art GIS facility, incorporating computers, GIS-related software, scanners and plotters, digitizers, Global Position Systems (both backpack and hand-held systems), and other related technologies. Through judicious use of grant funds, specialized equipment has been purchased to support student-centered research activities, including computers and other electronic equipment, scanning electron microscopes, micro-gravity meters, and other supporting materials. The Department has expended funds from its own operating budget to provide zip disks, memory-chip upgrades, faster computer processors, and other ancillary computer hardware needed to support faculty teaching and research activities. The standard computer set-up provided by the institution is completely inadequate for basic teaching and research needs in the sciences. Several of the more senior faculty are still running computers with outdated operating software, inadequate RAM and hard-drive capabilities, and without the ability to run more sophisticated analytical software (ArcGIS, S-Plus, etc.). The Department maintains a strong web presence with its departmental website (www.wku.edu/geoweb/) (see Appendix L, copy of the home page), which hosts several thousand visitors each year. The website has hundreds of information pages, with course descriptions, program summaries, and details about faculty and student research projects, as well as links to all of the important teaching, research, and service activities within the Department. The website is maintained by the Department Head and is updated monthly, or more frequently as news or changes occur.

4. Uniqueness of Program:

- The Department of Geography and Geology is the only one of its kind in the Commonwealth of Kentucky and it holds the largest concentration of geoscientists in the state.
- The Department is strategically located near Mammoth Cave National Park, along the 31W Heritage Corridor, and near important coal resources. Its location offers significant research advantages.
• The Department has the only program in the United States with a specific emphasis on karst hydrogeology and on the numerous problems associated with development upon karst terrain.

• This is the only program in the Commonwealth with a curriculum in atmospheric science, and it is the only department on campus with three Programs of Distinction (The Kentucky Climate Center, the Center for Cave and Karst Studies, and the Hoffman Environmental Research Institute through the Center for Water Resource Studies).

• Faculty are diverse in training and research interests, yet provide an integrative approach to human-earth issues that spans the human and physical sciences. Several faculty are internationally respected as experts in their research areas.

• The Department's unique focus on the spatial dynamics of human-earth relationships provides an analytical perspective not offered by any other discipline on campus.

• The Department's history of successful geoscience program tracks in city and regional planning, environmental management, and the geologic sciences places it in a unique position to integrate business, community, academic, and governmental approaches to addressing human-environment issues.

• The Department's expertise in spatial analysis gives it a distinct advantage in teaching, developing, and promoting GIS (Geographical Information Science) approaches to problem solving.

• The Department is distinctive in providing professional public service through the State Climatologist and the Kentucky Climate Center, through its weather information broadcasts from the College Heights Weather Station, and through the Center for Cave and Karst Studies that addresses karst-related environmental problems.

• The Department is internationally recognized for its well-marketed and high-quality summer research programs at Mammoth Cave National Park that address environmental problems associated with development on the karst terrain.

• The Department is distinctive in the University for its long history of successful professional public service related to human-earth issues in the local community, the Commonwealth, nationally, and internationally.

• Two faculty in the Department recently launched the Human-Environment Linkages Program (HELP), which represents a new direction for the Department of Geography and Geology (see more on this initiative below in Section I).

5. Contributions to Diversity Goals:

   The Department has a long history of integrating issues of ethnic diversity, gender equality, and personal orientation into the curriculum. The Department offers the only courses on campus that deal explicitly with the spatial aspects of diversity and gender. Many graduate-level courses, such as GEOG 550 Economic Geography, GEOG 580 Urban Geography, and GEOG 525 Political Geography, address issues of ethnic diversity in the United States. In many of the planning courses, significant attention is given to issues of economic and political well-being among African-Americans and other ethnic minorities in U.S. society.

   The Department has made special efforts in past years to identify, recruit, and hire minorities and females into faculty positions, especially through personal contacts, listservs within the disciplines, recruiting at national and regional conferences, and by word of mouth. Out of twenty full-time faculty, three are female, one is South Asian, and
the rest are white males. The Department recognizes that it has work to do in creating a more diversified faculty and it continues to identify ways to attract a broader and more diverse pool of applicants for advertised vacancies.

6. **Accreditation Status:**

   *Not Applicable.* There is no national or regional accreditation body for the disciplines of geography, geology, or geoscience.

7. **Planning, Development, and other Areas:**

   A copy of the Department’s 2001-2006 Strategic Plan is attached in Appendix L. All of the issues addressed in the Department’s Strategic Plan have been covered elsewhere in this document. The Department is pro-active in attracting development funds (with the excellent support of staff in the Development office) and it receives a steady flow of donations each year from a core group of alumni. Each year, the Department produces a 30-page alumni newsletter (GEOGRAM), detailing the activities of faculty and students over the preceding year (see 2003 version of the GEOGRAM newsletter in Appendix L). The newsletter is mailed to approximately 1500 alumni and typically results in direct contact from 30-50 alumni each year. This past year the Geology program received a $100,000 gift ($50,000 with a $50,000 state match) from the Gildersleeve family to support student research and travel. In 2001, the Department received a gift-in-kind of 55 acres of farmland from Dr and Mrs James Taylor (a former faculty member in the Department), with a value to be determined upon liquidation of the asset. Cash and in-kind donations from generous alumni contribute to student support each year for travel to conferences, field research sites, and for study abroad programs and field camps.

8. **Additional Indicators for Career Preparation Programs:**

   Probably the greatest potential for employment growth lies in the area of spatial mapping, GIS, and remote sensing. The Department has identified GIS as a growth area in its curriculum (see Appendix E.1, Tables E.1.6 and E.1.7). According to the Association of American Geographers (online at: http://www.aag.org/Careers/jobinfo.htm): “While GIS and Remote Sensing encompass diverse skills and are separate specialties, increasingly the two tools are used jointly to solve problems. The technical specialties offer some of the greatest opportunities, particularly as government and business discover the nearly limitless range of applications for these skills. Those with expertise in these areas can also help with illustrations for publications. Geographic Information Science specialists can find themselves working in almost any situation. Government needs them to manage and analyze environmental, population, and transportation activity. Local governments are turning to GIS to help manage public utilities and land transactions. Business is finding it a powerful means to monitor commercial activity and to manage the movement of goods and services. In some situations a narrow expertise in one GIS software may open the door for a college graduate, but greater opportunity exists for those who have a topical specialty to go along with their technical skills. Finally, whether using satellite images or aerial photographs, there is ample opportunity for those with training in these areas. Analysis of land use/land cover change is vital to agricultural, forestry, and other environmental activities. The U.S. EPA maintains a team that uses historical aerial photographs to
track past hazards-related activity. There is also opportunity to employ these tools in diverse military or national security applications.”

H. Response to Previous Program Reviews or Other Assessments

The Department submitted a program review in 1998, and received no constructive feedback from the submission. The response to the review was “maintain,” with the comment “The MS program seems to attract good students, and it seems to serve a constituency.”

In September 2003, the Department commissioned an external review of the Department, conducted by Dr. Robert Kent, Department Head in Geography and Regional Planning at Akron State University, Ohio. His review summary stated: “This is a strong department. It has a collegial supportive workplace environment. Department members are loyal and display a strong esprit de corps. The Department’s mission includes a strong general education component, besides granting associate degrees in meteorology, bachelors’ degrees in geography and geology, and a master’s degree in geosciences. Despite the heavy teaching load, faculty members are productive researchers, scholars, and teachers, and also are actively engaged in the local and regional community and indeed throughout the state. The Department is well respected within its college and could be considered one of the college’s more significant departments. The Department has a strong enrollment, many undergraduate majors, and a master’s program. With the recent creation of dedicated computer teaching labs, a GIS center, and a full time GIS lab manager, the Department is well positioned to build additional faculty strength in rapidly expanding areas like GIS and remote sensing. The Department should reinforce its expertise in planning and continue its outreach activities to local and regional planning agencies thorough internships, contracts, and professional interaction.”

I. Future Directions

- Geographical Information Science:

  The growth potential in GIS and related technologies is discussed elsewhere in this document (see also Appendix E.1, Tables E.1.6 and E.1.7). In summary, GIS use has grown exponentially over the past decade and is now pervasive in academia, government, and industry. In environmental monitoring, urban planning, location analysis, public health, criminology, forestry, transportation, utility management and many other fields, the power of GIS is used to analyze spatial data, create comprehensible visual representations, and enhance the decision-making process. GIS technology will only continue to diffuse more widely into society. It is likely that the standard home or office computer of the future will include GIS software, much as word processors, spreadsheets, and presentation software are now standard. In the winter 1999-2000 issue of ArcNews Online, Roger Tomlinson, president of Tomlinson Associates and an early leader in GIS development, characterized the future of GIS as a pivotal technology for the twenty-first century:

  Looking at GIS in the new millennium, one starts with the firm expectation that the adoption of GIS societywide and worldwide is inevitable and that GIS users will be advantaged in their work while nonusers will be relatively disadvantaged...
An essential foundation of GIS usage is the availability of trained people. Perhaps the entire rate of technology take-up in the first part of the millennium will depend on training. The need is for persons who are geographically literate and able to learn how to use the technology. The training focus must be on the ability to solve geographical problems.

Western Kentucky University has an unparalleled opportunity to be a leader in this field, building on the foundation of the GIS certificate program already in place. The existing program has been singled out by ESRI Corporation, the developer of leading GIS software, as a distinguished GIS program. The certificate program provides a broad foundation in GIS concepts and techniques, familiarity with a wide variety of data sources and applications. To meet future needs, the program should be enhanced by the addition of advanced courses that focus on specialized and in-depth use of GIS in particular fields and by the greater integration of GIS into all geoscience courses. To achieve these goals, expanded lab facilities to accommodate larger number of classes and students and a commitment to ensuring adequate numbers of GIS-trained faculty are needed.

- **Environmental Science:**

  The Department plans to take a leadership role in developing and promoting environmental science at the University. Geography is uniquely holistic and such a vision is required to pull together the disparate elements of environmental science. The Department is well-suited to coordinate individual research programs across the University and it can help to develop a curriculum for both undergraduates and graduate students. The idea is not to direct what research is to be performed, but rather to encourage synergies with other departments for grant writing while creating a standard educational curriculum. A logical outgrowth would be the development of a joint Ph.D. program with the University of Kentucky so that each institution could share its expertise for the benefit of everyone.

  Two faculty in the Department recently launched the Human-Environment Linkages Program (HELP), which represents a new direction for the Department of Geography and Geology. HELP is not just a new research lab, although cutting-edge research will occur here. The mission of HELP is to extend the benefits of research into the community by conducting research of local, national, and global significance and then disseminating that research to a variety of outlets. Environmental issues specifically commonly have both a scientific and a policy dimension and the HELP hopes to overcome the traditional failure to incorporate each in academic analyses. Coursework will focus on small sessions of motivated students doing research on environmental issues. A key component of the courses will be dissemination of the findings by the students through presentations at local high schools and to other interested stakeholders. This particular approach is unique among Kentucky institutions. HELP offers students training in computer skills, mapping, synthesis of data, and presentation skills all focused on research issues with “real-world” significance. This training and experience will be useful for students across their disciplines, it should improve retention, and it could open more career and graduate school opportunities. For example, both HELP’s Residential Radon and Karst Stormwater projects have been successful areas of undergraduate research. Students have presented their findings at research conferences and to area high schools over the past year.
Related to this is an unexploited departmental expertise in hazards research. This is a unique but pressing gap in state expertise that the Department could fill, as it has both geographers and geologists. Radon, quartz, flooding, West Nile Virus, sink-hole collapse, drought, homeland security, and even mid-continent earthquakes are all aspects that the Department could address. For example, existing faculty could develop a medical geography course and could research the emergence of new health risks such as West Nile Virus, new outbreaks of malaria, dengue fever, and SARS, as well as ecological vulnerabilities such as limits to food production due to global climate change.

**Meteorology and Climatology:**

Recently added coursework has allowed the Meteorology/Climatology program to meet the minimum coursework required by the American Meteorological Society to bestow its 'Seal of Approval,' to the Department’s Meteorology students. In the future, these courses will facilitate an expansion of research support for graduate students in this sub-discipline. The development of environmental monitoring capabilities in conjunction with the Kentucky Climate Center, and the increased awareness of the impacts of weather and climate on social and economic well-being, are expected to drive continued growth in student enrollment and opportunities for graduates in environmental careers. To meet future needs, the program should be enhanced by the addition of advanced courses that focus on in-depth use of forecasting models, radar-based remote sensing, environmental monitoring networks, and GIS. To reach these goals, expanded laboratory facilities are essential to accommodate the already growing student demand. New and expanded coursework is required, along with additional faculty, trained in model-based atmospheric science. The new courses and facilities are an integral part of the Department’s future growth strategy. This growth is hindered, at this point, by an insufficient number of faculty.

**Geoscience Outreach:**

Outreach is another area of potential growth for the Department, which has the faculty expertise to address many local, national, and international problems. Through the Hoffman Environmental Research Institute, the Center for Cave and Karst Studies, the Kentucky Climate Center, and the Human Environment Linkages Program, the Department could expand its outreach opportunities, including local presentations, regional workshops, and media outlets. The faculty have a duty to the community to assist in issues of concern, especially hazards, and the Department is uniquely positioned to offer expertise for public planning and policy.

Increased awareness of short-term climatic variability and concern about potential long-term change has contributed to growing interest in environmental monitoring from the local to the global scale. The Kentucky Climate Center is aggressively pursuing a strategic goal to develop a statewide environmental monitoring system. Realization of this goal will enhance Western Kentucky University’s national reputation for education, research, and service in the environmental sciences. The availability of real-time environmental data will greatly benefit the Department’s program in meteorology and climatology. In addition, the system will provide a basis for developing educational outreach programs for students and teachers in P-12. Finally, real-time environmental data have been demonstrated to have economic value and will
create opportunities to develop value-added products for the public and private sectors. Efforts are currently underway through the University to acquire external funding for system infrastructure, and an ongoing commitment by the University will be necessary to realize the full range of opportunities created by this system.

- **Summary:**
  The Department is well-placed to take advantage of changing technologies and new approaches to geoscience teaching, research, and service. It serves an important role in Ogden College and in the institution, both in terms of providing important general education courses and in terms of providing training in GIS and other spatial-analytical geoscience techniques. The faculty are productive in all areas and continually engage students for success in a global society. The Department requests an “Enhance” designation to allow it to expand in the areas of GIS, geoscience techniques, and student-centered learning.

PR (peer reviewed)

Katie Algeo, Ph.D. [2001]

Book and Software Reviews:

John All, Ph.D., J.D. [2002]

Nicholas Crawford, Ph.D.


(2000) with Brackman, T.B. (graduate student), Parker, R.G. (graduate student), Curry, W.A. (graduate student), Ek, D.A. (graduate student), Larson, R.A. (graduate student), Ryan, G.G. (graduate student), Gossett, J.M. (graduate student), Meredith, J. (graduate student) and D. Huffines. Investigation of Gasoline Vapors Rising from a Karst Aquifer into Greenwood Park Church of Christ and the Foundation Christian Academy, Bowling Green, Kentucky. *Proceedings of Mammoth Cave National Park’s Eighth Science Conference.*


Technical and Other Reports:
(1998-2003) 73 technical and other reports to clients, attorneys, public agencies, and other constituents (see detail in Appendix J).

**Richard Deal, Ph.D. [2001]**

**Stuart, Foster, Ph.D.**


Technical Reports:
(2003) A Model of Spatial Precipitation Gradient of Heavy Precipitation Events to Estimate the Probability of Extreme Differences in Precipitation Totals at Proximate Locations. Kentucky Climate Center and Center for Cave and Karst Studies, WKU.


Chris, Groves, Ph.D.
(In review) with Liu, Z., D. Yuan, J. Meiman, G. Jiang, and S. He. Controls on South China Karst Aquifer Storm-Scale Hydrochemistry. Ground Water. (PR)


(2002) with Glennon, J.A. An examination of perennial stream drainage patterns within the Mammoth Cave watershed. Journal of Cave and Karst Studies 64: 82-91. (PR)


Technical and other Reports:


**David J. Keeling, Ph.D.**


Book Reviews:


Editorials, Commentaries, and Editorships:


Stephen Kenworthy, Ph.D. [2003]


Kenneth Kuehn, Ph.D.


Rezaul Mahmood, Ph.D. [2001]
(In Review) with Legates, D. R. and Meo, M. Soil water availability and potential rainfed rice productivity in Bangladesh: A CERES-Rice Model-based Assessment. Applied Geography. (PR)


Michael May, Ph.D.


Other Publications:

Fred Siewers, Ph.D.

L. Michael Trapasso, Ph.D.


(2003) with et.al. Computer Exercises in Meteorology, ERIC-ChESS Clearinghouse for Social Studies and Social Science Education. Online Educational Resources, Social Studies Development Center of Indiana University, Bloomington, Indiana.


(1999) with Larissa Keith. Relationships Between Selected Meteorological/Pollution Parameters and Hospital Admissions for Asthma, *Journal of the Kentucky Academy of Science* 60(2): 73-77. (PR)


**Book Reviews:**


**Andrew Wulff, Ph.D. [2002]**

### Appendix E.3 Comparative Data - Geoscience Program

#### Table E.3.1. Graduate Credit Hours Produced

<table>
<thead>
<tr>
<th>Semester</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2003</td>
<td>209</td>
</tr>
<tr>
<td>Spring 2003</td>
<td>137</td>
</tr>
<tr>
<td>Fall 2002</td>
<td>154</td>
</tr>
<tr>
<td>Spring 2002</td>
<td>99</td>
</tr>
<tr>
<td>Fall 2001</td>
<td>154</td>
</tr>
<tr>
<td>Spring 2001</td>
<td>95</td>
</tr>
<tr>
<td>Fall 1999</td>
<td>67</td>
</tr>
<tr>
<td>Fall 1997</td>
<td>175</td>
</tr>
</tbody>
</table>

Source: WKU Banner Course Enrollment Data.

#### Table E.3.2.1. Graduate Courses Fall 2003, with enrollment data

<table>
<thead>
<tr>
<th>Course</th>
<th>Students</th>
<th>Credit Hours</th>
<th>Audience/Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geo 500 Geoscience Research</td>
<td>13</td>
<td>52</td>
<td>Core Program Course</td>
</tr>
<tr>
<td>Geo 502 Field Methods</td>
<td>6</td>
<td>24</td>
<td>Core Program Course</td>
</tr>
<tr>
<td>Geo 520 Geoscience Data</td>
<td>10</td>
<td>40</td>
<td>Core Program Course</td>
</tr>
<tr>
<td>Geo 501 Geo Development</td>
<td>4</td>
<td>12</td>
<td>California Research</td>
</tr>
<tr>
<td>Geo 510 Directed Research</td>
<td>1</td>
<td>1</td>
<td>Field Research</td>
</tr>
<tr>
<td>Geo 595 Geoscience Practicum</td>
<td>2</td>
<td>7</td>
<td>Field Experience</td>
</tr>
<tr>
<td>Geo 599 Thesis Research</td>
<td>6</td>
<td>27</td>
<td>Thesis Research</td>
</tr>
<tr>
<td>Geo 600 Matriculation</td>
<td>1</td>
<td>1</td>
<td>Maintain</td>
</tr>
<tr>
<td>Geo 416G Remote Sensing</td>
<td>3</td>
<td>9</td>
<td>Research Tool</td>
</tr>
<tr>
<td>Geo 417G Advanced GIS</td>
<td>7</td>
<td>21</td>
<td>GIS Certificate</td>
</tr>
<tr>
<td>Geo 431G Dynamic Meteorology</td>
<td>1</td>
<td>3</td>
<td>Climate Track</td>
</tr>
<tr>
<td>Geo 451G Kentucky</td>
<td>1</td>
<td>3</td>
<td>Teacher Education</td>
</tr>
<tr>
<td>Geo 474G Environ. Planning</td>
<td>2</td>
<td>6</td>
<td>Planning Track</td>
</tr>
<tr>
<td>Geol 415G Environment Geology</td>
<td>1</td>
<td>3</td>
<td>Hydrology Track</td>
</tr>
</tbody>
</table>

**Total** 58 209

Source: WKU Banner Course Enrollment Data, September 2003.
### Table E.3.2.2. Graduate Courses Fall 2002, with enrollment data

<table>
<thead>
<tr>
<th>Course</th>
<th>Students</th>
<th>Credit Hours</th>
<th>Audience/Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geo 500 Geoscience Research</td>
<td>12</td>
<td>48</td>
<td>Core Program Course</td>
</tr>
<tr>
<td>Geo 502 Field Methods</td>
<td>9</td>
<td>36</td>
<td>Core Program Course</td>
</tr>
<tr>
<td>Geo 520 Geoscience Data</td>
<td>3</td>
<td>12</td>
<td>Core Program Course</td>
</tr>
<tr>
<td>Geo 510 Directed Research</td>
<td>2</td>
<td>6</td>
<td>Field Research</td>
</tr>
<tr>
<td>Geo 540 Advanced Regional</td>
<td>1</td>
<td>3</td>
<td>Planning Track</td>
</tr>
<tr>
<td>Geo 571 Quality of Life Issues</td>
<td>2</td>
<td>6</td>
<td>Environ. &amp; Planning</td>
</tr>
<tr>
<td>Geo 599 Thesis Research</td>
<td>2</td>
<td>6</td>
<td>Thesis Research</td>
</tr>
<tr>
<td>Geo 600 Matriculation</td>
<td>3</td>
<td>3</td>
<td>Maintain</td>
</tr>
<tr>
<td>Geo 417G Advanced GIS</td>
<td>3</td>
<td>9</td>
<td>GIS Certificate</td>
</tr>
<tr>
<td>Geo 419G Advanced GIS</td>
<td>1</td>
<td>3</td>
<td>GIS Certificate</td>
</tr>
<tr>
<td>Geo 420G Geomorphology</td>
<td>1</td>
<td>4</td>
<td>Hydrology Track</td>
</tr>
<tr>
<td>Geo 487G Environmental Law</td>
<td>5</td>
<td>15</td>
<td>Environ. &amp; Planning</td>
</tr>
<tr>
<td>Geol 415G Environment Geology</td>
<td>1</td>
<td>3</td>
<td>Hydrology Track</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45</strong></td>
<td><strong>154</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: WKU Banner Course Enrollment Data, September 2002.

### Table E.3.3. Combined Grants and Contracts, 1998-2003

**Department of Geography and Geology (Geoscience Faculty)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Submitted</th>
<th>Funded</th>
<th>Total Grants and Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003 YTD</td>
<td>$ 7,439,783</td>
<td>$ 184,962</td>
<td>52</td>
</tr>
<tr>
<td>2002</td>
<td>$ 2,553,658</td>
<td>$ 895,673</td>
<td>69</td>
</tr>
<tr>
<td>2001</td>
<td>$ 4,967,532</td>
<td>$ 757,691</td>
<td>69</td>
</tr>
<tr>
<td>2000</td>
<td>$ 3,051,260</td>
<td>$ 1,138,260</td>
<td>24</td>
</tr>
<tr>
<td>1999</td>
<td>$ 1,732,543</td>
<td>$ 470,293</td>
<td>17</td>
</tr>
<tr>
<td>1998</td>
<td>$ 669,631</td>
<td>$ 175,131</td>
<td>15</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$ 20,414,407</strong></td>
<td><strong>$ 3,622,010</strong></td>
<td><strong>246</strong></td>
</tr>
</tbody>
</table>

Source: Faculty Annual Reports.
<table>
<thead>
<tr>
<th>Student</th>
<th>Thesis Title</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson, Michael</td>
<td>Transport of the Herbicide Atrazine on Suspended Sediments during a Spring Storm Event in Mammoth Cave, Kentucky.</td>
<td>2002</td>
</tr>
<tr>
<td>Carigan, Deven</td>
<td>Field Measurement and Theoretical Prediction of Limestone Dissolution Rates, Mammoth Cave, Kentucky.</td>
<td>1998</td>
</tr>
<tr>
<td>Capps, Arthur S.</td>
<td>Dye Tracing to Delineate Drainage Basins and Determine Groundwater Sensitivity, Mammoth Cave, Kentucky.</td>
<td>2001</td>
</tr>
<tr>
<td>Demaree, Nancy</td>
<td>Place, Disease, and Mortality: Trimble County, Kentucky, 1849-1894.</td>
<td>2000</td>
</tr>
<tr>
<td>Glennon, Alan</td>
<td>Application of Morphometric Relationships to Active Flow Networks with the Mammoth Cave Watershed.</td>
<td>2001</td>
</tr>
<tr>
<td>Gordon, Ryan</td>
<td>The Bicycle as a Transportation Vehicle: An Assessment of Bicycle Suitability in Bowling Green, Kentucky.</td>
<td>1998</td>
</tr>
<tr>
<td>Howard, Brian</td>
<td>A Park-and-Ride Feasibility Study for Evansville, Indiana.</td>
<td>2001</td>
</tr>
<tr>
<td>Kreitzer, Debra D.</td>
<td>Measuring the Applicability of the Seville Strategy to the Mammoth Cave Area Biosphere Reserve.</td>
<td>1998</td>
</tr>
<tr>
<td>Marklin, Susan</td>
<td>The Progression of Recycling in Bowling Green, Kentucky.</td>
<td>2001</td>
</tr>
<tr>
<td>Pfaff, Rhonda</td>
<td>Geographic Information Systems Methodologies to Examine Land Use and Groundwater Quality Relationships in South-Central Kentucky.</td>
<td>2003</td>
</tr>
<tr>
<td>Pruett, Timothy S.</td>
<td>The Lost Valley of Peru? A Geographic Analysis of Illicit Coca Production and Terrorism in the Upper Huallaga Valley.</td>
<td>2000</td>
</tr>
<tr>
<td>Troutman, Timothy</td>
<td>A Comprehensive Heavy Precipitation Climatology for Middle Tennessee.</td>
<td>1999</td>
</tr>
<tr>
<td>Vaughan, Kevin B.</td>
<td>Carbonate Chemistry and Limestone Dissolution Rates of Interstitial Fluids within Cave Stream Sediments.</td>
<td>1998</td>
</tr>
</tbody>
</table>
Table E.3.5. Teaching Practicum, 2005-2011

<table>
<thead>
<tr>
<th>Student</th>
<th>Supervisor</th>
<th>Course</th>
<th>Course Taught</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baldwin, Mark</td>
<td>Dr. Rezaul Mahmood</td>
<td>GEOG 121</td>
<td>GEOG 121 F05</td>
</tr>
<tr>
<td>Chaney, James</td>
<td>Kevin Cary</td>
<td>GEOG 110</td>
<td>GEOG 110 F05</td>
</tr>
<tr>
<td>Pricope, Narcisa</td>
<td>Dr. Chris Groves</td>
<td>GEOG 100</td>
<td>GEOG 100 F05</td>
</tr>
<tr>
<td>Rehkorf, Sarah</td>
<td>Debbie Kreitzer</td>
<td>GEOG 110</td>
<td>GEOG 110 F05</td>
</tr>
<tr>
<td>Sakofsky, Brian</td>
<td>Scott Dobler</td>
<td>GEOG 100</td>
<td>GEOG 100 F05</td>
</tr>
<tr>
<td>Sharp, Scotty</td>
<td>Dr. Steve Kenworthy</td>
<td>GEOG 280</td>
<td>GEOG 280 F05</td>
</tr>
<tr>
<td>Simpson, Shawn</td>
<td>Kevin Cary</td>
<td>GEOG 317</td>
<td>GEOG 317 F05</td>
</tr>
</tbody>
</table>