The University of Arizona

ARIZONA UNIVERSITY SYSTEM
CHIEF ACADEMIC OFFICERS GUIDELINES
FOR
REQUESTS FOR IMPLEMENTATION AUTHORIZATION
FOR NEW ACADEMIC DEGREE PROGRAM - UNIQUE

SIGNATURE COVER PAGE

Initiating college(s), department, or committee: School of Geography and Development

Title of this proposal: Master's of Science (MS) in Geographic Information Systems Technology

Unit Administrator: (name and title): Paul Robbins, Director

Signature: [Signature] Date: 2-8-10

College Dean: [Signature] Date: 2-8-10

College Dean: [Signature] Date: 2/10/2010
MEMORANDUM

DATE: February 9, 2010

TO: Dianne Horgan, Associate Dean, Graduate College

SUBJECT: Proposal for a MA in Geographic Information Systems Technology (GIST)

We are writing on behalf of the College of Agriculture and Life Sciences and the School of Natural Resources and the Environment (SNRE) to express our strong support for the proposal submitted by the School of Geography and Development (SGD) to create a Master’s Degree in GIST. The proposal is a natural extension of the collaboration by SNRE and SGD in delivering high-quality GIST courses and curriculum.

This program represents an important opportunity to expand our degree offerings in an area of high demand to professionals in Arizona and CALS is committed to providing support as indicated in the proposal.

Eugene G. Sander
Vice Provost and Dean

Lisa Graumlich, Director
School of Natural Resources and the Environment
MEMORANDUM

DATE: February 8, 2010

TO: Dianne Horgan, Graduate College

FROM: John Paul Jones III, Dean
College of Social & Behavioral Sciences

RE: Proposal for MS in Geographic Information Systems Technology (GIST)

I am writing on behalf of the College of Social and Behavioral Sciences Dean’s Office to express our strong support for the attached proposal to create a Masters degree in GIST, to be jointly operated by the School of Geography and Development and the School of Natural Resources and Environment. If approved, the new program will not only continue to strengthen an on-going collaboration between SGD and SNRE, but also between SBS and the College of Agriculture and Life Sciences.

This program offers wide-ranging benefits and SBS is committed to providing support as indicated in the proposal.
REQUESTS FOR IMPLEMENTATION AUTHORIZATION
FOR NEW ACADEMIC DEGREE PROGRAM
[UNIQUE PROGRAM]

I. PROGRAM NAME AND DESCRIPTION AND CIP CODE

Program Name: Master’s of Science (MS) in Geographic Information Systems Technology

Description: We propose the implementation of a Master’s of Science in Geographic Information Systems Technology. The proposed degree meets the important educational needs of working professionals seeking to improve their career standing through advanced training in the knowledge-based economy, as well as for recent graduates seeking employment in geospatial industries. This degree focuses on advanced studies and skills in geographic information science and geographic information technology for use in public, corporate, and academic research and innovation.

CIP CODE: TBD

A. DEGREE(S), DEPARTMENT AND COLLEGE AND CIP CODE

Proposed Degree

Master’s of Science in Geographic Information Systems Technology (GIST)

CIP CODE: TBD.

Departments and Colleges

School of Geography and Development (SGD), College of Social and Behavioral Sciences (SBS)
School of Natural Resources and the Environment (SNRE), College of Agriculture and Life Sciences (CALS)

B. PURPOSE AND NATURE OF PROGRAM

The purpose of this degree is to offer “cutting edge” geographic information systems, geographic information science, and geographic information technology to fill the worldwide demand for skilled geospatial professionals. Our focus is on educational training for entry and advancement in the geospatial industries, and thus this is a professional degree, but not necessarily a terminal degree.

The Master’s of Science in Geographic Information Systems Technology would not require a thesis. Instead, they would require students to address a normative or scientific
geographic problem in the form of a “substantial research project…in lieu of a thesis”.¹ The program will require an internship. Incoming students will meet all University of Arizona Graduate College admission requirements.

There are numerous geographic information systems and technology courses taught at the University of Arizona. Most such courses are offered through SGD and SNRE and have been developed in concert with these programs’ academically-oriented graduate degrees (e.g., MS/PhD in Geography, MS/PhD in Natural Resources). Students seeking a professional program focused entirely in GIST are limited to the cooperatively delivered Graduate Certificate in GIS (http://www.snr.arizona.edu/GIS_Web). Professional students are also limited by courses designed to augment specific academic programs with their own degree requirements, thereby limiting their access to a comprehensive and integrative GIST education, especially with respect to professionally-oriented training. Matters such as daytime course scheduling, uneven sequencing of courses, and the need to focus on the requirements of a student’s specific academic degree are just a few of the roadblocks for busy professionals. The MS in GIST is designed to meet the needs of professionals by offering an integrated evening program in GIST that can be completed through evening study in one year.

The proposed program will offer advanced training in the principles and practices of geographic information systems technology through learner-centered education and problem-based learning. This pedagogic strategy reinforces the focus on professional education and training.

A new tract for the Graduate GIS Certificate at the University of Arizona² would also be developed. The current Graduate GIS Certificate Program would continue unaffected by the proposed programs. The new tract for the Graduate GIS Certificate Program would constitute the first fall sequence of courses of the proposed MS in GIST degree as well as three credits of Practicum.

C. PROGRAM REQUIREMENTS

The MS in GIST would be offered as an integrative series of courses in the evenings from 6-9pm, Monday through Thursday, in the fall and spring semesters. Only students in the new tract for the Graduate Certificate in GIS, or students in the MS in GIST would be able to enroll in the courses offered by this program. Credits from the new Graduate GIS Certificate would be transferable to the MS in GIST. No other credits would be allowed to transfer to this degree program as it would affect program fees and available seating.

For the MS in GIST, the summer session would consist of three credits of GIST Internship and three credits of GIST Practicum. The MS in GIST would have a total of thirty graduate credit hours taken in the fall, spring and first summer semester, thereby

¹ http://grad.arizona.edu/academics/program-requirements/masters-degrees/credit-requirements
² http://www.snr.arizona.edu/GIS_Web/
satisfying the University of Arizona’s Graduate College requirements for a MS degree within one calendar year.³

Evening courses reaffirm the professional focus of the proposed degree as students would be able to work during the day, seek geographic information systems technology employment or internships, or work on campus.

We are proposing an integrative and innovative pedagogic sequence of courses. Rather than each course being taught on a separate night in the fall and spring semesters, they would occur sequentially with three courses running approximately 5.3 weeks in the fall semester and four courses running 4 weeks in the spring semester (based on the normal 16 week semester). Business courses would either be taken online or follow their regularly scheduled times. This integrative pedagogic strategy takes advantage of learner-centered education (LCE) practices in the following ways: (a) each course builds upon the knowledge gained in the previous course, which thereby reduces redundancy across courses and between the certificate and the Master’s degree; (b) the reduction in redundancy allows students to focus all their attention on one area rather than forcing sometimes awkward linkages across course topics if taken on different days of the week; and (c) the integrative approach allows courses to be arranged in a sequential manner.

The integrative model also provides flexibility in the curriculum, including: (a) the ability to introduce new pedagogy within a course that highlights current innovations in the geospatial technology industry; and (b) the inclusion of visiting faculty and geospatial professionals possessing unique skills but with time commitments that preclude semester long commitments. Furthermore, an integrative model allows the MS in GIST to take advantage of the diversity of existing strengths in geographic information technology at the University of Arizona (see “Existing Courses” below). Faculty and staff in both SGD and SNRE who currently teach or do research related to geographic information systems technology will be drawn upon to teach a unique set of skills related to specific courses or course modules.

Learner Centered Education

Our proposed integrative pedagogic practice emphasizes learner-centered education principles adopted by the Arizona Board of Regents in 1999. It does so in the following ways: (a) it creates a Learning Community; (b) allows for Differential Learning Pedagogic Practices; (c) promotes Active Cooperative Learning, which leads to (d) improved Outcomes and Assessment Matrices.

- Creating a Learning Community

Our integrative pedagogic practice seeks to create an integrated community of learners. It does so by providing an “efficient and flexible college education that promotes deeper, more lasting and more transferable learning.”⁴ This is reinforced through the frequency of weekly interaction and through a defined annual student cohort that engages with one another throughout an entire year. Students and faculty spend each evening together

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³ http://grad.arizona.edu/academics/program-requirements/masters-degrees/credit-requirements
⁴ http://www.abor.asu.edu/4_special_programs/lce/general_faq.htm
during the week, thereby reinforcing a sense of community and providing a holistic approach to creating a learning community. Furthermore, integrative courses that meet regularly allow for frequent interaction among students and faculty, creating a socially cohesive and professional environment that broadens learning goals.5

Annual extracurricular events would be built into the program, such as an opening night orientation and reception, an end of the fall semester gathering, a spring GIST Practicum “colloquium” (to discuss their summer curriculum), and a graduation ceremony. As the program grows, alumni would be invited to the opening night reception to perpetuate the sense of community and offer a forum for professional networking.

The MS in GIST and the new tract for the Graduate Certificate in GIS would further seek to employ professionals from the local business community as Faculty Associates (FAs). Funding for FAs would come from tuition returned and/or from a to-be-proposed $1,500 program fee. This is essential to maintaining business linkages, showing that the program is professionally based, and supplementing applied skills and problem sets not available within the University system. Key individual and corporate liaisons in the Pima geospatial business community that could teach in the program or assist in locating qualified FAs include:

- John Regan, Pima County Department of Transportation, Information Technology Department, with 21+ years in the GIS profession. He has worked on the Sonoran Desert Conservation Plan and served on the board of supervisors and county administrator’s office. At the University of Arizona, he has taught in the School of Renewable Natural Resources. He is informally referred to as the “Godfather” of GIS in Pima County.
- Steve Whitney, Pima County Department of Transportation, Information Technology Department.
- Jack Lloyd Division Manager, Pima County Department of Transportation, Information Technology Department.
- John Dickinson, Pima County Department of Transportation, Information Technology Department.
- Doug Kliman, PhD in Geography from the University of Arizona. Former owner of Tactical Geographics (http://www.tacgeo.com/index.htm) and skilled in Web-Based GIS.
- Scientific Technologies Corporation (http://www.stchome.com), an ESRI Business Partner with an office in Tucson focused on services and technology solutions for medical records, public health resources, and surveillance systems for epidemiology and registries.
- Sunquest Information Systems Inc (http://www.stchome.com), an ESRI Business Partner with an office in Tucson focused on providing medical laboratory connectivity, orders, reporting and messaging solutions.
- TerraSystems Southwest Inc (http://www.terrasw.com), an ESRI Business Partner with an office in Tucson focused on GIS strategic planning,

5 http://www.abor.asu.edu/4_special_programs/lce/guiding_prin.htm
project management, application development, analysis support and neighborhood GIS development and implementation.

- The Jones Payne Group (http://www.jonespayne.com/index.php), an ESRI Business Partner with an office in Tucson and a multidisciplinary firm with a GIS Services Team focused on project and database management, and Internet application development. The GIS team is experienced in GIS programming and web-based GIS technologies.


- Statistical Research Inc (http://www.sricrm.com/index.html), a Tucson company focused on cultural resource management and historic preservation. The Assistant Director, and Director of the Cartography and Geospatial Technologies Department, Stephen A. McElroy, Ph.D., has taught courses at the University of Arizona’s School of Geography and Development.

Teachers in the program would be offered professional development opportunities and an ESRI Education Development Center (EDC) proposal would be written to take advantage of EDC’s benefits.⁶ We will assist long term FAs to obtain, or maintain, their Geographic Information Systems Professional (GISP) certification (http://www.gisci.org/). The philosophy behind incentives related to University of Arizona staff members and FAs is to provide them a sense of ownership and pride in the proposed degree and certificate and make them feel valued members of this learning community. University of Arizona staff members and FAs should never be considered “part-time” instructors but be given additional incentives that not only make them feel integral to the degree and certificate but encourage them to maintain high teaching standards, think creatively to help keep the degree and certificate current with the every-changing geospatial technology industries, and aid graduate students in job placement.

- Differential Learning Pedagogic Practices

The fast paced and integrative nature of the MS in GIST and the new tract for the Graduate Certificate in GIS requires teachers to practice differential learning pedagogies. When a student is absent for any legitimate reason, especially for an extended period of time, their absence affects their ability to complete a course and can have greater consequences as courses build upon knowledge gained from previous courses. This is where creating a learning community has its advantages in that it promotes more frequent interaction and enables students and teachers to work together to remedy the situation. Teachers must be both professional and flexible and “recognize, value, and adapt to the diversity of student learning styles and needs in their community.”⁷

Second, differential learning pedagogy relates to the level of skills a student has in geographic information systems technology upon entering the program. As the degree

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⁶ http://www.esri.com/industries/university/edc/
⁷ http://www.abor.asu.edu/4_special_programs/lce/guiding_prin.htm
and certificate would have no prerequisites in prior work in GIST, student entry skill levels will vary greatly. Having an excellent teacher in the first class of the fall semester is essential as this class provides the foundational knowledge that will guide students throughout their degree or certificate. A teaching assistant is essential in the fall semester (if enrollment exceeds 12 students), as those lacking in skills will require additional assistance, which can place a disproportionate demand on a single teacher and may lessen the initial bonding experience required to create a healthy learning community. Again, this is where creating a learning community can be of value, as the more experienced students can assist the less experienced students with their background deficiencies. Finally, differential learning pedagogy is based on the assumption that no one instructional model is appropriate in every circumstance. Our integrative and intensive program will provide learning opportunities that optimize the prospect for quality student-faculty and peer-to-peer interactions in support of learning.8

- Active Cooperative Learning

The creation of a learning community using differential learning pedagogy practices will promote the sharing of information and knowledge between students and teachers, encourage cooperative and innovative approaches to education, and advance life-long learning beyond formal education.9 Central to the MS in GIST and the new tract for the Graduate Certificate in GIS is a pedagogic philosophy that promotes deep learning, i.e., critical analysis that links already known concepts and principles to problem solving in unfamiliar contexts.10 Deep learning positions students at the center of decision-making processes and requires their active learning in problem-based, technology-delivered education. A focus on active cooperative learning does not rely on lectures or textbook based pedagogy. This further reinforces learner-centered education practices by constructing settings that foster a dialogue among learners.

- Outcomes and Assessment

Through a focus on learner-centered education practices, the MS in GIST and the new tract for the Graduate Certificate in GIS will emphasize “the direct involvement of learners in activities that produce deeper understanding of the content through the development of skills that are readily transferable to life and work.”11 Our proposed integrative curriculum achieves student learning outcomes that can be assessed by meaningful, objective and measurable goals that focus on active learning and problem-based learning.

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8 http://www.abor.asu.edu/4_special_programs/lce/guiding_prin.htm
9 http://www.abor.asu.edu/4_special_programs/lce/general_faq.htm
10 http://www.abor.asu.edu/4_special_programs/lce/guiding_prin.htm
11 http://www.abor.asu.edu/4_special_programs/lce/guiding_prin.htm
Required Courses

- Fall Courses

<table>
<thead>
<tr>
<th>Credits</th>
<th>No. of Weeks</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>4</td>
<td>5.3</td>
<td>Fundamentals of GIST</td>
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<tr>
<td>4</td>
<td>5.3</td>
<td>Geostatistics and Spatial Modeling</td>
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<tr>
<td>4</td>
<td>5.3</td>
<td>Applied GIST</td>
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The first fall semester will consist of three, four credit-hour classes. These courses would be required of the MS in GIST and the new tract for the Graduate Certificate in GIS. The first course, Fundamentals of GIST, would be taught by a tenure-track faculty member who will also be the Program Director (this sets the stage for the formation of the learning community as it establishes and promotes interpersonal connections between students and the Program Director, who will also serve as the students’ primary advisor and practicum supervisor). Both SGD and SNRE already have strengths in this first course through regularly offered courses: RNR/GEOG 503: Applications of Geographic Information Systems and RNR/GEOG 517: Geographic Information Systems for Natural and Social Sciences. Course content will build on these strengths but with an applied-professional rather than graduate student-research focus.

The second course, Geostatistics and Spatial Modeling, moves to an intermediate skill level of geographic information systems and technology. The University of Arizona already has existing strengths in this area, with topical material similar to the following courses: RNR/GEOG 520: Advanced Geographic Information Systems; GEOG 553: Advanced Locational Theory; RNR/GEOG 573: Spatial Analysis and Modeling; GEOG 574G: Introduction to Geostatistics; and GEOG 657: Spatial Analysis.

The third and final course of the fall semester, Applied GIST, focuses on advanced normative and scientific geographic problem solving through applied projects. This course draws from the “Active Cooperative Learning” pedagogic principles. The University of Arizona already has existing strengths in this area through the following courses: GEOG/RNR 516A: Computer Cartography; GEOG/RNR 516E: Geovisualization; RNR/GEOG 519: Cartographic Modeling for Natural Resources; and GEOG/RNR 516C: Urban Geographic Information Systems. While GEOG/RNR 516C includes a problem-based learning component, some of the material in this course is more appropriately linked to the proposed spring semester class, Urban and Environmental GIST. Further, while GEOG/RNR 516A and GEOG 516E constitute one area of the Applied GIST course, it is not the central focus of that course. The focus of this course is to integrate the educational knowledge obtained in the fall semester.
Spring Courses

<table>
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<th>Credits</th>
<th>No. of Weeks</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>3</td>
<td>4</td>
<td>Fundamentals of Remote Sensing</td>
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<td>3</td>
<td>4</td>
<td>GIST Programming</td>
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<tr>
<td>3</td>
<td>4</td>
<td>Web-Based GIST</td>
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<tr>
<td>3</td>
<td>4</td>
<td>Urban and Environmental GIST</td>
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</table>

The spring semester would consist of four, three credit-hour classes. These courses would be required of the MS in GIST. The first course would focus on the fundamental science and application of remote sensing technology. The University of Arizona has an extremely robust and interdisciplinary remote sensing series of courses. The “Fundamentals of Remote Sensing” course would be similar to the content of courses such as: GEOG 524: Integrated Geographic Information Systems; GEOG/RNR 583: Geographic Applications of Remote Sensing; and REM/GEOG 590: Remote Sensing for the Study of Planet Earth. For this course, we will seek collaboration with colleagues in the Remote Sensing & Spatial Analysis (REM) Graduate Interdisciplinary Program.

A unique feature of the program will be two courses not currently offered at the University of Arizona: GIST programming and Web-Based GIST. Both GIST programming and Web-based GIST are highly sought after skills in the geospatial workforce. Students with GIST programming and web-based GIST skills find better paying jobs in a shorter period of time. According to the United States Department of Labor, when it comes to the geospatial technology industry, “generally speaking, the more education you have, the higher your wage.”12 Web-based geographic information systems technology has advanced significantly since the release of Google Earth in 2005. The Web-Based GIST course integrates skills learned in the GIST Programming class and is fundamentally linked to digital human interface design for software interfaces, intranets and the Internet. Software used in web-based GIST includes Adobe® Flex®, Builder™, application programming interface (API), Microsoft Silverlight, ArcGIS Web Application Developer Framework (ADF) for the Microsoft .NET; and, especially ArcServer and ArcSDE server technology. Programming languages and skills in GIST include creating algorithms, programming with ArcObjects, Visual Basic and VBA, Java, C++, Python, html and xml, and producing geospatial mashups.

The final course of the spring semester focuses on problem-based learning for the public and corporate sectors related to Urban and Environmental GIST. The University of Arizona already has existing strengths in this area, with some topical material paralleling that in the following courses: GEOG/RNR 516C: Urban Geographic Information Systems; GEOG/RNR 516D: PPGIS: Participatory Approaches in Geographic Information Science; GEOG 553: Advanced Location Theory; GEOG/RNR 524: Integrated Geographic Information Systems; RNR/GEOG 522: Resource Mapping; RNR 527: Artificial Intelligence in Resource Management; and GEOG/RNR 584: Fire

12 http://www.careervoyages.gov/allindustries-indemand.cfm?pagenumber=1&industrynumber=12&sortby=projectedneed
Mapping. This course integrates the educational knowledge obtained in the spring semester.

- Summer Course

<table>
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<tr>
<th>Credits</th>
<th>No. of Weeks</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>8</td>
<td>GIST Internship</td>
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<tr>
<td>3</td>
<td>8</td>
<td>GIST Practicum</td>
</tr>
</tbody>
</table>

The MS in GIST would include two three credit summer courses: a GIST Internship and a GIST practicum. Both courses would deploy learner-centered education practices that focus on problem-based learning. The Program Director would serve as the practicum supervisor for all students in the MS in GIST degree. Further, the Program Director would assist all students in obtaining an internship in GIST. For the GIST practicum, students would be required to formulate a short proposal that addresses a specific geographic problem, the availability of data sources to address the problem, and a plan of action outlining methods and analysis. The plan would have specific milestones so that the practicum is completed on time. The plan’s approval will be granted only if the Program Director believes the problem can be addressed within the given timeline and that data is available to address the problem. This initial iterative process will be done in person, at the spring GIST Practicum “colloquium” and through individual consultation. A due date will be set late in the spring semester for proposal submission. If a student finds that their proposed project is unmanageable due to data or time constraints, the Program Director will work with the student to determine an appropriate project. Students can work on projects with other faculty or staff at the University of Arizona, with FAs who teach in the program, with their employer, or with employers from the regional GIST industry. In all cases, the Program Director remains the practicum supervisor.

Deliverables for the final GIST Practicum include a written paper and a 15 minute presentation. Students can work in teams on a project if permission is given and the workload of each student on the project is clearly defined.

D. CURRENT COURSES AND EXISTING PROGRAMS

Existing Program: GIS Certificate Program

The School of Natural Resources and the Environment (CALS) and the School of Geography and Development (SBS) cooperate on an existing Graduate Certificate in GIS through the following courses:

- RNR/GEOG 503: Applications of Geographic Information Systems (3 units). General survey of principles of geographic information systems (GIS); applications of GIS to issues such as land assessment and evaluation of wildlife habitat; problem-solving with GIS. Graduate-level requirements include completion of a project on the use of GIS in
their discipline or an original GIS analysis (100 points) in coordination with the instructor.

- GEOG/RNR 516A: Computer Cartography (3 units). Introduces the principles of map design, production and analysis. Graduate-level requirements include an instructor approved 5-8 page paper on a related topic and analytical cartography demonstrating scholarly analysis in contemporary analytical cartography.
- RNR/GEOG 517: Geographic Information Systems for Natural and Social Sciences (3 units). Introduction to the application of GIS and related technologies for both the natural and social sciences. Conceptual issues in GIS database design and development, analysis, and display. Graduate-level requirements include a thorough bibliographic review and a scholarly paper on a current application of geographic information systems in the student's major field.
- GEOG/RNR 516C: Urban Geographic Information Systems (3 units). Introduces concepts and application skills for use of geographic information systems to investigate a range of urban spatial issues and decision-making processes. Emphasis on complete process of GIS-based problem solving, including project planning, spatial data sources/acquisition, preparation/coding, analysis, representation, and communication.
- GEOG/RNR 516D: PPGIS: Participatory Approaches in Geographic Information Science (3 units). A project-based course focusing on applications and impacts of GIS and other spatial analysis technologies in grassroots community development, participatory decision making, and community-engaged social science. Class format includes discussion seminar, GIS workshop, collaboration, and out-of-classroom community involvement.
- GEOG/RNR 516E: Geovisualization (GIS) (3 units). Introduces principles and practices of Geovisualization (Geoviz) and softwares (Community Viz and ERDAS Image).
- RNR/GEOG 519: Cartographic Modeling for Natural Resources (3 units). Computer techniques for analyzing, modeling, and displaying geographic information. Development of spatially oriented problem design and the use of logic are applied to the use of GIS programs. Emphasis on applications in land resources management and planning. Graduate-level requirements include a research paper.
- RNR/GEOG 520: Advanced Geographic Information Systems (3 units). Examines various areas of advanced GIS applications such as dynamic segmentation, surface modeling, spatial statistics, and network modeling. The use of high performance workstations will be emphasized. Graduate-level requirements include the development of a GIS study plan.
- RNR/GEOG 522: Resource Mapping (3 units). Use of computer technologies to map and inventory natural environments; integration of global positioning systems, remote sensing, and geographic information systems. Graduate-level requirements include a detailed report on the application of resource mapping to a specific problem in natural resource management.
- GEOG/RNR 524: Integrated Geographic Information Systems (3 units). Integration of airborne and spaceborne remote sensor image data with non-image geographic information system (GIS) data.
- RNR 527: Artificial Intelligence in Resource Management (3 units). Use of artificial intelligence as it applies to natural resources, including knowledge representation,
problem solving, expert systems, feature recognition, neural networks, and genetic algorithms. Examples will be derived from current applications using various techniques to address management problems.

- **GEOG 553: Locational Analysis (3 units)**. Advanced location theory, including such topics as spatial variation in costs and demand, consumer travel behavior, spatial competition and strategic marketing, geography of economic impacts, and the location of public and private facilities. This is a GIS-intensive course.
- **RNR/GEOG 573: Spatial Analysis and Modeling (3 units)**. Examination of spatial analysis and statistical techniques for investigating natural phenomena. Topics include point pattern analysis; spatial autocorrelation; point to surface transformation; geostatistical techniques; and landscape analysis and modeling.
- **GEOG 574G: Introduction to Geostatistics (3 units)**. Exploratory spatial data analysis, random function models for spatial data, estimation and modeling of variograms and covariances, ordinary and universal kriging estimators and equations, regularization of variograms, estimation of spatial averages, non-linear estimators, includes use of geostatistical software. Application of hydrology, soil science, ecology, geography and related fields.
- **GEOG 577: Spatial Statistics and Spatial Econometrics (3 units)**. This course provides the statistical and econometric techniques required for the analysis of geocoded data. Identification of spatial heterogeneity and inclusion in a formal regression model. An important aspect of the course is to gain hands-on experience in applying the appropriate techniques and using state-of-the-art software.
- **GEOG/RNR 583: Geographic Applications of Remote Sensing (3 units)**. Use of aircraft and satellite imagery for monitoring landforms, soils, vegetation and land use, with the focus on problems of land-use planning, resource management and related topics. Graduate-level requirements include the completion of a project report.
- **GEOG/RNR 584: Fire Mapping (3 units)**. Mapping fire-prone landscapes using aerial photographs and satellite images. Graduate-level requirements include a research project that reviews critically the fire mapping literature OR demonstrates a fire mapping application using actual data.
- **REM/GEOG 590: Remote Sensing for the Study of Planet Earth (3 units)**. A multidisciplinary course delineating the physical basis of electromagnetic remote sensing, the concepts of information extraction, and applications pertinent to earth systems science. Graduate-level requirements include an additional term paper.
- **RNR 593 and GEOG 593: Internship (2-8 Units)**. Specialized work on an individual basis, consisting of training and practice in actual service in a technical, business, or governmental establishment.
- **RNR 594 and GEOG 594: Practicum (2 units)**. Supervised instruction in the processing of geographic data for applications in natural resources. The student will be responsible for the supervised processing of research data sets. Emphasis will be placed on methodological practice and documentation of procedures. A practicum supervisor will be selected by the student in consultation with the curriculum advisor.
E. NEW COURSES NEEDED

<table>
<thead>
<tr>
<th>Credits</th>
<th>Course Title</th>
<th>Catalog Description</th>
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<tbody>
<tr>
<td>4</td>
<td>Fundamentals of GIST</td>
<td>In emphasizing principles of geographic information science, geographic information technology, and computer science, this course will draw on the introductory GIS materials in the above courses.</td>
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<tr>
<td>4</td>
<td>Geostatistics and Spatial Modeling</td>
<td>Drawing in targeted ways from a selection of the above courses, this course will emphasize geostatistical techniques, spatial statistics, spatial autocorrelation, point pattern analysis, kriging interpolation, kernel density, analysis and modeling of spatial structures, surface analysis, map algebra and zonal analysis.</td>
</tr>
<tr>
<td>4</td>
<td>Applied GIST</td>
<td>Drawing on more advanced courses in the above list, this course emphasizes geographic problem solving skills, project management skills, cartographic science and professional presentation skills in a variety of mediums.</td>
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<tr>
<td>3</td>
<td>Fundamentals of Remote Sensing</td>
<td>This course emphasizes principles of remote sensing including digital and multispectral image processing and enhancement, georectification, spectral characteristics, land-use and land-cover boundary detection, segmentation, and model simulation.</td>
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<tr>
<td>3</td>
<td>Urban and Environmental GIST</td>
<td>This course addresses a range of urban and environmental issues in the natural and social sciences using geographic information systems technology. Emphasis is on the complete process of GIS-based problem solving, including project planning, spatial data sources and acquisition, preparation and coding, analysis, representation, and presentation of results.</td>
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<td>3</td>
<td>GIST Programming</td>
<td>This course will include algorithm creation in conjunction with programming software such as ArcObjects, Visual Basic and VBA, Java, C++, Python, html and xml. It would also enable students to customize GIS software to automate tasks and engage in the ever-growing sector of open source GIS.</td>
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<tr>
<td>3</td>
<td>Web-Based GIST</td>
<td>This course focuses on apply Internet based geographic information systems technology to develop spatially interactive websites, web mapping applications from multiple sources (mashups), web-based geospatial application programming interfaces, and fundamentals of geospatial server technology.</td>
</tr>
<tr>
<td>3</td>
<td>GIST Internship</td>
<td>Specialized work on an individual basis, consisting of training and practice in actual service in a technical, business, or governmental establishment with a focus on</td>
</tr>
</tbody>
</table>
geographic information systems technology.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>GIST Practicum</td>
<td>This course focuses on addressing normative and scientific geographic problems, data capture, compilation and manipulation, formulating methods and analysis to address the problem in a given timeline. A written summary and a presentation is required that answers the geographic problem, addresses methods and analysis used, and presents results in text, graphic, multimedia animation, and mapped form.</td>
</tr>
</tbody>
</table>

F. REQUIREMENTS FOR ACCREDITATION

There is no agency that oversees accreditation of geographic information systems technology programs.

The Master’s of Science in Geographic Information Systems Technology, and if needed the new tract for the Graduate GIS Certificate Program, will use an assessment plan that will meet the University of Arizona and the Arizona Board of Regents expectations regarding regional and national accreditation.

Our assessment plan includes both a program level matrix and a student outcome matrix. The assessment plan would begin in the first year of operation, providing it meets the approval of the University of Arizona and the Arizona Board of Regents.

Our student outcomes, performance criterion, and measures are clearly related to school and college missions, are observable and use direct measures, are expressed as program-level learning outcomes for graduates from the MS in GIST and, if needed, the new tract for the Graduate GIS Certificate. The focus on measuring student performance is based on evidence of student learning rather than the act of completing an assignment.

II. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Student learning outcome 1: Graduates of the Master’s of Science in Geographic Information Systems Technology will be able to use geographic technologies to solve a geographic problem. Student learning measures for outcome 1: Applied GIST course presentation and GIST practicum final project. Student learning performance criterion for outcome 1: At least 80% of the students will perform at or above a satisfactory level. For the GIST certificate, only the Applied GIST course would be used.

Student learning outcome 2: Graduates of the Master’s of Science in Geographic Information Systems Technology will be able to present geographic information orally and graphically. Student learning measures for outcome 2: Applied GIST course presentation and GIST practicum final project presentation. Student learning performance criterion for outcome 2: At least 80% of the students will perform at or
above a satisfactory level. For the GIST certificate, only the Applied GIST course would be used.

Our student assessment matrix focuses on two fundamental skills that underlie the foundational pedagogic philosophy of the proposed programs. Our rubric for measuring student learning outcomes is based on the following quantifiable scale:

1. Undeveloped
2. Developing
3. Satisfactory
4. Outstanding

This scale relates to student learning outcomes, performance criteria, and direct measures rather than directly relating it to course or project grades. Undeveloped is defined as a student who performed well below the expected measure, and did not master the learning outcomes. Developing is defined as a student who performed below the expected measure, showed some mastery of the learning outcomes, but their overall performance was still in a developmental stage. Satisfactory is defined as a student who performed at the expected measure of the learning outcomes. Outstanding is defined as a student who performed above the expected measure, showed that they had not only mastered the learning outcomes, but surpassed the expectations of the learning outcomes.

The program assessment plan will draw from three levels: (1) a written student evaluation of the program; (2) an external advisory board of public and private geographic information systems technology experts; (3) an inter-departmental review of the program. Upon completion of their degree requirements, students will be asked to complete a program evaluation form. Students will be able to remain anonymous in this evaluation. An active and engaged employer advisory board will be established by the Program Director. This advisory board will meet at least once a year to review the programs curriculum and provide general programmatic advice. Follow the student evaluations and advisory board meeting, an inter-departmental review of the program will be conducted by the School of Natural Resources and the Environment (CALS) and the School of Geography and Development (SBS). This review will examine information provided by students, the advisory board, and student outcomes. This review will also keep track of enrollment and degrees and attempt to track the employment history of every graduate to help assess program outcomes and success. The Program Director will oversee the program assessment and student assessment.

III. STATE’S NEED FOR THE PROGRAM

In 2005, the Arizona Geographic Information Council (AGIC) produced a report on the state of Geographic Information Systems in the state. The report stated that organizations across the state have become more aware of the use and advantages of geographic information systems technology to perform routine takes, and to take advantage of existing databases to enhance operations and improve both daily decision-making and long-term planning. According to the report, “GIS is being used successfully by hundreds of Arizona organizations in diverse areas such as emergency response,
The report goes on to show how geographic information systems technology is used throughout the state of Arizona to maintain safe nuclear power, identify wildfire hazards, respond to emergencies, monitor water needs, fight air pollution, determine legislative districts, map crime, provide public information, stop illegal dumping, project community growth, and track health risks, among other areas. Critical activities within the State of Arizona such as border security, pipeline safety, disaster response, wildfire management, subsidence monitoring, highway construction, flood control, growth planning, and infrastructure management require accurate geographic information (page 49). Furthermore, on December 17, 2003 the federal government enacted the “Homeland Security Presidential Directive 7: Critical Infrastructure Identification, Prioritization, and Protection” policy. This national policy requires the identification of critical infrastructure that might be prone to terrorist attacks. This directive requires federal, state, and local agencies to play an active role in identifying critical infrastructure, a project that relies on geographic information systems technology.

Established by Arizona’s Executive Order 89-24, AGIC serves as the “oversight group for geographic information and geographic information technology issues and coordination efforts”. According to AGIC’s 2005 report “GIS has emerged as an important communication, coordination and analysis resource for the state of Arizona” (page 4). AGIC’s oversight extends into a number of areas that require skilled geographic information systems technology specialists including:

- **District Boundaries:** Redistricting, drawing school attendance zones, drawing voting precincts, and urban planning.
- **Elevation:** Delineating watersheds, flood modeling, slope determination, tower placement, utilities planning, viewshed calculation and the creation of digital ortho-imagery.
- **Geodetic Control:** Used to collate and update accurate positions of survey markers that delineate property and district boundaries. It also maintains and updates the state’s spatial accuracy information with the National Spatial Data Infrastructure (NSDI). Executive Order 12906, signed by President Bill Clinton on April 11, 1994, launched the initiative to create the NSDI and the project is overseen by the Federal Geographic Data Committee.
- **Geographic Names:** Supports emergency management and critical infrastructure mapping.
- **Geology:** Groundwater monitoring and planning, infrastructure planning and construction, pollution modeling and remediation, ecological inventories, mineral resource utilization, geologic hazard assessment and mitigation.
- **Imagery:** General mapping, detecting land cover changes, zoning applications, property appraisals, environmental analysis, feature identification, and many other

15 [http://agic.az.gov/about/](http://agic.az.gov/about/)
uses. Imagery provides an economical tool for developing and updating transportation, land ownership, and other themes.

- **Land Cover**: Used in fire fighting, watershed management, fire prevention planning, bark-beetle monitoring, drought and wildfire management, forest health monitoring, environmental inventory, and municipal planning.

- **Land Ownership**: Notification to property owners of flood potential, transportation right-of-way planning, and many other uses. GIS conversion of manual parcel records has been shown to increase property tax receipts through identification of “missing” ownership parcels and through more accurate appraisals. Potential users include county appraisal districts, Emergency 911, city planning and public works departments, the Division of Emergency Management, the Arizona Department of Transportation, and the Federal Emergency Management Agency.

- **Land Use**: Used for emergency E911 response planning, services distribution, regional growth analysis, urban and rural area planning, open space identification, code violation identification, zoning issues, and general map production.

- **Political Boundaries**: Emergency E911 response planning, services distribution, growth analysis/urban planning, Public/Private Land inventory, jurisdictional determination, and general map production.

- **Soils**: Used for land appraisal, site selection, agriculture, construction, transportation planning, flood control, and estimation of groundwater contamination susceptibility.

- **Surface Water**: Water resource planning, land use planning, flood control, agriculture, and urban planning.

- **Transportation**: Urban and regional planning, disaster preparedness, service delivery, E-911 emergency response planning, travel, zoning, and general map reference.

- **Arizona Preparedness**: border and homeland security, extended drought, wildfire, flooding, and other threats to the state’s safety and security.

Recognizing the importance of GIS to the State of Arizona, Governor Jan Brewer signed Senate Bill 1318 (SB1318) into law on July 10, 2009. The measure strengthens GIS in the state and allows for more effective operations by facilitating geospatial data sharing for the benefit of GIS organizations, while also ensuring data protection for supplying organizations. Key provisions of SB1318 include: make sharing between public agencies less cumbersome by eliminating the need to do specific agreements to share data; provide liability protection for data sharing; make data sharing between public agencies and the private sector easier by allowing commercial fees to be optional rather than mandatory; provide protection from public release of shared critical infrastructure data; provide for agencies to restrict the redistribution of data to other agencies; and, place more emphasis on data sharing, clearinghouse and enterprise GIS concepts.17

Along with AGIC, geographic information systems technology is central to the following state agencies:

• The Arizona Land Resource Information System (ALRIS) which supports the statewide use of GIS by developing and managing GIS hardware and software and provides education and consultation to public agencies in the use of GIS technology. In order to decrease total costs for GIS in Arizona, ALRIS creates and maintains key data sets commonly used by public agencies and acts as a clearinghouse for digital spatial data in Arizona.\(^\text{18}\)

• The State Cartographer’s Office (SCO) serves the Arizona GIS community by coordinating GIS standards and policies, overseeing the development of common projects, providing web-based information services, establishing clearinghouse information about data resources, improving access to GIS databases, and supporting the Arizona Geographic Information Council.\(^\text{19}\)

In a recent article in the *Arizona Economy* (Eller College of Management, the University of Arizona) William P. Patton, PhD, posits that Arizona ranks 18th for high-tech jobs, firms and investments in the United States. According to Patton, “in 2007, high-tech industries employed 278,700 workers, accounting for 11% of total employment in Arizona. While high-tech accounted for 11% of employment, high-tech industries contributed $20.3 billion to payrolls, 18% of the total payroll for all industries in 2007. The average wage for all high-tech industries combined is 75% higher than the average wage for all industries. In 2007, the average annual wage for high-tech industries was $72,700 vs. $41,600 for all industries”.\(^\text{20}\)

Patton identifies three firms that are essential to Arizona’s high-tech economy, two of which (aerospace, and control instruments) intersect with skills offered in advanced education in geographic information systems and technology. He notes that “the future of economic development in Arizona is going to be heavily impacted by the state’s ability to attract, retain, expand and start up high tech industry” and that “emerging technologies will involve heavy emphasis on science and engineering occupations”. Furthermore, environmental technology, renewable energy, water resource management, and “green” or sustainable industries could play a significant role in Arizona’s economy in the future, all of which will require personnel trained in geographic information systems and technology.

Patton concludes that “the most important of the location factors for high tech firms is to have a highly skilled and educated workforce in the region. Since their workforce is critically important to the success of high tech businesses, they like to locate in areas with strong universities that can produce educated employees. The also like to locate in urban areas with a good overall quality of life. This helps them to retain workers who might otherwise move elsewhere.” These conclusions support the need for a Master’s of Science in Geographic Information Technology as the two essential locational factors for high tech firms make Tucson an optimal choice.

\(^{18}\) [http://www.land.state.az.us/alris/]

\(^{19}\) [http://sco.az.gov/]

A. FULFILLING THE NEEDS OF THE STATE AND REGION

The University of Arizona is the only public four year university in Arizona to not have a Master’s degree in Geographic Information Systems Technology. The proposed Master’s degree would contribute to Tucson’s economy through advancing research and economic development at the University of Arizona, providing a well-trained geospatial workforce to the region’s transportation and logistics industry, control systems industries, high-tech industries, manufacturing and IT, E-learning, environmental technologies, optics, local military operations, and military and aerospace industries such as the Davis-Monthan Air Force Base, the U.S. Army Intelligence Center (Fort Huachuca), the U.S. Border Patrol, Raytheon Missile Systems Company, BE Aerospace, Kaman Aerospace Corporation, Paragon Space Development Corporation, Sargent Controls & Aerospace, Honeywell Aerospace, Hamilton Aerospace, Mac Aerospace, Bombardier, and Learjet Inc.21

According to Southern Arizona’s High Tech Connection, “Southern Arizona is a regional leader in the knowledge-based economy” with “more than 1,000 high-tech industry companies employing in excess of 30,000 people and generating annual revenues greater than $7.0 billion.” The proposed MS degree program would forge an alliance with the Southern Arizona Tech Council (SATC) to assist in effectively training students for high-tech jobs.22 Furthermore, the proposed degree program would be focused on training and re-training public sector employees in Southern Arizona’s counties, cities and federal agencies.

B. IS THERE SUFFICIENT STUDENT DEMAND FOR THE PROGRAM?

There is a regional, state, national, and global need for highly skilled geospatial professionals – training which would be obtained through the proposed MS degree in GIST and the new tract for the Graduate Certificate in GIS. An analysis of the current academic market for Master’s in GIS shows that these needs are currently not being met (see below). Moreover, it should be noted that the current Graduate Certificate in GIS is the most popular of all graduate certificate programs offered by the UA Graduate College. This leads us to believe that the proposed MS degree will be very popular, growing to our projected annual maximum number of students of 30 within a few years.

A cost comparison of Master’s in GIS in the United States at Carnegie Doctoral/Research Universities-Extensive reveals that the University of Arizona would have the lowest in state tuition, and the lowest non-online out of state tuition in the United States.

22 http://www.sazhightechconnect.com/index.cfm
<table>
<thead>
<tr>
<th>Institution</th>
<th>In state tuition</th>
<th>In state ranking</th>
<th>Out of state tuition</th>
<th>Out of state ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>The University of Arizona</td>
<td>$11,048.04</td>
<td>1</td>
<td>$25,960.04</td>
<td>2</td>
</tr>
<tr>
<td>University of Maine</td>
<td>$13,080</td>
<td>2</td>
<td>$34,410.00</td>
<td>3</td>
</tr>
<tr>
<td>Arizona State University</td>
<td>$22,948</td>
<td>3</td>
<td>$38,268</td>
<td>4</td>
</tr>
<tr>
<td>Penn State University**</td>
<td>$23,260</td>
<td>4</td>
<td>$23,260</td>
<td>1</td>
</tr>
<tr>
<td>University of Southern California**</td>
<td>$38,597</td>
<td>5</td>
<td>$38,597</td>
<td>5</td>
</tr>
<tr>
<td>University of Minnesota</td>
<td>$41,035.32</td>
<td>6</td>
<td>$62,682.82</td>
<td>6</td>
</tr>
<tr>
<td>Boston University</td>
<td>$78,013.00</td>
<td>7</td>
<td>$78,013.00</td>
<td>7</td>
</tr>
</tbody>
</table>

*Includes a $1,500 program fee discussed later

**Online Degree

Carnegie Doctoral/Research Universities-Extensive are prestigious institutions from which to gain a graduate degree. Given time and an aggressive advertisement campaign, the University of Arizona will be positioned to become the leader in the non-online Master’s in GIS and Post-Baccalaureate GIS certificate market. An advertisement campaign would focus on the unique integrative and professionally focused aspects of the program, the low costs for both in state and out of state tuition, the condensed timeline, and the fact that students would be coming to the leading public research university in the American Southwest, live in an extraordinary location with an unmatched natural setting and thriving, amenity-rich city well positioned for exponential high tech industrial growth.

A Master’s of Science from a Carnegie Doctoral/Research Universities-Extensive is more desirable as it adds credibility to a student seeking employment in the geospatial workforce. The new tract for the Graduate Certificate in GIS will encourage students to enroll in the MS in GIST as they will have already finished 50% of their credit hours towards a MS in GIST degree.

1. What is the anticipated student enrollment for this program? (Please utilize the following tabular format).

<table>
<thead>
<tr>
<th>5-YEAR PROJECTED ANNUAL ENROLLMENT</th>
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</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>No. Students</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

2. What is the local, regional and national need for this program? Provide evidence of the need for this program. Include an assessment of the employment opportunities for graduates of the program during the next three years.
A 2004 article in *Nature: International Weekly Journal of Science* highlighted the growing need for geographic information systems technology programs to fill the ever expanding geospatial industry.\(^{23}\) According to this article, “The demand for geospatial skills is growing worldwide” and “all indications are that the US$5-billion worldwide geospatial market [in 2004] will grow to $30 billion by 2005 — a dramatic increase that is sure to create new jobs, according to Emily DeRocco, assistant secretary at the US Department of Labor's employment and training division.” Furthermore, NASA reports says that “26% of its most highly trained geotech staff are due to retire in the next decade, and the National Imagery and Mapping Agency [now known as the National Geospatial Intelligence Agency] is expected to need 7,000 people trained in GIS in the next three years.” The article sites that globally there are over 140,000 organizations that use GIS. Also, “a ten-year industry forecast [2003-2013] put together by the American Society for Photogrammetry & Remote Sensing (ASPRS) identified environmental, civil government, defense and security, and transportation as the most active market segments” for geospatial employment. One company, *Space Imaging*, “increased by 70% last year” (2003). Furthermore, “the US military, the first industry to adopt GIS and remote sensing on a large scale, has spent more than $1 billion on commercial remote sensing and GIS in the past two years” (2002-2003), and this number will increase due to homeland security and immigration issues, intelligence and security geographic information needs at the local, national, and global levels, and the two ongoing wars in Iraq and Afghanistan which depend on geographic information systems technology.

According to the United States Department for Labor, geospatial technologies is an “emerging industry” with vast potential for job growth as the industry expands, evolves, and diversifies.\(^{24}\) The Department of Labor, using Bureau of Labor Statistics, projects future trends over a ten year period for occupations where new growth is determined to be the greatest. Based on projected employment needs for the geospatial technology industry, 29 different occupational fields will have to fill 1,191,000 jobs during the period of 2006-2016.

Data obtained from the most prominently used GIS job website (the GIS Jobs Clearinghouse, [http://www.gjc.org/gjc-cgi/listjobs.pl](http://www.gjc.org/gjc-cgi/listjobs.pl)), shows that from 1/4/2002 through 8/1/2009 there were 13,872 job postings. Just in the last two months (10/19/2009 - 12/16/2009) the GIS Jobs Clearinghouse had 100 job postings. Nearly all GIS Jobs Clearinghouse postings are non-academic positions. Those that are academically oriented focus on research positions or community college teaching.

The September/October 2009 Urban and Regional Information Systems Association (URISA) Newsletter examined a current report by Daratech Inc. on the current state of the geospatial industry. Daratech found that there was a robust 11% compound annual growth rate over the last six years, and they estimated that this rate of growth would continue in 2010.

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\(^{23}\) [http://www.nature.com/nature/journal/v427/n6972/full/nj6972-376a.html](http://www.nature.com/nature/journal/v427/n6972/full/nj6972-376a.html)

\(^{24}\) [http://www.careervoyages.gov/geospatialtechnology-main.cfm](http://www.careervoyages.gov/geospatialtechnology-main.cfm)
Furthermore, Daratech found that even as public sector jobs have been hard hit by the recession, geospatial technology sales to this sector grew by 4.1% or roughly $957 million in 2009.

Over the last 10 years, a number of Masters and certificate programs in geospatial information technology in the United States have been created to fill the employment demands of this rapidly growing industry. The quality of these programs varies greatly, with community colleges and Carnegie-classified Master’s Colleges and Universities mainly offering certificates, and with the Master’s market largely being dominated by institutions with Carnegie Doctoral/Research Universities-Extensive designations. However, student demand for certificates and Master’s vary regionally, and nearly all have failed to capture the attention of the international market.

Much of the educational training in non-online GIScience is integrated within existing degree programs (e.g., geography, natural resources), which limits revenue generation as well as popularity in the professional arena. The two largest stand alone Master’s in Geospatial Information Systems Technology in terms of student enrollment include the University of Redlands and Arizona State University. The University of Redlands takes on 30 students per year and their attrition rate is high. It is designed to run two years, but many take three years to finish, a problem that extends costs and increases attrition rates. Redlands does have advantages over other programs, the most significant of which is their regional ties with industry software leader ESRI. However, it is a private school with high fees and a high cost of living, and does not enjoy a Carnegie Doctoral/Research Universities-Extensive designation.

Arizona State University rolled out a Master’s of Advanced Study in Geographic Information Systems in 2004. This is a one year Master’s degree and does not require a GRE, or thesis. Over six years, student enrollment has ranged between 17 and 32 students.25 Similar to Redlands, 30 to 32 students are considered the maximum number

that can be effectively managed in a Master’s in GIST. ASU’s program has a 96% graduation rate, draws out of state and international students, even though their out of state tuition plus program fees are high.\textsuperscript{26} ASU and Redlands have shown that the non-online Master’s program market is not being met, especially for international and out of state students as they continue to maintain high enrollment even with high tuition costs and a global recession. ASU’s one year program has proven that a shortened timeline lowers attrition rates and maintains steady enrollment. In our analysis of the current Master’s for GIST in the United States, we have sought to create a proposal that takes advantages of the strengths of existing programs of SGD and SNRE, as well as the exceptional opportunities afforded by the University of Arizona and Tucson.

3. Beginning with the first year in which degrees will be awarded, what is the anticipated number of degrees that will be awarded each year for the first five years? (Please utilize the following tabular format).

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<table>
<thead>
<tr>
<th>PROJECTED DEGREES AWARDED ANNUALLY</th>
<th>1\textsuperscript{st} Year</th>
<th>2\textsuperscript{nd} Year</th>
<th>3\textsuperscript{rd} Year</th>
<th>4\textsuperscript{th} Year</th>
<th>5\textsuperscript{th} Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Degrees</td>
<td>6-8</td>
<td>10-12</td>
<td>12-20</td>
<td>20-30</td>
<td>28-32</td>
</tr>
</tbody>
</table>

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IV. APPROPRIATENESS FOR THE UNIVERSITY

The proposed program is central to key elements of ABOR 2020 and the University of Arizona Strategic Plan, including:

- Training Arizona’s workforce for economically diverse, high paying jobs;
- Training that will help improve the quality of life in Arizona;
- Enhancing lifetime earnings among graduates;
- Increasing the number of graduate degree holders in Arizona;
- Increasing workforce flexibility;
- Improved ability for workforce to appreciate and adopt new technologies;
- Improved curricular alignment;
- More licenses, spin-offs, and venture capital investment;
- Enhancing cooperative partnerships between the private and public sector;
- Providing better solutions to society’s problems;
- Increased national and international recognition for the University;
- Improve community outreach;
- Awarding more degrees in high demand areas;
- Producing degrees more efficiently without sacrificing quality.

V. EXISTING PROGRAMS AT OTHER CAMPUSES

\textsuperscript{26} http://geoplan.asu.edu/files/MASGIS\_1209.pdf
A. EXISTING PROGRAMS IN ARIZONA

1. For a unique (non-Duplicative) program, provide a statement to the effect that there are no existing programs at other Arizona public universities that duplicate the proposed program.

The Master’s of Advance Study in Geographic Information Systems at ASU uses CIP CODE: 45.0701. The Applied Geographic Information Science (MS) at Northern Arizona uses CIP Code 45.07.02. However, this degree is scheduled this year to be merged with the Master of Arts in Rural Geography to form the new degree Master of Science in Applied Geospatial Sciences.27 Furthermore, while ASU does offer a one year Master’s program like our proposed program, it is limited to producing roughly 30 students per year. Given the statewide, national, and international demand for GIST professionals discussed above, we are confident that our program can exist side by side with ASU’s without harming their enrollments.

B. OTHER INSTITUTIONS

None of the private universities in that state of Arizona offer a Master’s degree in Geographic Information Systems Technology. This includes Yavapai College, Thunderbird School of Global Management, Grand Canyon University, Prescott College, and The University of Phoenix.

1. Identify WICHE institutions that currently offer this program. If appropriate, briefly describe the programs. (Please use the following format).

Although there is no agency overseeing accreditation of geographic information systems technology programs, the Commission of North Central Association of Colleges and Schools Higher Learning Commission offer accreditation to institutions in the following WICHE States: Arizona, Colorado, and New Mexico. The status of programs in these state and those in institutions also accredited by the Western Association of Schools and Colleges and the Northwest Commission on Colleges and Universities is shown below.

<table>
<thead>
<tr>
<th>Program</th>
<th>WICHE Institution</th>
<th>NCA Accreditation</th>
<th>Western Assoc of Schools and Colleges Accreditation</th>
<th>Northwest Commission on Colleges and Universities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master of Science GIScience</td>
<td>San Diego State University, San Diego, CA</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Masters of Science in Geographic Information Science</td>
<td>San Francisco State University, San Francisco, CA</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>(accepting students fall 2010)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Master of Science in Geographic Information Systems</td>
<td>University of Redlands, Redlands, CA</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Master of Science in Geographic Information Science</td>
<td>University of Denver, Denver, CO</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Master’s in Geographic Information Science</td>
<td>Idaho State University, Pocatello, ID</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
</tbody>
</table>

Note that none of the other WICHE institutions that offer Master's degrees in GIScience are Carnegie Doctoral/Research Universities-Extensive28, while only one of the five institutions are NCA accredited.

VI. EXPECTED FACULTY AND RESOURCE REQUIREMENTS

A. FACULTY

1. Current Faculty -- List the name, rank, highest degree and estimate of the level of involvement of all current faculty who will participate in the program. If proposed program is at the graduate level, also list the number of master's theses and doctoral dissertations each of these faculty has directed to completion. Attach a brief vita for each faculty member listed.

28. Excluding ASU.
Courses in the new degree programs will be integrated into the current faculty and research specialists’ workloads.

Keiron Bailey, Associate Professor SGD, PhD, 5 percent effort
  - Masters: 4  Doctoral: 0

Gary Christopherson, Associate Professor SGD, PhD, 10 percent effort
  - Masters:  Doctoral:

Sandy Dall’Erba, Assistant Professor SGD, PhD, 5 percent effort
  - Masters: 0  Doctoral: 2

Phil Guertin, Full Professor SNRE, PhD, 5 percent effort
  - Masters:  Doctoral:

Stuart Marsh, Full Professor SNRE/SGD, PhD, 5 percent effort
  - Masters:  Doctoral:

Daoqin Tong, Assistant Professor SGD, PhD, 10 percent effort
  - Masters: 1  Doctoral: 0

Craig Wissler, Assistant Professor SNRE, MLA, 10 percent effort
  - Masters:  Doctoral:

Stephen Yool, Full Professor SGD, 5 percent effort
  - Masters: 19  Doctoral: 13

Doug Meredith, Research Specialist, Senior, MA, 5 percent effort
  - Masters: 0  Doctoral: 0

2. Additional Faculty -- Describe the additional faculty needed during the next three years for the initiation of the program and list the anticipated schedule for addition of these faculty.

One additional faculty member in the form of a Program Director will be needed for this new degree programs. We anticipate sharing this appointment between the School of Geography and Development and the School of Natural Resources and Environment. The Program Director will run the programs, organize the pedagogical program, oversee administration, and teach in two courses in the fall semester, and serve as the practicum and internship supervisor for all students. During the spring semester, in addition to her/his regular administrative duties, the Program Director will teach regularly scheduled undergraduate and graduate courses at the University of Arizona. S/he will be paid an additional stipend from student fees to organize and oversee the summer practicum or, their summer workload will be incorporated into their annual workload.
3. Current FTE Students and Faculty -- Give the present numbers of FTE students and FTE faculty in the department or unit in which the program will be offered.

<table>
<thead>
<tr>
<th></th>
<th>FTE Students (Fall 2009)</th>
<th>FTE Faculty (2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geography and Development</td>
<td>514.1</td>
<td>16.7</td>
</tr>
<tr>
<td>Natural Resources and Environment</td>
<td>233.22</td>
<td>22.43</td>
</tr>
</tbody>
</table>

4. Projected FTE Students and Faculty -- Give the proposed numbers of FTE students and FTE faculty for the next three years in the department or unit in which the program will be offered.

<table>
<thead>
<tr>
<th></th>
<th>FTE Students Δ by 2013</th>
<th>FTE Faculty Δ by 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geography and Development &amp; Natural Resources and Environment</td>
<td>27-30 (additional graduate FTE students)</td>
<td>0.5 in GRD 0.5 in SNRE</td>
</tr>
</tbody>
</table>

B. LIBRARY

1. Current Relevant Holdings -- Describe the current library holdings relevant to the proposed program and assess the adequacy of these holdings.

The library has sufficient resources to support the many GIS, remote sensing, and spatial analysis programs already on campus, and we do not foresee any need to increase these holdings.

2. Additional Acquisitions Needed -- Describe additional library acquisitions needed during the next three years for the successful initiation of the program.

None.

C. PHYSICAL FACILITIES AND EQUIPMENT

1. Existing Physical Facilities -- Assess the adequacy of the existing physical facilities and equipment available to the proposed program. Include special classrooms, laboratories, physical equipment, computer facilities, etc.

The School of Geography and Development and the School of Natural Resources and Environment both operate their own 30-seat spatial analysis laboratories with advanced hardware and specialized software. These resources are under heavy demand during the daytime hours, but see much less use during the times proposed for this program’s teaching and laboratory work.
2. Additional Facilities Required or Anticipated -- Describe physical facilities and equipment that will be required or are anticipated during the next three years for the proposed program.

During the first couple of years of operation, the courses will be taught in existing on-campus facilities run by both the School of Geography and Development and the School of Natural Resources and Environment. Afterwards, we may move to an off-campus facility, possibly one located in downtown Tucson. We are currently having discussions with Tucson City personnel about the feasibility of a downtown location.

D. OTHER SUPPORT

1. Other Support Now Available -- Include support staff, university and non-university assistance.

Both the College of Social and Behavioral Sciences and the College of Agriculture and Life Sciences have technology support personnel able to assist us in maintaining our hardware and software in the labs. We also have sufficient support staff on campus for program coordination, website development and advertising.

2. Other Support Needed, Next Three Years -- List additional staff needed and other assistance needed for the next three years.

It is possible that, with a move to a downtown location, that additional technology and office staff support will be required. Any such support will be funded by student fees.

VII. FINANCING

Minimal costs are incurred to implement the programs as infrastructure and staffing of some of the courses is already in place. A $1,500 program fee will be applied to each student in the MS in GIST programs and a $600 fee will be applied to students enrolled in the new tract for the Graduate Certificate in GIS. These fees are imposed to offset costs incurred by hardware and software, administration, professional development, and personnel.

Possible grants sources that could help fund the degree include the following:

- http://www.sloan.org/program/15
- http://www.sfaz.org/stem/k-12-student-teacher-discovery.aspx
- http://www.abor.asu.edu/4_special_programs/lce/index_lce.html
A. NEW ACADEMIC DEGREE PROGRAM BUDGET PROJECTIONS FORM. Complete the appropriate budget form, available at http://www2.nau.edu/ugstudy/UCCForms.htm, describing the current departmental budget and estimating additional costs for the first three years of operation for the proposed program. Please note that these costs for each year are incremental costs, not cumulative costs.

See attached document.

VIII. OTHER RELEVANT INFORMATION

None.
Keiron Bailey

Address: 205 East Forrest Feezor Street, Vail, AZ 85641
Tel/Fax: 520 626 4096 (work), 520 762 1476 (home)
Email: kbailey@email.arizona.edu

Education
2002 Ph.D. in Geography, University of Kentucky.
1998 Visiting Scholar, Department of Geography and Environmental Engineering, The Johns Hopkins University, Baltimore.
1996 M.A. in Geography, University of Hawai`i at Manoa.
1991 B.Sc. (Hons) in Geography, University of Birmingham, England.

Employment
2009- Associate Professor. School of Geography and Development. University of Arizona.
2004-09 Assistant Professor, Department of Geography and Regional Development, University of Arizona.
2003 Research Associate, Department of Geography and Regional Development, University of Arizona.
2003 Visiting Professor, Department of Cultural and Women’s Studies, Tokyo Jogakkan College, Machida, Tokyo.
2001-02 Professional Associate, Kentucky Transportation Center, Lexington, KY.
1999-2001 Research Assistant, Kentucky Transportation Center, Lexington, KY.
1998-99 Teaching Assistant, Department of Geography, University of Kentucky, Lexington, KY.
1997-98 English Language Instructor, various conversation schools, Kanagawa, Japan.

Peer Review Publications

2009


2008


2007


“Akogare, ideology and ‘Charisma Man’ mythology; reflections on ethnographic research in the eikaiwa Wonderland” in Gender, Place and Culture: A Journal of Feminist Geography 14(5): 585-608.


“Justice and the Public’s Involvement in Infrastructure Planning” in Practicing Planner 5(1) (with T. Grossardt).


2006


**2005**


**2004**


**2003**


“Developing the Next Generation of Technological Aids to Effective Public Involvement in Public Transportation” in *Proceedings of the American Public Transit Association* conference (with T. Grossardt and A. Arno).

2002


2001


**Works in process**


**Book review**


**Invited manuscripts**

Competitive Research Funding Submissions

2004-06 $25,000 “Enhancing Student Learning with Internet GIS Enrichment and Participatory GIS Collaboration.” Arizona Board of Regents Learner Centered Education (with S. Elwood and G. Christopherson).


1995 $50,000 A Pilot Fuzzy Logic Model to Predict Coral Reef Response to Pollution Loadings (with M. Ridgley and S. Dollar, University of Hawai‘i). Project funded by the World Bank.

External Service


2009 Reviewer for Gender, Place and Culture: A Journal of Feminist Geography

2007- Reviewer for Cartography and Geographic Information Science.

2009 Reviewer for Social Sciences and Humanities Research Council, Canada.

2008 Reviewer for Transportation Technologies.

2007 Reviewer for Growth and Change.

2007 Reviewer for Space and Culture

2006 Reviewer for The Professional Geographer.

2006 Reviewer for Collaborative Geographic Information Systems.

2005 Reviewer for Western Regional Science Association.

2005- Reviewer for Environment and Planning D: Society and Space.

2005 Reviewer for CORP GeoMultimedia Conference. Vienna, Austria.


Departmental Committees
2008- Development Committee
Graduate Committee
Technology Committee

2007-08  Graduate Committee

2006-07  Technology Committee
Graduate Committee
Annual Performance Review Committee

2005-06  Technology Committee
Graduate Committee
Hiring Committee

2004-2005 Chair, Technology Committee
Co-chair, Colloquium Committee
Admissions Committee

2003-2004 Technology Committee

College and University Committees

2005- GIS Graduate Certificate Committee.

2005  Represented the Department at monthly College-level ACIST meetings.

2004  Delivered presentation at University symposium, showcasing Proposition 301 funded research to university faculty and administration.

External Committees

2008  Co-director of Structured Public Involvement for Milton Madison Bridge project, OH and KY.

2008  Co-chair of Transportation Research Board Visualization Sub-Committee on Education and Training.

2005-7 Co-director of Structured Public Involvement for Louisville Southern Indiana Ohio River Bridges Project Sections 2 and 5; and Lakes Bridges Project. KY and IN.

2005  Secretary of Asian Geography Specialty Group, AAG.


2002  Invited by Program Director to showcase Transit-IDEA T-33 project to IDEA Committee at the National Academies, Washington, DC.

Advising

Thesis Director  Ms. Monica Stephens, MA, Geography
Mr. David Meggett, MA, Geography
Mr. Larry Cassen, MA, Geography
Ms. Susan Kaleita, MA, Geography

Co-director Mr. George Saliba, MA, Geography

Interim director Ms. Paula Decker, PhD, Geography

Committee Membership, Graduate Students
- Ms. Anne Marie Hanson, PhD, Geography
- Mr. Erick Sanchez, PhD, Geography
- Mr. Fletcher Chmara-Huff, MA, Geography
- Ms. Paula Decker, MA, Geography
- Ms. Hsin-hui Chiang, MA, Planning
- Mr. Doug Davis, PhD, Political Science
- Mr. Claude Rubinson, PhD, Sociology
- Ms. Brooke Ison, PhD, Latin American Studies
- Mr. Felipe Ladron de Guevara, PhD, Civil Engineering
- Mr. Taylor Shipman, MS, Arid Lands Studies
- Ms. Rani Olson, MA, Planning
- Ms. Melanie Meyers, MA, Geography

Fellowships and Awards

2010  *Udall Foundation Fellowship* in Public Policy.

2008  *Greg Herrington Award for Visualization in Transportation*. Transportation Research Board of the National Academies. “Structured Public Involvement in Integrated Transportation and Land Use Planning: Case Study Jeffersonville, IN.” (with B. Blandford, T. Grossardt and J.Ripy)


Professional Nominations, Recognitions and Projects


2008  Structured Public Involvement featured in University of Kentucky’s *Odyssey* magazine.

2008  Eikaiwa wonderland work featured on eikaiwa wiki.

2007  Structured Public involvement work on Lakes Bridges Project featured in *Louisville Courier-Journal*, *Cadiz Record* and *Signature* magazine.

2007  Invited to participate in the Committee on Visualization, *Transportation Research Board*. 
2006 Two papers each evaluated highest among reviewed submissions by the Context-Sensitive Design and Large Structures Subcommittees at the *Transportation Research Board*.

2006 SPI paper selected for showcase presentation as “cream of the crop” by *Transportation Research Board* at the 85th Annual Meeting, Washington, DC.

2005-06 Unprecedented high satisfaction scores for context-sensitive bridge design process obtained by anonymous polling at open public meetings. Louisville, KY and New Albany, IN.

2005-06 Structured Public Involvement employed by design and engineering consortium for the Ohio River Bridges and approaches, Sections 1,2,4 and 5. Louisville KY.

2004 Public involvement publications featured on the Public Involvement webpage by the *Transportation Research Board* Public Involvement Committee (see “Innovative Public Involvement Techniques” at http://trb-pi.hshassoc.com/publicationsandarticles.htm)

2004 Invited to *Army Science* conference.


2003 Public involvement research highlighted by the Federal Highway Administration in “Successful Public Involvement Examples” (see http://www.fhwa.dot.gov/tcsp/case8.htm)

2003 Invited to showcase Transit-IDEA T-33 research by IDEA Program Director at the Annual Meeting of the Transportation Research Board, Washington, D.C. One of two selected projects.

2002 Public involvement work featured by *Transportation Intelligence 1:1* (see http://www.tac-atc.ca/techtrans/archive/v1n1). One of six selected papers.

2002 Transit-IDEA T-33 project nominated for the *Association of Collegiate Schools of Architecture Collaborative Practice Award*.

2002 Transit-IDEA T-33 Review Committee. Community participants noted that “they had not seen this level of public involvement before” (application of the CAVE method to Transit station design).

2002 Invited to present the Transit-IDEA T-33 project at the *Community Design Symposium*, Graduate School of Design, Harvard University.


2000 Public involvement work featured in the *Crestwood/Old Henry Community Newsletter*. 
Conference Presentations


Invited Presentations and Workshops

2009  Universidade de los Andes. Bogota, Colombia.
2009  Helsinki City Auditorium. Helsinki, Finland.
2009  Edison Electrical Society. New Orleans, LA.
2009  University of Edinburgh. Scotland.
2008  Governor’s Office and Alaska Department of Transportation. State of Alaska.
       Juneau, AK.
2008  Arizona State University. Phoenix, AZ.
2008  Utah State Government and Department of Transportation. Salt Lake City, UT.
2008  New Mexico Department of Transportation. Santa Fe, NM.
2007  Pima Association of Governments. Tucson, AZ.
2007  University of Kentucky. Department of Geography. Lexington, KY.
2007  State of Kentucky, Legislative Research Commission. Frankfort, KY.
2007  University of British Columbia. Vancouver, BC.
2005  Institute for Conflict Resolution. Tucson, AZ.
2005  Arizona Department of Transportation. Phoenix, AZ.
2002  Transportation Research Board, Public Involvement Committee. Washington, DC.

Classes Taught

University of Arizona  Problems in Regional Development  Fall and Spring 2009, 2008, 2007
               Regional Analysis  Spring 2006
               Economic Geography  Fall 2006, 2005
<table>
<thead>
<tr>
<th>Course</th>
<th>Institution</th>
<th>Dates</th>
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<tbody>
<tr>
<td>Geovisualization</td>
<td>Spring 2007, 2006, 2005</td>
<td></td>
</tr>
<tr>
<td>Computer Cartography</td>
<td>Fall 2004</td>
<td></td>
</tr>
<tr>
<td>Introduction to Geographic Information Systems</td>
<td>Spring 2004</td>
<td></td>
</tr>
<tr>
<td>Santa Cruz County, Nogales, AZ Community GIS Academy</td>
<td>Summer 2004</td>
<td></td>
</tr>
<tr>
<td>Foreign Culture Study</td>
<td>Spring 2003</td>
<td></td>
</tr>
<tr>
<td>Area Studies (USA)</td>
<td>Spring 2003</td>
<td></td>
</tr>
<tr>
<td>English for International Relations</td>
<td>Spring 2003</td>
<td></td>
</tr>
<tr>
<td>English for Global Issues</td>
<td>Spring 2003</td>
<td></td>
</tr>
<tr>
<td>Comprehensive English</td>
<td>Spring 2003</td>
<td></td>
</tr>
<tr>
<td>Tokyo Jogakkan College</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of Kentucky</td>
<td></td>
<td></td>
</tr>
<tr>
<td>World Regional Geography</td>
<td>Summer 2000</td>
<td></td>
</tr>
<tr>
<td>Lands and Peoples of the Non-Western World</td>
<td>Spring 2000, 1999, Fall 1998</td>
<td></td>
</tr>
</tbody>
</table>
CURRICULUM VITA
FOR
GARY L. CHRISTOPHERSON

School of Geography and Development
Director, Center for Applied Spatial Analysis
Harvill 409
The University of Arizona
Tucson, AZ 85721
(520) 621-6267
garych@casa.arizona.edu

EDUCATION


B.S. 1979, University of Oregon: Sociology

WORK EXPERIENCE

Associate Professor of Practice: 2009 – Present
School of Geography and Development, The University of Arizona, Tucson, AZ 85716. Contact Person, John Paul Jones III – jpjones@email.arizona.edu

Department of Geography and Regional Development, The University of Arizona, Tucson, AZ 85716. Contact Person, John Paul Jones III – jpjones@email.arizona.edu

Director: 1998 – Present
Center for Applied Spatial Analysis (CASA)
School of Geography and Development, The University of Arizona, Tucson, AZ 85716. Contact Person, John Paul Jones III – jpjones@email.arizona.edu

CASA is a research unit in the department of Geography and Regional Development at The University of Arizona. CASA’s mission is to facilitate the use of geographic information systems, spatial data, and related techniques within the department and
within the college of social and behavioral sciences. CASA supports and develops research projects and encourages the wider use of GIS through collaboration on grants, demonstrations, training, teaching, and internships.

**STUDENT COMMITTEES**

*Current M.A. Committees:* Amy Clark, Meredith Reifschneider

*Completed M.A.:* Myrtho Joseph, Larry Cassen

*Current Ph.D. Committee:* Lenom Cajuste; Katherine Dungan; Phillip O. Leckman; Gozde Ozacar, David Mehalic, Jessica Munson, Abigail Roanhorse, Jonathan Scholnick

*Completed Ph.D.:* Peter Johnson, Joseph Abraham, John Chamblee, Laura Mazow, Luke Premo, John Mazzeo, Eric Sanchez

**GRANTS**

- **$15,000** 2009 *National Park Service - Desert Southwest Cooperative Ecosystem Studies Unit* (Current)
  
  Cultural Resources Base Map. Gary L. Christopherson Principal Investigator

- **$147,743** 2009 *Anyplace Access for Arizonans Initiative: TRIF Award* (Current)
  
  An Online Graduate Certificate in Geospatial Information Science and Technology (GIST). Gary L. Christopherson Principal Investigator

- **$15,000** 2009 *Arizona Partners in Science* (Current)
  
  Managing Landscapes for Wildfire: restoring fire balance in the Catalina-Rincon mountains. Gary L. Christopherson Principal Investigator

- **$49,397** 2008 *Arizona Regents Reach Out (ARRO) Grants* (Current)
  
  Online Geospatial Education and Curriculum Development for K-12 Teachers. Gary L. Christopherson Principal Investigator

- **$8,900** 2008 *National Park Service - Desert Southwest Cooperative Ecosystem*
Studies Unit (Completed)

Developing a New Geospatial Exotic Plant Database, Gary L. Christopherson Principal Investigator

$152,000 2008 NSF Office of CybeInfrastructure (Current)

CI-TEAM Implementation Project: Collaborative Research: Advancing Cyberinfrastructure-based Science through Education, Training, and Mentoring of Science Communities – Award Number 0753346 – Gary L. Christopherson Principal Investigator, Steve Yool and Willem Van Leeuwen Co-PIs

$11,868 2008 National Park Service - Desert Southwest Cooperative Ecosystem Studies Unit (Current)

Fire Effects Monitoring Data Integrity Program, Gary L. Christopherson Principal Investigator

$175,722 2007 Anonymous Private Foundation (Current)

International Open GIS Initiative for Missing and Deceased Migrants, Bruce Anderson, John Chamblee, Gary L. Christopherson, and Robin Hoover Co-Principal Investigators

$5,140 2008 National Park Service - Desert Southwest Cooperative Ecosystem Studies Unit (Completed)

The Saguaro Mapping Project. Gary L. Christopherson Principal Investigator

$1,260,993 2000 Environmental Protection Agency (Completed)


$20,000 1999 NASA (Completed)

Native Peoples Native Homelands. Co-principal investigator with G. Bruce Meyers, The University of Arizona. Sub award Agreement 3-10791-7820, with the University of New Mexico. Creation of GIS infrastructure for Arizona Native Americans. ()

$499,735 1998 National Science Foundation Urban Research Initiative.
Creation of a GIS for Six Cities in Arid Environments: in Morocco, Senegal, Mali, Niger, Tanzania, and Botswana. Thomas Park, Principal Investigator, Gary L. Christopherson, Stuart Marsh, and Amadou Thiam, Co PIs. Grant # 9817743 (http://www.nsf.gov/cgi-bin/showaward?award=9817743) $15,000 1996 National Geographic Society Scientific Research Grant Project. (Completed)

Cycles of Environmental Degeneration and Regeneration in Jordan, Grant # 5758-96, Oystein S. LaBianca Principal Investigator, Gary L. Christopherson Co-PI.

PUBLICATIONS

Accepted, 2009 Morehouse, Barbara J., Sara O’Brien, Gary L. Christopherson, and Peter s. Johnson, Integrating public values and risk perceptions into a decision support system. *International Journal of Wildland Fire*


2005 (coauthor with Benjamin Saidel) Four Days at Khalasa: Using Aerial Photography and GIS Analysis to Reappraise
Woolley and Lawrence’s Survey of Byzantine Elusa in the Western Negev Desert. *Palestine Exploration Quarterly.*


Environmental Systems Research Institute.


1996 (with D. P. Guertin, & K. A. Borstad). Increasing our understanding of Ancient Jordan with ARC/INFO.


Sandy DALL’ERBA

Address: School of Geography and Development (SGD)
Harvill Building Box 2
Tucson, Arizona 85721 USA
Email: dallerba@email.arizona.edu
Phone: (520) 621 1652 Fax: (520) 621 2889

POSITION

2006- Onwards
Assistant Professor, Department of Geography and Regional Development, University of Arizona, Tucson, USA.

2006- Onwards
Founder and Chair, European Study Group, University of Arizona, Tucson, USA.

EDUCATION

2004
PhD thesis (with distinction) in Economics, University of Pau, France. Research Directors: Jacques Le Cacheux (Univ. Pau) and Geoffrey J.D. Hewings (Univ. Illinois). Title: European Regional Development Policies in the Light of Recent Regional Science Tools.

2000
MSc International Economics (with distinction), University of Pau, France.

TEACHING EXPERIENCE

2006-Onwards
European Study Group Interdisciplinary seminars (Geog 496F/596F offered in Fall): selection of topics on Europe and transatlantic relationships.
Locational Analysis (Geog 453 offered in Fall): central place theory, agglomeration, index of concentration, location quotients, gravity models
Regional Analysis (Geog 454 offered in Spring): economic integration, economic growth, beta- and sigma-convergence, Markov chain, regional development policy, linear regression, spatial statistics
Spatial statistics and spatial econometrics (Geog 657 offered in Spring): principles and application of these techniques with Geoda and SpaceStat.

Consistently rated by students as excellent.

2003-2004
Research Assistant, Teacher Assistant, University of Pau

2000-2001
Teacher Assistant, University of Pau
HONORS AND PRIZES

2009  Best Paper Award granted by the Regional Studies Association (the UK) for the article entitled “The European Regional Growth Process Revisited, Spatial Economic Analysis, 3(1), 7-25” (written in collaboration with M. Percoco and G. Piras)

2008  Nominated “Favorite Professor” twice in the College of Social & Behavioral Science


2006  Nominated “Favorite Professor” in the College of Social & Behavioral Science

2005  Affiliated Assistant Professor, Regional Economics Applications Laboratory, University of Illinois at Urbana-Champaign, IL.


ACADEMIC PUBLICATIONS

• Peer-reviewed journal articles :


- **Books**:


- **Peer-reviewed contributions to edited volumes**:


- **Editorials**:


- **Book reviews**:


**Unpublished Discussion Papers**


**Citations (as of Dec. 1, 2009)**

Google Scholar: 148 citations.

*Social Science Citation Index (ISI Web of Knowledge)*, which refers only to citations of my ISI-listed journal articles in other ISI-listed journal articles: 10 citations.

*Research Papers in Economics (RePEC- IDEAS)*: 27 citations.

**Awarded Grants**

- 2008-2011: Grant Jean Monnet Program (European Module) from the European Commission to develop EU-related activities at the University of Arizona. PI. 100%. ($10,437)

- 2008: Foreign travel grant, Office of International Affairs, University of Arizona. Grant for the 5th Annual Meeting of the European Union Regional Economics Applications Laboratory, Istanbul. ($1,500)

- 2008: Summer Research Grant Development Award, Social and Behavioral Sciences Research Institute, University of Arizona. New perspectives on U.S. regional development policies. PI. 100% ($4,996)

- 2007: Small grant, Social and Behavioral Sciences Research Institute, University of Arizona. Coverage optimization of emergency facilities location in Tucson, AZ. Co-PI in collaboration with Daoqin Tong. 50% ($1,800)


• 2005: ATIP-Young Researchers. Project assessing regional convergence and devolution within an enlarged Europe. Project under the supervision of Rachel Guillain (Univ. of Burgundy).


• 2004: European Commission (FEMISE). Project analyzing the barriers to integration and trade between Mediterranean countries and EU members. Project under the supervision of Antoine Bouët (Univ. Pau).

• 2003: Regional Council of Aquitaine (France). Project assessing the impact of regional development policies in Aquitaine. Project under the supervision of Jacques Le Cacheux (Univ. Pau).

• 2001-2003: Scholarship from the Georges Lurcy Association and the French Ministry of Research and Education.

• 2000-2003: Scholarship from the Aquitaine region.

• 1997-1998: Erasmus travel grant (one year stay in Aachen, Germany).

**SERVICES**

2009- Onwards  SGD technology committee, member.

2008- Onwards  Advisor of the Real Estate Club of the University of Arizona

2008  Organizer of the Fifth Annual Conference of the Rocky Mountain European Scholars Consortium, October 10-11.

2007- Onwards  Graduate Interdisciplinary Program (GIDP) in Statistics, Affiliated member.

2007- Onwards  Western Regional Science Association, conference program committee.

2007- Onwards  GIS Certificate, faculty member and advisor of several students.

2007- Onwards  Coordinator of an exchange program between the UofA and the University of Gaziantep, Turkey.

2006- Onwards  European Study Group, Chair.

2006- Onwards  SGD undergraduate student committee, member.

2006- Onwards  Coordinator of an exchange program between the UofA, two other US universities and four European universities (Good Governance Consortium: http://ggc.wu-wien.ac.at/).

**SUPERVISION OF STUDENTS / VISITING SCHOLARS**

2010 – on: Melanie Meyers, PhD student in Geography, Univ. of Arizona.

2008 – on: Liz Ilena Rodriguez Gamez, PhD student in Geography, Univ. of Arizona.
Fall 09: Majed Akhter, PhD student in Geography, Univ. of Arizona.

Fall 07/Spring 08: Monica Stephens, MA student in Geography, Univ. of Arizona.

Spring 08: Fatih Celebioglu, Assistant Professor in Economics, Univ. of Dumlupinar, Turkey

Spring 08: Muhammad Zafar, PhD student in Geography, Univ. of the Punjab, Pakistan.

Spring 07: Bulent Ozkan, Assistant Professor in Economics, Univ. of Gaziantep, Turkey.

2007 - on: GIS certificate advisor for Tiernan Erickson, Whitney Budinoff, Felix Meier, Brian Pugh, Mohammed Sharawi.

**CONSULTANCY/REFEREE**

- 2009: Member of the referee board, *Journal of Academic Researches and Studies*
- 2007: Grant proposal assessment for the *National Science Foundation*.
- “*European Regional Development Policies: History and Current Challenges*”, Central Bank of Colombia, Cartagena (Colombia), 2-day workshop, August 2005.
- 2004: Research project assessment for the *Swiss National Science Foundation*.

**PRESENTATIONS**

- Invited Lectures:
  - Department of Geography, University of California, Santa Barbara, April 2009.
  - Pardee Center, University of Denver, Denver, February 2009.
  - Department of Applied Economics, University of Utah State University, Logan, November 2008.
  - Kobe University International Economic Round Table, Kobe, January 2007.
  - Department of Geography, University of Florida, Gainesville, January 2006.
  - Department of Economics, University of Nevada, Reno, January 2006.
  - Department of Economics, Faculty of Law, Economics and Finance of the University of Luxembourg, Luxembourg, June 2005.
• International Monetary Fund, Washington DC, December 2004.
• International Conference WIDER on Inequality, Poverty and Human Welfare, Helsinki, May 2003.
• European Union Center, University of Illinois, Urbana-Champaign, April 2003.

Conferences:

• 20th Anniversary of the Regional Economics Applications Laboratory, Urbana, November 2009.
• 48th Annual Meeting of the Western Regional Science Association, Napa Valley, February 2009.
• 5th Annual Meeting of the European Union Regional Economics Applications Laboratory, Istanbul, September 2008.
• 2008 Meeting of the Association of American Geographers, Boston, April 2008.
• Spatial Econometric Conference, Cambridge, July 2007
• International Conference on Urban and Regional Modeling - Ecomod, Brussels, June 2006.
• 45th Annual Meeting of the Western Regional Science Association, Santa Fe, February 2006.
• 40th Conference of the Association de Science Régionale De Langue Française (French Association of Regional Science), Brussels, September 2004.
• 43rd Annual Meeting of the Western Regional Science Association, Hawaii, February 2004
• 39th Conference of the Association de Science Régionale De Langue Française (French Association of Regional Science), Lyon, September 2003.
• 18th Conference of the Pacific Regional Science Organization, Acapulco, July 2003.
• 42nd Annual Meeting of the Southern Regional Science Association, Louisville, April 2003.
• 42nd Annual Meeting of the Western Regional Science Association, Rio Rico, February 2003.
• 44th Annual Conference of the Association of Collegiate Schools of Planning, Baltimore, November 2002.
• 33rd Mid-Continent Regional Science Association, Kansas City, May 2002.
• 1st Ecole de Printemps en Economie Géographique (Conference in Economic Geography), Pau, April 2001.

   • Seminars/Outreach:

• Dept. of Geography, Arizona State University, January 2010.
• Alliance Française of Tucson, Tucson, January 2009.
• Dept. of Sociology, Univ. of Arizona, September 2007.
• Dept. of Economics, Univ. of Arizona, August 2007.
• Dept. of Geography and Regional Development, Univ. of Arizona, November 2006.
• Dept. of Economics, Univ. of Eindhoven, April 2006.
• CATT, University of Pau, March 2006.
• Dept. of Economics, Tilburg University, March 2006.
• Dept. of Economics, Free Univ. of Amsterdam, March 2006.
• Dept. of Spatial Economics, Free Univ. of Amsterdam, November 2005.
• REAL, University of Illinois, Urbana-Champaign, September 2005.
• REAL, University of Illinois, Urbana-Champaign, October 2004.
• LEG, University of Burgundy, Dijon, June 2004.
• REAL, University of Illinois, Urbana-Champaign, January 2004.
• CATT, University of Pau, November 2003.
• REAL, University of Illinois, Urbana-Champaign, June 2003.
• REAL, University of Illinois, Urbana-Champaign, May 2003.
• REAL, University of Illinois, Urbana-Champaign, April 2003.
• REAL, University of Illinois, Urbana-Champaign, February 2003.
• REAL, University of Illinois, Urbana-Champaign, July 2002.
• REAL, University of Illinois, Urbana-Champaign, April 2002.
• European Union Center, University of Illinois, Urbana-Champaign, November 2001.

• Short term research visits

• Istanbul Technical University, Dept. of Urban and Regional Planning, Istanbul, March 2006

**LANGUAGES**

French (Mother tongue), English

**SOFTWARES**

RATS 32S, E-Views 3.0, WYSEA (Econometrics), SpaceStat 1.91, R (Spatial Econometrics), Arcview, GeoDa (Geographical Information System), Matlab (Programming).
ASSOCIATIONS MEMBERSHIP

- Regional Science Association International
- Western Regional Science Association
- European Union Studies Association
- Association of American Geographers
- Rocky Mountain European Scholars Consortium
Biographical Sketch
David Phillip Guertin

Address:
Watershed Management and Ecohydrology Program, School of Natural Resources, University of Arizona, Tucson, Arizona 85721, Phone: 520 621-1723, Fax: 520 621-8801, Email: phil@snr.arizona.edu

Positions: Professor of Watershed Management
Program Chair, Watershed Management and Ecohydrology Program
Extension Specialist in Watershed Management

Research Interests: Watershed Assessment and Analysis; Geographic Information Science

Education:
National Research Council Postdoctoral Fellow 1985-1986 Hydrology
University of Minnesota Ph.D. 1981-1984 Forest Hydrology
Colorado State University M.S. 1978-1979 Watershed Hydrology
Utah State University B.S. 1974-1977 Forest Hydrology

Professional – Academic Activity:
1978 – 1979 Graduate Research Assistant, Colorado State University, Ft. Collins, CO
1979 – 1981 Assistant Scientist, University of Minnesota, Cloquet Forestry Center, Cloquet, MN
1981 – 1984 Graduate Research Assistant, College of Forestry, University of Minnesota, St. Paul, MN
1986 – 1988 Assistant Research Scientist, School of Renewable Natural Resources, University of Arizona, Tucson, AZ
1994 – 2000 Group Leader, Advanced Resource Technology Group, University of Arizona
1988 – Present Assistant, Associate, Full Professor, University of Arizona
1998 – Present Program Chair, Landscape Studies Program, University of Arizona
2005 – Present Extension Specialist, University of Arizona

Teaching Assignments (last 5 years):
Watershed Management; Application of Geographic Information Systems; Spatial Analysis for Hydrology & Watershed Management; Cartographic Modeling for Natural Resources; Advanced GIS; Resource Mapping; Spatial Analysis and Modeling

Active Grants and Projects:
Evaluating the Effects of Grazing Land Conservation Practices on Southwestern Watersheds. USDA- CSREES, $598,000.
Development of a Rangeland Decision Support Tool to Improve Rangeland Watersheds. USDA- CSREES, $384,554.
Geospatial Watershed Modeling for Improved Watershed Assessments, USDA-Agricultural Research Service, 2006-2011, $461,450
Selected Publications (last five years):

Arizona Master Watershed Steward Program, AZ-DEQ, 2008-2010, 145,000

Selected Publications (last five years):
CURRICULUM VITAE

Stuart Emmet Marsh
Professor
School of Natural Resources and Environment
School of Geography and Development

Director
Arizona Remote Sensing Center

Chair
Arid Lands Resource Sciences Interdisciplinary Ph.D. Program

The University of Arizona
Office of Arid Lands Studies
Tucson, AZ 85721
Phone: 520 621-8574 Fax: 520 621-7834
email: smarsh@email.arizona.edu

EDUCATION

Ph.D. Stanford University - 1979 Department of Applied Earth Sciences
Dissertation Director: Ronald J.P. Lyon
Dissertation Title: Quantitative Relationships of Surface Geology and Spectral Habit to Satellite Radiometric Data

M.S. Stanford University - 1975 Department of Applied Earth Sciences
Thesis Director: Ronald J.P. Lyon
Thesis Title: Feasibility of Satellite Thermal Infrared Remote Sensing for Geothermal Resources

B.S. George Washington University - 1973 Department of Geology

EMPLOYMENT HISTORY

2004-Present Director Arizona Remote Sensing Center

2002-Present Chair Arid Lands Resource Sciences Graduate Interdisciplinary Program

2006-2007 Acting Director Arid Lands Information Center

2001-Present Professor Arid Lands Resource Sciences – Office of Arid Lands Studies and Department of Geography and Regional Development
Adjunct Professor School of Renewable Natural Resources
1988-2004  Associate Director Arizona Remote Sensing Center  
1988-2001  Associate Professor Arid Lands Resource Sciences – Office of Arid Lands Studies and Department of Geography and Regional Development  
1986-1988  Manager, Geoscience Computer Services, Sun Exploration and Production Co., (SUNOCO), Dallas, Texas  
1983-1986  Manager, Remote Sensing Processing and Field Systems, Sun Exploration and Production Co., Dallas, Texas  
1981-1983  Senior Research Geologist, Sun Exploration and Production Co., Dallas, Texas  
1979-1980  National Research Council Resident Research Associate  
           Jet Propulsion Laboratory, California Institute of Technology  
           Pasadena, California  

HONORS AND AWARDS  
2008  Special Team Award – School of Natural Resources University of Arizona  
1999  Presidential Citation - American Society of Photogrammetry and Remote Sensing  
      In recognition of 8 years of service as associate editor of the Journal  
      Photogrammetric Engineering and Remote Sensing  
1996  J. William Fulbright Senior Scholar Award for Research/Lecturing in Australia  
1996  Elected Fellow – Arizona-Nevada Academy of Sciences  
1996  John I. Davidson President's Award (1st Place) for practical papers by the  
      American Society of Photogrammetry and Remote Sensing  
1995  Elected President, Arizona-Nevada Academy of Sciences  
1994  Appointed by the Governor to the Arizona Geographic Information Council  
1983  NASA Certification of Recognition  
1980  Post-Doctoral Fellowship – National Research Council (NRC)  
1976  HEW Resource Development Fellowship – Stanford University  

SERVICE  
Outreach  
Invited Speaker – NOAO High School Teacher Training Program – SFAz Grant (2008)  
Invited Speaker – Catalina Foothills High School AP Environmental Science (2006)  
Invited Speaker – Eyes in the Sky Program Keynote Address (2005)  
Invited Speaker – Organ Pipe Cactus National Monument (1999)
Invited Speaker – Esperero Canyon Middle School Science Program (1999)
Invited Speaker – Green Valley Forum (1999)
Invited Speaker – Thornydale Elementary School (1994)
Invited Speaker – TUSD, APEX School Program (1994)
Member – Arizona Geographic Information Council (1994-1996)

Intramural Service

Departmental Committees:

School of Natural Resources & Environment - Office of Arid Lands Studies

- Member, SNRE Promotion and Tenure Committee (2009-)
- Member, SNRE Curriculum Committee (2009-)
- Member, SNRE Strategic Planning Committee (2009-)
- Chair, OALS Retention Review Committee (2008)
- Chair, OALS Promotion and Tenure Committee (2006)
- Chair, OALS Retention Review Committee (2006)
- Chair, Faculty Search Committee (2005)
- Chair, Post-Doctoral Research Scientist Search Committee (2001)
- Member, Faculty Search Committee – Geospatial Extension Specialist (1999)
- Member, OALS Faculty Annual Peer Review Committee (1994→)
- Chair, OALS Faculty Annual Peer Review Committee (1997)
- Chair, Annual Performance Review Guidelines Development Committee (1998/1994)

Department of Geography and Regional Development

- Elected Member, Annual Performance Review Committee (2009)
- Elected Member, Five Year Review Committee of Department Chair (2008)
- Chair, Promotion and Tenure Committee for C. Woodhouse (2008-2009)
- Chair, Annual Performance Review (2004-2005)
- Member, Annual Performance Review (2003-2005)
- Member, Promotion and Tenure Committee (2003-2005)
- Chair, Promotion and Tenure Committee (2003-2004)
- Member, Graduate Committee (2001-2002)
- Member, Promotion and Tenure Committee (2000-2001)
- Chair, Faculty Search Committee – Physical Geographer (1998-1999)
- Member, Annual Performance Review Committee (1997-1999)
- Member, Faculty Promotion and Tenure Committee (1999/1996/1995)
Member, Graduate Committee (1997)
Chair, Committee to Develop Guidelines for Adjunct Status (1997)

*College Committees:*

**College of Agriculture and Life Sciences**
- Member, College Promotion and Tenure Review Committee (2006-2009)
- Member, School of Natural Resource Promotion Review Committee (2005)
- Chair, Post-Tenure Review Audit Committee (2002)
- Reviewer, School of Renewable Natural Resources Hatch Proposal (2001)
- Member, Post-Tenure Review Audit Committee (2000-2002)
- Member, Faculty Search Committee – Assistant Professor in Geographic Information Science – School of Renewable Natural Resources (2000)
- Member, Faculty Search Committee Assistant Professor SRNR (1999-2000)
- Member, McGinnies Fellowship Review Committee (1997-2000)
- Member, 5-Year Review Committee of Director OALS (1998-1999)
- Member, CRIS Project Review Committee (1995)

**University Committees:**

- Chair, Search Committee – Faculty Associate to the Dean of the Graduate College (2009-2010)
- Member, ADVANCE Transformational Technologies Working Group (2008-2009)
- Member, External Review Committee – Academic Program Review of the American Indian Studies Graduate Interdisciplinary Program (2006)
- Member, University Committee on Ethics and Commitment (2005-2008)
- Member, Institute for the Study of Planet Earth Promotion Review Committee (2005)
- Chair, Faculty Senate Committee on Elections (1997-1998)
- Member, Faculty Senate Committee on Elections (1994-1996)
- Member, Faculty Review Committee Small Grants Program (1997)
- Reader, Upper-Division Writing Proficiency Examinations (1994)

**Interdisciplinary Committees:**

- Chair, Graduate Interdisciplinary Programs Advisory Committee (GIDPAC) (2009-2010)
- Member, Executive Committee Interdisciplinary Graduate Program on Remote Sensing and Spatial Analysis (2009-2014)
- Elected Member, Graduate Interdisciplinary Programs Advisory Committee (GIDPAC) (2007-2010)
- Chair, Interdisciplinary Graduate Program on Arid Lands Resource Sciences (2002–)
- Member, Extra-departmental two/four year review committee of R. Merideth Udall Center for Studies in Public Policy (2001)
Member Executive Committee, Interdisciplinary Graduate Program on Arid Lands Resource Sciences (1996→)
Member, Interdisciplinary Graduate Program on Arid Lands Resource Sciences (1991→)
Member Executive Committee, Interdisciplinary Graduate Program on Global Change (1994-1999)
Member, Interdisciplinary Graduate Program on Global Change (1994→)
Member, Interdisciplinary Graduate Program on Remote Sensing and Spatial Analysis (1989→)

Extramural Service

Review Panel Member – USGS 2009 National Climate Change and Wildlife Science Center RFP (2009)
Panel Member – USDA NP 203/204 Air Quality and Global Change Assessment Panel – Five Year Review (2008)
External Reviewer – Tenure Review Dept. of Geography University of Idaho (2001)
Member Fellows Committee, Arizona-Nevada Academy of Sciences (2000)
Member Organizing Committee, Arizona-Nevada Academy of Sciences Annual Meeting (2000)
External Reviewer Academic Program Review Department of Earth Sciences, California State University Dominguez Hills (1998)
Associate Editor, Photogrammetric Engineering and Remote Sensing (1992-1999)
Member, Editorial Board, Photogrammetric Engineering and Remote Sensing (1999→)
Chair, American Society of Photogrammetry and Remote Sensing William A. Fischer Memorial Scholarship Committee (1994→)
Member, Program Committee Eleventh Thematic Conference - Applied Geologic Remote Sensing (1996)
Director, Arizona-Nevada Academy of Sciences S. Arizona Region (1990-1994)
Member, Editorial Advisory Committee Lewis Publishers (1994)
Manuscript Reviews (average 6 per year) for the following scientific journals:

   Journal of Arid Environments
   Journal of Wildlife Management
   International Journal of Remote Sensing
   International Journal of Geographic Information Science
   International Commission of Agricultural Engineering EJournal
   Remote Sensing of Environment
   Remote Sensing
Proposal and Grant Reviews (average 4 per year):
  - National Science Foundation (Geography)
  - NASA Earth Systems Science Fellowship Program
  - U.S. Environmental Protection Agency
  - U.S. Department of Agriculture
  - University of California Kearny Foundation Proposal


PUBLICATIONS/CREATIVE ACTIVITY (Published or Accepted)

Chapters in Scholarly Books and Monographs:


Refereed Journal Articles (Published or Accepted in Final Form):


**Electronic Publications (Peer Reviewed):**


**RECENT SCHOLARLY PRESENTATIONS**

**Seminars:**

Accruing Assets for Promotion and Tenure Through Service – University of Arizona ADVANCE program seminar 2009. (Invited)


**Symposia and Conferences:**


GRANTS and CONTRACTS (2000-2010)

Federal


2. Creation of a GIS for Six Cities in Arid Environments Role: Co-Principal Investigator (w/ T. Park, A. Thiam, G. Christopherson), Source: National Science Foundation (NSF), Amount: $499,736, Status: Completed (1999-2002)


State or County


3. Santa Cruz County Riparian Mapping and Native Plant Ordinance Project. Role: Co-Principal Investigator (with S. Drake), Source: Santa Cruz County Arizona, Amount: $76,800, Status: Completed (2006-2007).


Industry


International Organizations

1. A Terrestrial Ecology Study to Assess the Impact of Man’s Activities on Rangeland Resources – Saudi Arabia. Role: Co-Principal Investigator (w/ K. Foster), Source: Meteorology and Environmental Protection Administration – Kingdom of Saudi Arabia, Amount: $300,000, Status: Completed (1999-2001)


Douglas D. Meredith

Address
9602 E. Wasatch Pl.
Tucson, AZ 85749
(520)344-0407
doug@douglasmeredith.net

Computer Experience

04/08 – present Senior Java Developer, Tony French Systems, Ltd., Highland, KS
Maintenance and enhancement of web sites based on a legacy version of MarketLive. Much of this is JSP at its grungiest, with 100's of lines of embedded Java code. I refactor where time and requirements allow and hack where they don't. This is old school seat of the pants programming: exasperating but refreshing in a twisted sort of way. Also a great deal of Javascript programming. I've been introducing jQuery whenever possible. Some SQL Server and .NET development with C# as well.

02/08 – present Senior Research Specialist, Dept. of Geography and Regional Development/Arizona Remote Sensing Center, University of Arizona, Tucson, AZ
Developing various geographic web applications, including presentation of ESRI shapefiles over Google Maps using Drupal and GeoServer on the server-side and OpenLayers and jQuery on the client. This hourly, as needed, position is providing great experience in these open source applications as well as Javascript and PHP.

10/06 – 1/08 Senior IT Engineer/Software Engineer, Contivo, Inc. San Jose, CA
Contivo was a small company developing sophisticated database integration tools and services. The workforce was untethered, with employees telecommuting from all over the country. I wore several hats: maintaining and enhancing the distributed IT infrastructure; investigating customer issues with server-side software; bundling and deployment of server-side software; client- and server-side Java development. This position allowed me to expand my knowledge of IT infrastructure supporting a distributed workforce, Oracle and SQL Server administration, object-relational mapping tools such as Hibernate, multi-tier server-side software, software bundling and deployment technologies, CVS and related version tracking tools, JUnit, the Eclipse development environment, XML and XML Schema, database translation issues, and Web Services using Apache CXF.

4/05 – 10/06 Director, Geovisualization Initiatives, Department of Geography and Regional Development, University of Arizona, Tucson, AZ
General tasks included: development and management of the Geovisualization Laboratory’s technological infrastructure; development of Web-based GIS data services; consultation and software development support for faculty and students; writing and co-writing grant proposals; coordination of community outreach GIS projects undertaken in the Geovisualization Lab by faculty and students. This position allowed me to expand my knowledge of Web Services, GIS technology, IT infrastructure, grant writing, and teaching. Interesting position until funding ran out.

6/03 – 5/05 Founding partner of WorldWise Software, LLC, Fayetteville, AR
Founded to enable commercialization of GeoBlaze, a system for the Web-based dissemination of geodata. GeoBlaze was developed by myself and other designers through our work with the University of Arkansas. WorldWise Software was to be licensed by the University to resell instances of this software. Some things go and some things don’t.

5/97 – 4/05 Center for Advanced Spatial Technologies (CAST), University of Arkansas, Fayetteville, AR
Design, development and enhancement of software to interface GIS and archaeological databases to the World Wide Web. Primary among these was GeoBlaze, a Java-based Web application providing query and download of geodata in user-specified data format and projection. This provided extensive experience in Java
technologies, both client and server side as well as JDBC and Oracle. My work at CAST also provided valuable experience with Web server software (Apache, Jakarta, iPlanet, NCSA and Oracle Web Application Server), CGI programming, HTTP, HTML, Perl, Javascript, PL/SQL, and SQL. I also shared system administration responsibilities for a mixed network of Windows, Sun Solaris, and Linux boxes.

6/87 – 5/96 AG Communication Systems (a joint venture between AT&T and GTE), Phoenix, AZ
5/94 - 5/96
Development of downloadable firmware for a multi-processor hardware card using DSP technology to provide ADSI telephony services. ADSI is a communications protocol that will allow specially equipped telephones to provide a GUI-based interface to voice-messaging and other features. This firmware was written in C for a Motorola 68340 processor. Development platform was a Pentium PC running Windows. Development tools included Microtec XRAY Debugger and EST Series 300 emulator.

7/92 - 5/94
Development of a LAPD emulation and black box test suite to run on a protocol analyzer. LAPD is a communications protocol associated with ISDN. The emulation and test suite were written in a hybrid of almost-ANSI C and a tokenized state-oriented language.

3/92 - 7/92
Development of MS-DOS version of WindowPhone. WindowPhone was a Windows-based product that made use of Caller-ID (via accessory hardware card) to provide sophisticated call management features to PC users. The MS-DOS version used Microsoft C++ and a commercial GUI package to provide the same functionality.

7/91-3/92
Development of load generation and offline debug tools. This was on an IBM PC platform using Borland C++ and MS-DOS batch files.

1/91 - 7/91

3/90 - 1/91
Tour of duty in Problem Isolation. Responsible for front-end analysis and investigation of problems reported from the field.

6/87 - 3/90
Kernel operating system software for a digital telephone switching system. Responsibilities included maintenance of existing software, debugging support for field outages, and design of enhanced software to support new feature development. Primary software area was dynamic memory administration. Extensive programming in concurrent Pascal and 8086 assembly language. Development environment was split between HP/Apollo workstations and an IBM mainframe running TSO.

1/86 – 5/87 KSU Computing Activities, Kansas State University, Manhattan, KS
Student consultant/programmer.

Ecological Field Experience

6/96 – 8/96 University of Arkansas, Fayetteville, AR
Field Tech for research on the physiological ecology of timber rattlesnakes. Activities included temperature sensitive telemetry and mark/recapture.

9/94 – 8/95 Arizona State University West, Phoenix, AZ
Field Tech for research on the physiological and behavioral ecology of western diamondback rattlesnakes. Activities included temperature sensitive telemetry, mark/recapture, behavioral observation during spring emergence, time budget analysis, and lab processing.

4/94 – 8/94 Arizona Game and Fish Department, Phoenix, AZ (volunteer)
Various projects including: mexican spotted owl survey, flammulated owl survey, riparian vegetation censusing, Chiricauhau leopard frog survey, and Mexican wolf howling survey.
Teaching Experience

4/05 – 10/06 Department of Geography and Regional Development, University of Arizona, Tucson, AZ
   Occasional lectures on geographic information systems for the Web.

8/98 – 9/98 Department of the Interior, Mesa Verde National Park, CO (contract position)
   Climbing instructor and rope safety technician for a group of archaeologists working on erosion control in cliff dwellings within Mesa Verde National Park.

8/96 – 5/97 Department of Biological Sciences, University of Arkansas, Fayetteville, AR
   Teaching Assistant for Human Physiology.

10/90 – 5/92 Arizona Mountaineering Club, Phoenix, AZ (volunteer)
   Climbing instructor for Basic Rock-climbing and Advanced Anchors and Rope-work courses.

Education

M.A. in Biology (1999)
University of Arkansas, Fayetteville
GPA: 4.00

B.S. in Computer Science (1987)
cum laude
Kansas State University
GPA: 3.749

Honors

National Merit Scholar
KSU Putnam Scholar
State of Kansas Honor Scholar
Dean’s Honor List (three semesters during B.S.)
Daoqin Tong
Curriculum Vitae

Chronology of Education
2007  Ph.D., Geography, The Ohio State University
2007  M.A.S. (Master of Applied Statistics), Statistics, The Ohio State University
2004  M.S., Civil Engineering, The Ohio State University
2001  B.S., Civil Engineering, University of Shanghai for S & T, China

Doctoral Dissertation: Continuous Space Facility Location for Covering Spatial Demand Objects
(Advisor: Dr. Alan T. Murray)

Chronology of Employment
2007-  Assistant Professor, Geography, The University of Arizona
2007-  Assistant Professor, Graduate Interdisciplinary Program in Statistics, The University of Arizona
2004-2007 Research Assistant, Center for Urban and Regional Analysis, The Ohio State University
2006:  Teaching Assistant, Geography, The Ohio State University
2002-2004 Research Assistant, Remote Sensing Unit, The Ohio State University

Honors and Awards
2009:  Association for Women Faculty Travel Award, The University of Arizona
2006:  Student Paper Award, University Consortium for Geographic Information Science Summer Assembly
2006:  Best Student Paper Award, 19th Annual GIS for Transportation Symposium
2002-2003 University Fellowship, The Ohio State University

Service/Outreach
Outreach
2009:  Consultant for siting a new Women’s and Children’s Community Center in Tucson, Arizona
2007:  Participant in fundraising event for the GRD department in Phoenix, AZ, October 9

University Appointments and Service
A. University Committees
2007- Faculty, Graduate Interdisciplinary Program in statistics
2007- Member, GIS certificate committee

B. Departmental Committees
2009- Member, Graduate Committee
2008: Member, Jan Monk Distinguished Speaker committee
2007-2009 Member, Department Committee on Instructional Technology

Professional Service
A. Conference organizing
2007- Co-chair, Organization Committee of the Annual Meeting of the Western Regional Science Association

B. Review Service
2009: Guest editor, Région et Dévellopement
2008: Reviewer, NSF proposal

C. Conference Sessions Organized
2009: Location and Spatial Analysis sessions, Annual Meetings of the Association of American Geographers

D. Journal Reviews
GeoJournal
Spatial and Spatio-temporal Epidemiology
Environment and Planning B: Planning and Design
Geographical Analysis
Papers in Regional Science
Computers, Environment and Urban Systems
Journal of Geographical Systems
Annals of American Association of Geographers
2009 Applied Geography Conference
International Journal of Applied Geospatial Research
Annals of Regional Science
Environment Management
Transportation Research Board

E. Professional Membership
Association of American Geographers
The Regional Science Association International
The Western Regional Science Association

F. Miscellaneous Service
2009: Panel, Department new graduate student orientation

Publications/Creative Activity
A. Refereed Journal Articles (* designates Ph.D. work)


**B. Electronic Publications, peer reviewed**


**C. Peer-reviewed Proceedings**


**Work in Progress (submitted or in revision)**


**Scholarly Presentations (invited)**
2008: Research Colloquium: Arizona State University

**Seminar**
2009: Research Seminar: Civil Engineering, University of Arizona
2008: Research Seminar: System and Industrial Engineering, University of Arizona

**Conferences (submitted)**

Liu Y., M. Momayez and D. Tong “Estimate soil moisture from remote sensing images through cokriging”, *22nd Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP)*, Fort Worth, Texas, USA, March 29-April 2, 2009


USA, June 25-July 2, 2008

Tong D. “A new approach for regional coverage modeling”, 104th Annual Meeting of the Association of American Geographers, Boston, Massachusetts, USA, April 15-19, 2008


Murray A.T., T.C. Matisziw, D. Tong and H. Wei “GeoComputational approaches to coverage maximization in service facility siting”, GeoComputation 2007, NUI Maynooth, Ireland, September 3-5, 2007


Tong D. and A.T. Murray “Geographic information science to enhance location coverage modeling”, University Consortium for Geographic Information Science Summer Assembly, Vancouver, Washington, USA, June 28-July 1, 2006

Tong D., C.J. Merry and B. Coifman “Deriving transportation information from GPS probe vehicle data integrated with a GIS”, GIS for Transportation Symposium, Columbus, Ohio, USA, March 27-29, 2006


Murray A.T. and D. Tong “Threshold coverage optimization”, Internal Symposium on Locational Decisions X, Sevilla and Islantilla, Spain, June 2-8, 2005

Grants and Contracts
Maximizing the Participation in Farmers’ Markets (100%, PI, $5,000, SBS, University of Arizona), 2009

$1,800 College Small Grant (2007) (CoPI), funded by College of Social and Behavioral Sciences, University of Arizona

$ 3,000 Summer 2005 Research Grant Award for research toward the proposal of dissertation work, funded by Department of Geography, The Ohio State University

Teaching
Geography 696A-Economic Geography (Fall 2009), University of Arizona
Geography 553 – Advanced Location Theory (Fall 2007, Spring 2009), University of Arizona
Geography 458 – Geography of Transportation (Spring 2008, 2009, 2010), University of Arizona
Geography/Planning 457/557 – Statistical Techniques in Geography, Regional Development and Planning (Fall 2008, 2009), University of Arizona
Geography/Math 574G – Introduction to Geostatistics (Fall 2008, Spring 2010), instructor, university of Arizona
Geography 416C/516C – Urban Geographical Information Systems ( Spring 2008), University of Arizona
Geography 607 – Geography Information Systems (Fall 2006), lab instructor, The Ohio State University

Advising Committee
Liang Xue, Ph.D. from Hydrology
Sandra Holland, Ph.D. from Geography
Paula Decker, Ph.D. from Geography
Luke Shillington, Master from Geography (chair)
Monica Stephens, Master from Geography
Jared Powell, Master from Geography
Youfang Liu, Master from Mining
Alice Tseng, GIS certificate
Johanna Kraus, GIS certificate
Davita Mueller, GIS certificate
CURRICULUM VITAE

Craig A. Wissler
School of Natural Resources
The University of Arizona

EDUCATION

Master of Landscape Architecture, *summa cum laude*, The University of Arizona, Tucson, Arizona, 1993

Bachelor of Science, Environmental Resources in Agriculture, *summa cum laude*, Arizona State University, Tempe, Arizona, 1983.

EXPERIENCE

Director, Advanced Resource Technology Program, School of Renewable Natural Resources, The University of Arizona, Tucson, AZ 85721. Responsible for administration and management of large GIS research support facility. Technical duties include database design, applications support and production design. Administrative duties include contract and budget administration, policy development, and program development. July 2000 to present.

Assistant Professor of Renewable Natural Resources, School of Renewable Natural Resources, The University of Arizona, Tucson, AZ 85721. Responsible for GIS in Natural Resources course design and development. Graduate student advisement and sponsorship. Project development and management for GIS applications in natural resources. November 1999 to present.

GIS Coordinator, Advanced Resource Technology Group, School of Renewable Natural Resources, The University of Arizona, Tucson, AZ 85721. Primary responsibilities include database development and analysis for large natural resource and planning projects. Duties include project development, supervision and training of staff, software support, and computer lab management. Developed independent research projects with various state agencies for natural resource planning. Participated in GIS workshops and provided GIS training to faculty members. Instructional responsibilities include course development, instruction and student advisement. February 1991 to November 1999.

GIS Programmer/Analyst, The Planning Center, 950 N. Finance Center Drive, Ste. 210, Tucson AZ 85710. Responsible for development and implementation of GIS applications in land planning and analysis. Duties include software and hardware configuration, and development of interface between CAD, ARC/INFO, and DBMS. Involved in the design, development and management of databases for vector, raster, and arc-node systems. Supervised planning graphic production activities. December 1989 to February 1991.


Research Assistant, Division of Landscape Resources, School of Renewable Natural Resources, University of Arizona. Project manager for contracts involving data capture and manipulation on regional planning projects. Assisted in the production of a system specification for a research GIS station. Developed and provided training for custom CAD digitizing package comprised of menu macro and AutoLisp routines. September 1987 to December 1988.


HONORS AND AWARDS

1983 -- Range Student of the Year, Arizona State University
1989 -- Sigma Lambda Alpha, Iota Chapter, Landscape Architecture Honor Society
1995 -- Staff Excellence Award, School of Renewable Natural Resources, The University of Arizona

SERVICE

Intramural

Computer Resources Committee, School of Renewable Natural Resources 1996-1997
Survey/Drainage Project Management Team, Campus and Facilities Planning 1996
Campus Mapping Working Group, The University of Arizona 1995-1996
Campus Map Team, The University of Arizona 1997

Extramural

Pima County Sonoran Desert Conservation Plan GIS Technical Advisory Team, 1999
La Madera Neighborhood Association, Board Member, 1996 to present
City of Tucson Planning Commission, 2006 to present
TEACHING

University Courses -- Principal Instructor

LAR 402/502 Landscape Planning, 1994
RNR 599 GIS Database Development Techniques for Natural Resources, 1995
RNR 407/507 (417/517) GIS for Natural Resources, 1995-2009
RNR 403/503 420/520 Applications of GIS, 2007-2009

University Courses -- Team Instructor

LAR 402/502 Landscape Planning, 1993
RNR 271 Computer Applications for Students in Natural Resources, 1992-1993
RNR 696 GIS Seminar, 1996
RNR 420/520 Advanced Techniques in GIS, 2000-2009

Other Teaching Experiences

Primary contract instructor for the Arizona Land Resource Information System Introduction to ARC/INFO training course, 1993-1996

Primary instructor for advanced GIS training, Instituto Tecnologico de Sonora (ITSON), January 1994

Primary instructor for Introduction to ARC/INFO, Dahlgren Naval Air Weapons Station, Virginia, October 1994

Primary instructor for ARC/INFO GRID and COGO training, U.S. Army Training Center, Hohenfels, Germany, May 1996

Certified ArcView Instructor, 1997

GRADUATE COMMITTEE SERVICE

Yulan Yuan, M.L.A., Landscape Architecture
Pamela Swantek, M.S., Wildlife Fisheries Science
Paul Braun, M.S., Renewable Natural Resources
Demetrio Fernandez-Reynoso, PhD, Natural Resources
Myles Flynn, M.L.A., Landscape Architecture
Kevin Causas, M.S., Renewable Natural Resources
Jean-Paul Charpentier, M.S., Wildlife Fisheries Science
Spencer Lace, M.S. Natural Resources
Myrtho Joseph, M.S., Natural Resources
Aaron Poe, M.S., Natural Resources
Tank Ojha, PhD., Geosciences
Scott McCarthy, M.S. Wildlife Fisheries Science
Joanne Newcomb, PhD., Anthropology
Amy Beussink, M.S. Watershed Management
Royden Hobbs, PhD., Wildlife Fisheries Science
Averill Cate, M.S. Watershed Management
Robert Czaja, M.S. Renewable Natural Resources
Dilruba Yeasmin, PhD. Natural Resources
PUBLICATIONS


PRESENTATIONS


STEPHEN R. YOOL
Curriculum Vitae

Chronology of Education
1980-1985 University of California Santa Barbara Ph.D.
1971-1973 California State University Hayward M.P.A.
1965-1969 California State University Hayward B.S.


Major Fields: Geography, including Biogeography, Remote Sensing and Geographic Information Science applications to human and natural systems

Chronology of Employment
2008- Professor, Geography, The University of Arizona
2008- Adjunct Professor, Planning, The University of Arizona
2003: Interim Head of Department
2001-2008 Associate Professor, Geography, The University of Arizona
2000- Arid Lands Resources Sciences Grad Interdisciplinary Program
2000- Global Change Grad Interdisciplinary Program
2000- Remote Sensing & Spatial Analysis Grad Interdisciplinary Program
1996-01: Adjunct Assistant Professor, Planning, The University of Arizona
1995-01: Assistant Professor, Geography, The University of Arizona
1992-95: Adjunct Assistant Professor, Geography, The University of Arizona
1989-92: Research Scientist, Lockheed, Sunnyvale and Palo Alto, California
1985-89: Physical Scientist, Naval Ocean Systems Center, San Diego, California
1979-85: Research Associate, Remote Sensing Unit, U.C., Santa Barbara, California

Honors and Awards
2007: Honored Faculty Address: SBS Honors Convocation
2007: Dean's Magellan Award for Excellence in Instruction
2006: Presidential Citation, American Society of Photogrammetry & Remote Sensing
2005- Marquis Who’s Who in America
2004- Who's Who in Social Sciences Higher Education
2003: Environmental Systems Research Institute Award for Best Scientific Paper in GIS
2003: Research Professor, College of Social and Behavioral Sciences
1999: Presidential Citation, American Society of Photogrammetry & Remote Sensing
1996: Nominee, University of Arizona Five-Star Teaching Award
1993: Summer Faculty Fellow, Army Topographic Engineering Center, Alexandria, VA
1992: Lockheed Publication Award for "Real-time image processing"
1987: Naval Ocean Systems Center Exemplary Achievement Award
1985: California Space Institute Research Award for Doctoral Dissertation
1985: Goddard Space Flight Center Postdoctoral Research Award
1979: U.C. Santa Barbara Dean's Instructional Improvement Award

Service/Outreach (Post-Tenure)
University Appointments and Service

A. University Committees
2006- Provost’s NSF Major Instrumentation Review Committee
2006- Executive Committee, Arid Lands Resources Sciences Graduate Interdisciplinary Program
1996- Faculty, Arid Lands Resource Sciences Graduate Interdisciplinary Program
1995- Faculty, Global Change Graduate Interdisciplinary Program
1993- Faculty, Remote Sensing and Spatial Analysis Graduate Interdisciplinary Program

B. Departmental Committees
2009: Chair, Christopher Scott Promotion Committee
2008- Chair, Development Committee
2003-2009: Director, Undergraduate Studies
2008: Chair, Annual Faculty Performance Review Committee
2008: Member: Planning Chair Search Committee
2008: Chair, Christopher Scott Third Year Review Committee
2008: Chair, Beth Mitchneck Promotion Committee
2007: Co-Chair, GIS/Geostats/Geoviz Faculty Search Committee
2007: Member, Academic Program Review Committee
2007: Chair, Annual Faculty Performance Review Committee
2006: Chair, Physical Geography Faculty Search Committee
2006- Member, Annual Faculty Performance Review Committee
2004- Director, Undergraduate Studies, Geography & Regional Development
2003- Department Standing Committee on Curriculum (Chair)
1992- Member, Department Committee on Instructional Technology

C. College Committees
2001; 2002: Dean’s Post-Tenure Audit Committee

Professional Service
A. Professional Society Offices Held
2010=2012: Arizona Board of Place Names
2008- Chair, Remote Sensing Specialty Group Awards Comm., Assn of American Geographers
2007: President, Southwest Region, American Society of Photogrammetry & Remote Sensing
2006: President Elect, Southwest Region, American Society of Photogrammetry & Remote Sensing
2005: Vice President, Southwest Region, American Society of Photogrammetry & Remote Sensing

B. Review Service
2008: Reviewer NSF IGERT Pre-Proposals
2008- Judge, AAG Geography Student Affinity Group
2008- Editorial Board: GISci & Remote Sensing
2007- Editorial Board: Fire Ecology
2007: NSF Geography and Regional Science
2007: Early Career Award Selection Committee, ASPRS
2006: National Science Foundation, Geography and Regional Science
2001- Evaluator, Fischer Memorial Scholarship, ASPRS
2000- Judge, AAG Remote Sensing Specialty Group Student Paper Competition
1998-2001: Associate Editor, Photogrammetric Engineering & Remote Sensing
C. Conference Sessions Organized

2007
Geography Section, Arizona-Nevada Academy of Sciences

2006
Geography Section, Arizona-Nevada Academy of Sciences

2005
Wildfire Session, Association of American Geographers

2004
Wildfire Session, Association of American Geographers

2003
Wildfire Session, Association of American Geographers

2002
Wildfire Session, Association of American Geographers

D. Tenure and Promotion Cases Reviewed
Associate Professor (7 cases)
Professor (1 case)

E. Journal Reviews

Biotropica
The Science of the Total Environment
Photogrammetric Engineering & Remote Sensing
Journal of Geography in Higher Education
Fire Ecology
Geomorphology
GIScience & Remote Sensing
Applied Geography
Remote Sensing of Environment
International Journal of Remote Sensing
Canadian Journal of Remote Sensing
International Journal of Geographic Information Science
I.E.E.E. Transactions on Geoscience & Remote Sensing
The Professional Geographer
Annals of the Association of American Geographers
GeoCarto International
Applied Optics
Computer Graphics and Image Processing
Landscape Ecology
Madrono
Ecology
Agriculture, Ecosystems, and Environment
Plant Ecology
Geoscience and Remote Sensing Letters
Journal of Biogeography
International Journal of Wildland Fire
Ethiopian Journal of Biological Sciences
F. Book Reviews

G. Miscellaneous Service
2009: Chair, Gary Christopherson Review and Appointment
2009: Chair, Christopher Scott Promotion Committee
2008: Chair, Beth Mitchneck Promotion Committee
2008: Chair, Christopher Scott 3rd year Review Committee
2008: Book chapter review: Remote Sensing of Land Cover Change
2008: Chair: Harnessing Geotechnologies (Departmental 50th Anniversary Session)
2008: Proposal Reviewer, Kansas State Targeted Excellence Program
2008: Graduate Student Travel Award Judge (Institute for the Study of Planet Earth)
2007: Faculty Mentor to Dr. Daoqin Tong
2007- Faculty Mentor to Dr. Gary Christopherson
2006- Faculty Mentor to Dr. Willem van Leeuwen
2005: Arizona Illustrated wildfire interview
2004: Arizona Illustrated interview
2004: ‘A World of Music’ (Teaching geography using the music of different countries).
2003: Arizona Illustrated wildfire interview
2002: Arizona Illustrated wildfire interview
2001: Moderator, National Geographic Geography Bee

Publications/Creative Activity
A. Book Chapters

B. Refereed Journal Articles (* designates Ph.D. work)


1986-1995

Unclassified refereed publication activity suspended during employment in federal and industrial research laboratories.


Work in Progress (submitted or in preparation)


Media

Producer and Director, Promotional Video: Remote Sensing & Spatial Analysis Graduate Interdisciplinary Ph.D. program (2006)
Scholarly Presentations (invited)
2009: Interannual Variations in Live Fuel Moistures (RNR 355)
2008: Science talk on Climate Change: City of Tucson Environmental Services
2008: Grand Challenges in Wildland Fire Information Technology and Management (RNR 355)
2008: Research Colloquium: San Diego State University
2008: Research Seminar: University of Adelaide Dept. of Geographical and Environmental Studies
2007: Keynote Address: International Wildfire Symposium (Thessaloniki, Greece)
2006: NASA Space Grant Consortium
2005: Distinguished Research Lecturer, The University of Arizona

Conferences & Symposia (submitted)
Yool, S.R. Exploring linkages between phenology and infectious disease, Association of American Geographers, April 2009, Las Vegas, NV
Yool, S.R. A Remote Sensing Concept for Modeling Infectious Disease, Association of American Geographers, 6-10 March 2007, Chicago, IL
Yool, S.R. Modeling Infectious Diseases from Space, Arizona-Nevada Academy of Sciences, 8 April 2006, Tucson, AZ

Grants and Contracts
Re-Measurement of Stand Structure Plots After Wildfire in Southeastern Arizona (10%, PI, $50,000, USDA), 2008-2009
Cyberinfrastructure: Information technology in support of science, engineering, and environmental applications (10%, Co-PI, $125,000, NSF), 2008
IGERT Program in Development, Life Sciences and Society: Complexity of Innovation and Diffusion (10%, Co-PI, NSF, pending), 2008
Geospatial Analysis of Urban Thermal Gradients: Application to Tucson Arizona’s Projected Water Demand 2007 (50%, Co-PI, $12,000, USGS), 2007
Cyberinfrastructure: Information technology in support of science, engineering, and environmental applications (10%, Co-PI, $125,000, NSF), 2007
National Aeronautics and Space Administration Internship (100%, PI, $8000, NASA), 2006
National Aeronautics and Space Administration Internship (50%, Co-PI, $8000, NASA), 2005
A Valley Fever (Coccidioidomycosis) Public Health Decision Support System Based on Climate and Environmental Change (50%, Co-PI, $265,004, EPA), 2005-2007
National Aeronautics and Space Administration Internship (100%, $8000, PI, NASA), 2004
The University of Arizona GIS Minor Website (100%, PI, $19,944, Proposition 301), 2004
Mapping Alpine Snowmelt Over the Colorado River Basin using Multiple Satellite Platforms: MODIS & AVHRR Data for Monitoring Variability in Regional Climate & Water Resources (100%, PI, $72,000, NASA), 2002-2004
Baker-Maverick Postfire Regeneration (10%, Co-PI, $70,500, USDA), 2003-2004
Climatic and Human Contributions to Fire Regimes Affecting Ecosystems in the U.S. Southwest (25%, Co-PI, $275,000, EPA), 2000-2003
The University of Arizona GIS Minor Website (100%, PI, $19,944, Proposition 301), 2003
GIS Development and Support for Fort Huachuca (50%, Co-PI, $660,000, Army), 2000-2002
NASA Southwest Earth Science Applications Center (25%, Co-PI, $2,500,000, NASA), 2000-2002
Fire effects on vegetation within the Baker Canyon Reburn (100%, PI, $75,000, USDA), 2002
Fuel Risk Mapping in the Los Alamos Urban-Wildland Interface—Cerro Grande Amendment (100%, PI, $85,000, USDA), 2000
New Learning Environments and Instructional Technologies Grants Program: Updating the Department of Geography & Regional Development’s Spatial Analysis Laboratory (50%, Co-PI, $15,000, The University of Arizona), 2000
Characterizing Fire Regimes in Conifer Forest using Optical and Microwave Remote Sensing (100%, PI, $102,000, EPA), 1999-2001
Fuel Risk Mapping in the Los Alamos Urban-Wildland Interface (100%, PI, $40,000, USDA), 1999
Maverick Prescribed Fire Visualization and Analysis (100%, PI, $14,500, USDA), 1999
Peloncillo Mountains fire fuels mapping (100%, PI, $29,000, USDA), 1998
Peloncillo Mountains fire fuels mapping (100%, PI, $24,000, USDA), 1998
Peloncillo Mountains GIS Agave habitat and fire response model (100%, PI, $24,000, USDA), 1997
Huachuca Mountains fire fuels mapping demonstration (100%, PI, $75,000, USDA), 1997
Pole Bridge Canyon fuel load mapping (100%, PI, $21,300, USDA), 1997
Fuels mapping and fire spread simulation at the Appleton-Whittell research ranch (100%, PI, $5,000, National Audubon Society), 1997
San Mateo Fuels Inventory (100%, PI, $4000, USDA), 1996
Mapping fire effects and patterns of the Baker Fire, Peloncillo Mountains, Arizona (100%, PI, $27,600, USDA), 1996
Fire Effects Mapping and Modeling in the Apache Kid Wilderness, NM (100%, PI, $17,500, USDA), 1996
Vegetation Index Variability Analysis Contract (100%, PI, $60,000, Army), 1996
Spatial Visualization and Analysis of Fire Habitats in the Chiricahua Mountains, Coronado National Forest, Arizona, using Remote Sensing and Geographic Information System (GIS) Techniques (100%, PI, $40,000, USDA), 1995
Spatial Analysis of Fire Effects in the Cibola National Forest, New Mexico, using Remote Sensing and Geographic Information System (GIS) Techniques (100%, PI, $20,000, USDA), 1995
Virtual Communications/Spatial Analysis Laboratory (100%, Co-PI, $89,000, NSF), 1995
University Instructional Computing Award (100%, Co-PI, $20,000, The University of Arizona), 1994
Government Applications Task Force Contract (100%, PI, $40,000, Army), 1994
Post-Summer Faculty Research Grant (100%, PI, $26,700, Army), 1994