Florida Atlantic University
2013-14 Academic Program Review
Self-Study Report Department of Geosciences

Program:	**Geosciences**
Program Director/ Coordinator Name:	Charles Roberts, Interim Chair
Program Self-Study Contact:	Charles Roberts
Self-Study Contact Email:	croberts@fau.edu
Self-Study Contact Phone Number:	561-297-3254

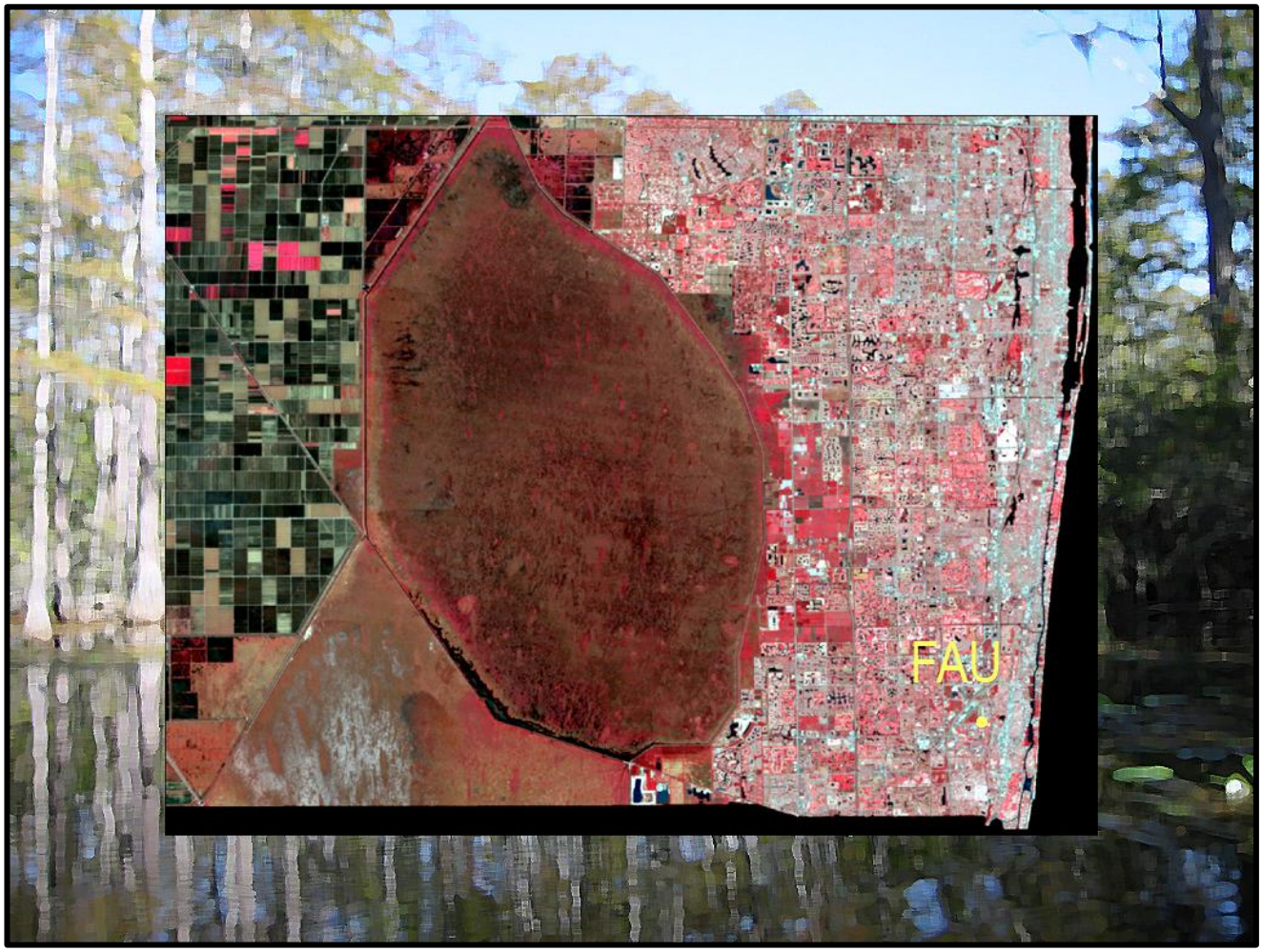


Table of Contents

List of Tables

Mission and Purpose of the Program

In the context of the BOG and FAU mission and Strategic Plans

The university-wide strategic plan identifies 4 goals and 3 signature themes that provide a framework for achieving those goals:
Goal I: Enrich the educational experience
Goal II: Inspire research, scholarship and creative activity
Goal III: Increase FAU's community engagement
Goal IV: Leverage momentum toward achieving FAU's strategic goals by being good stewards of its human, technological, physical and financial resources
Three Signature Themes are Identified University-Wide:
Marine and Coastal Issues
Biotechnology
Contemporary Societal Challenges

The Charles E. Schmidt College of Science (CESCOS) at FAU developed a college level tactical plan for implementation from 2012-2017. CESCOS began the process in the summer of 2011 with a college retreat to consider the college vision and mission statements, and SWOTT (Strengths, Weaknesses, Opportunities, Threats, and Trends) analysis, and completed a tactical plan that included college goals and strategies for their fulfillment in the Spring of 2013.

The Department of Geosciences developed a strategic plan during the 2012-2013 academic year that aligns with that of both the university and college level plans. The department appointed a sub-committee to evaluate our strengths and weaknesses and envision a path of continued development and enhanced success over the next 5 years. The following strategic plan, endorsed by the Department of Geosciences faculty, the Dean of CESCOS, and FAU's Provost, will be implemented from the 2013-2014 through the 2017-2018 academic years.
Mission Statement The Mission of the Department is to provide students with a high quality scientific education and expose them to professional practices and research centered on Earth Systems Science, Human-Environmental Interactions, and Geospatial Information Sciences. The Department aims for excellence in teaching, research and creative activity, and strives to service the university, local, regional, and global communities through its research, degree programs, certificates, course offerings, professional training, mentoring, outreach, and creativity.

Date and description of last review of this program

Findings and recommendations (Last Review 2009)
Findings:
Weaknesses
1)An insufficient number of high quality students in the graduate program, due primarily to inadequate funding of Graduate Teaching Assistantships - we are simply not competitive with other Florida institutions, both public and private
2)Insufficient office and laboratory space will be rectified with the move to the Science and Engineering building
3)Advising at both the graduate and undergraduate level needs to be improved

Research

The Office of Institutional Effectiveness at FAU collects productivity on all academic units at the university. The entire document found on the Institutional Effectiveness pages shows the research productivity summary for the Geosciences Department since the 2003-2004 academic years. A review of Part II of the Departmental Dashboard Indicators for the period 2001-2007 shows time devoted to research, including both tenured and tenure-earning faculty at any level, with steady values for Person-Years between 1.3 and 1.7 and FTE

between 1.7 and 2.3. Dashboard Indicators also show sponsored research including both tenured and tenure-earning faculty at any level devoted to research with steady values for Person-Years between 0.2 and 0.7 and FTE between 0.3 and 0.9. The research/scholarly productivity for books, peer-reviewed publications, other publications, and presentations have been gradually increasing year by year, but is still below college norms. Other departments in the college have established Ph.D. programs, so it is expected the Geosciences numbers would be lower. As our young faculty mature and develop research groups within the new Ph.D. program, we expect these numbers will increase substantially. The sponsored research and program expenditures were around $100,000/year for the early years but have been steady around $240,000 since 2004-2005.

Recommendations:
1)Building teaching and research programs that complement and enhance the missions of FAU's Charles E. Schmidt College of Science: Environmental Science Program, The Center for Environmental Studies, and Harbor Branch Oceanographic Institution
2)Continued strengthening of the Department's research Center in Geo-Information Science
3)Creation of a Center for Hydrogeology and Water Resources
4)Implement the single-advisor system for the geography and geology programs. This will eliminate the advisor shopping practices that have been going on, and charge the advisors with making an effort to see that all majors are advised at least once per semester.

Major changes made since last review by section:

Addressing Weaknesses:

1) We still have insufficient funding to attract high quality graduate students at both the Ph.D. and the Masters level, and continue to lose the best applicants each year. In addition, we simply do not have enough funded positions to sustain a viable Masters program and have to rely on self funded students and the masters along the way to keep our numbers of Masters level graduates at the minimum levels. While the undergraduate base has grown in recent years, this has not translated into increased funding for the graduate programs.
2) The move to the new building has improved the office and lab space situation. However we seem to have reached maximum capacity both in Boca Raton and Davie with all labs and offices filled by the Fall of 2014 and have inadequate "dirty" labs and faculties to house field equipment and stage field work.
3) Advising at both the undergraduate and graduate levels has improved and is continuing to improve, with single advisors assigned for each degree program, except for thesis and dissertation producing students, who are advised by individual faculty members. Ph.D students must identify a dissertation advisor prior to being admitted to the program. Additional measures are needed and are underway to monitor and improve degree completion rates which were exceptionally good in the first few classes of the Ph.D. program.

Addressing Research:

The Research Plan in the assessment database currently has three outcomes.

1) Full time faculty with research assignment will publish in refereed journals, books, book chapters, refereed reports and proceedings.
   Currently, nine of the twelve full-time faculty with research assignments reported fifteen publications submitted or accepted in the most current annual evaluation, an average of 1.3 publications per faculty member, with a seventy-five percent acceptance rate. The faculty are meeting this program goal. The department will continue to use the faculty mentor system to encourage submissions and to increase the acceptance rate.
2) Full time faculty with research assignments will present their research at professional meetings or invited forums.
   Eight of the twelve full time faculty with research assignments reported thirty one papers or posters presented at appropriate professional venues on the most current annual evaluations, an average of 2.6 presentations per faculty member.
3) Full time faculty with research assignments will obtain funding to support their research.

Eight out of ten faculty with research assignments for all three years subsequent to the last program review applied for and obtained funding. Faculty exceeded their goal, which was 75% of the faculty with research assignments obtain funding within three years of the last program review.

Addressing Recommendations:

1)We have strongly linked the department to the CES, whose new director, Colin Polsky, is Tenured within the department of Geoscience. Two of his employees are in our Ph.D. program and one, Karen Bolter, has been a major spokesperson for the CES appearing with Anne Currie on Good Morning America and on TEDx speaking on sea level rise in Miami Beach. CES maintains offices in Geosciences space in both the Boca and Davie campus of FAU, and we will soon be co-developing curriculum together related to sea level rise, coastal change, coastal hazards, and global environmental change to complement the existing curriculum offered in Geoscience. Three of the department faculty are on the Environmental Science program committee, have supervised a dozen or more MS degrees in that program, and work with that program on its degree programs and certificate programs. Dr. Markwith developed the state of Florida's first Environmental Restoration graduate course and certificate program, a four course sequence that is part of the Environmental Science or Geography masters degree programs. Currently, the department Interim Chair is organizing, in conjunction with the Geoscience faculty, the Biology faculty and the Harbor Branch faculty a Coastal and Marine Science MS degree program. It is expected that the new degree program will be in the catalog by the fall of 2015.

2) The Center for GIS was never strengthened, since its directors were drawn into college and university committees and eventually promoted to associate deans. There is now a pronounced shortage of GIS faculty that is somewhat masked by the large number of GIS online courses and certificates that have been developed.

3)While the Hydrology modeling center never materialized due to the pending retirement of our hydrologic modeler With the development of a new interdisciplinary coastal and marine science master's degree at FAU and the increased focus on issues related to sea level rise, we hired a coastal geologist instead of replacing our hydrologic modeler. However, our resources for hydrology education and research have continued to expand. Due to a nexus of issues, including restoration of the Everglades and Indian River Lagoon, salt water intrusion, sea level rise, and rapid population growth - all of which are connected by water, Southeastern Florida is a quintessential example of the important role that hydrology plays in variety of disciplines. In recognition of the importance of water quality in a wide variety of FAU's research and educational initiatives, the Department of Geosciences was allotted space and resources to establish a water analysis lab in a new science building on the Davie campus. The mission of the lab is to provide high quality analytical services to support environmental research done by faculty in the Department, the University, and their collaborators. Additionally, the lab places a strong emphasis on providing education and research opportunities for both undergraduate and graduate students. The lab is equipped with state-of-the-art instrumentation for the determination of nutrients, major ions, metals, and stable isotopes of water as well as some soils analyses. As part of its commitment to providing hands on training to students, the lab offers training sessions and hourly user rates to students interested in running their own analyses. The instrumentation for the lab was fully installed in 2012. Development of the lab as a core facility that serves a wide variety of research and educational projects across the department and college has been slow; Dr. Root, who oversees the lab did not have any technician support for getting the lab up and running and commutes back and forth between the Boca campus where she teaches and the Davie campus where the lab is located. Additionally, there is no internal funding from FAU to help sustain the basic day to day functions of the lab. In spite of these challenges, the lab has made a significant contribution to student learning and research as summarized in the table below. With the lab now fully up and running and with our increasing experience running the instrumentation, we expect the lab activities to grow and for the lab to continue to progress towards being an integral part of, not only

the department's degree programs and research, but the college's as well. We continue to explore opportunities to expand the use of the lab for class projects, including developing remote access to the instrumentation (which is in Davie) from our classrooms in Boca and developing interactive websites that instruct students in our online classes in analytical techniques.

4) The Single Advisor system has been implemented and seems to be working. There is one advisor for each nonthesis degree program.

Instruction

Establishment of the Goals for student learning: Results from the assessment database.

BA/BS Geography

Goal 1 Enrich the Educational Experience
Goal 2 Inspire Research, Scholarship and Creative Activity
Goal 3 Increase FAU's Community Engagement

Outcome 1 Graduates in Geography will be able to produce writing that is grammatically correct and well-organized and to deliver clear and well organized oral presentations. Both written and oral communications should illustrate clear communication skills also utilizing graphic tools in geographic information systems, remote sensing and other techniques.
Implementation Strategy: Capstone Course: GEA 4275 Human/Environmental Interactions
Assessment Method: Students are assigned a major research project that demonstrates their mastery of communication of spatial information through Geovisualization. Students will present that research project at the end of the class. The instructor gives the students a rubric that the geography faculty have approved. This gives the students a guide to the things that he is looking for in determining their course grade. Our review committee uses this rubric as a starting point for their dialogue. It is a binary scoring (satisfactory or not satisfactory) followed by a discussion of the shortfallings. The discussions are broadened to other faculty. If a multiyear problem is noted, then changes are recommended to department curriculum.
Current Results: In general, the oral and graphic presentation skills of our students are improving.
Program Improvements: We see no need for program improvements at this time.

Outcome 2: Graduates in Geography will understand basic concepts and theories in the spatial analysis of human-environmental systems-the area of geography in which our programs are based.
Implementation Strategy: Capstone Course: GEA 4275 Human/Environmental Interactions
Assessment Method: Students are assigned a major research project that illustrates their understanding of the basic goals of the course which ties together all the important areas of the discipline related to human/ environmental interactions applied to geographic problems. Students undertake and present a research project at the end of the class. The instructor gives the students a rubric that the geography faculty have approved. This gives the students a guide to the things that he is looking for in determining their course grade. Our review committee uses this rubric as a starting point for their dialogue. It is a binary scoring (satisfactory or not satisfactory) followed by a discussion of the short fallings. The discussions are broadened to other faculty. If a multiyear problem is noted, then changes are recommended to department curriculum.
Current Results: Utilizing the distinction through discovery student achievement rubric, we find that the undergraduates are not doing a sufficient literature review before undertaking their research projects. They are struggling with methodology designs.
Program Improvement: We are engaged in a two year cross college QEP project with Civil Engineering, in which a new once credit research course has been developed and taught for the first time in the spring of 2014. The students will later take 1 or more of a series of or research oriented courses, GLY 4822 Hydrogeology, GEO 4300 Biogeography, and GEA 4273 Human-Environmental Interactions will each have an enriched research section which will require the use of the Distinction through Discovery Rubric assessment tool. We will then be able to compare the results of the tool from the advanced courses

to that of the students in the Research 1 course. We will also be able to compare the results of students who have not participated in the Research 1 course who take the three higher level research courses. This will give us feedback on the effectiveness of the research 1 course.

Outcome 3: Graduates in Geography will use critical thinking to evaluate information, data and problems related to Geography by applying basic principles of scientific methodology including data collection and/or field observations that are analyzed using appropriate quantitative or qualitative techniques that illustrate the understanding, description and modeling of a geographic problem.
Implementation Strategy: Capstone Course: GEA 4275 Human/Environmental Interactions
Assessment Method: Students are assigned a major research project that illustrates their understanding of the scientific method as applied to geographic problems. Students will present that research project at the end of the class. The instructor gives the students a rubric that the geography faculty have approved. This gives the students a guide to the things that he is looking for in determining their course grade. Our review committee uses this rubric as a starting point for their dialogue. It is a binary scoring (satisfactory or not satisfactory) followed by a discussion of the shortfallings. The discussions are broadened to other faculty. If a multiyear problem is noted, then changes are recommended to department curriculum.
Current Results: We have decided that a specific research methods course needs to be developed.
Program Improvement: We are engaged in a two year cross college QEP project with Civil Engineering, in which a new once credit research course has been developed and taught for the first time in the spring of 2014. The students will later take 1 or more of a series of or research oriented courses, GLY 4822 Hydrogeology, GEO 4300 Biogeography, and GEA 4273 Human-Environmental Interactions will each have an enriched research section which will require the use of the Distinction through Discovery Rubric assessment tool. We will then be able to compare the results of the tool from the advanced courses to that of the students in the Research 1 course. We will also be able to compare the results of students who have not participated in the Research 1 course who take the three higher level research courses. This will give us feedback on the effectiveness of the research 1 course.

BA/BS Geology

Goal 1 Enrich the Educational Experience
Goal 2 Inspire Research, Scholarship and Creative Activity
Goal 3 Increase FAU's Community Engagement

Outcome 1 Students will demonstrate mastery of basic field techniques and basic regional geology that will incorporate material learned in previous geology courses in the department as applied in a practical setting.

Implementation Strategy: Capstone Course: GLY 4750C Field Methods

Assessment Method: A written exam is administered covering the broad regional geology of the area to be visited on the field trip component of the course, including the characteristics of the geomorphic regions, knowledge of the geologic history of the region, and site-specific knowledge of localities visited. The entire examination is used for evaluation purposes. In each year, two faculty members contributed questions for the examination. We expect 70% or more of the students to obtain a C on the examination. Exam outcomes will be used to modify the teaching of the material to improve student comprehension. Testing procedures may also be modified to be sure the test accurately reflects student learning.

Current Results: In three of the last seven years, students met the criterion. The capstone level assessment is challenging for our program for the following reasons: 1) GLY 4750C, is the only course that all geology majors (BA and BS) take, 2) our geographic location in S. Florida makes it difficult to take students to field areas where traditional geology skills, such as mapping and interpreting geologic history, are possible, 3) we have a small number of faculty making it difficult to staff field courses that require travel to other parts of the country, and 4) we have a single capstone level course for both BA and BS students which means we are teaching the class to students with diverse backgrounds.

Program Improvements: The department is continuing discussions on how to improve the capstone course.

Outcome 2 Majors in Geology will demonstrate the ability to properly make and present geologic observations in the field, as

recorded in a geologic field notebook.

Implementation Strategy: Capstone Course: GLY 4750C Field Methods

Assessment Method: Students demonstrate their ability to properly present field geologic observations in GLY 4750 by recording both written and illustrative notes in field notebooks. Majors in Geology will demonstrate mastery of broad knowledge of Appalachian geology (a more varied geological landscape and structure than that of Florida), details of specific sites within the region, and basic field techniques appropriate to the region via a field trip to the Appalachians, as well as two one day field trips in South Florida. Field books are collected and evaluated based on the completeness and accuracy of the observations as well as on the clarity of writing. Students are also required to orally summarize their observations and interpretations of the geologic setting and geologic history of the field sites while in the field. We expect that these oral presentations clearly explain the observations, exchange ideas, and explain the students' hypothesis and interpretations.
A grading rubric is used to assess student performance. This rubric is as follows:

Completeness - 20%
Organization - 20%
Recording of data - 20%
Sketches, stratigraphic columns - 20%
Interpretation - 20%

Each member of the grading committee reviews the notebook, assigning a score, and the scores are averaged

Current Results: In 2007, the average grade was 95%, twelve percent higher than in 2012.

Program Improvements: The challenges with this learning outcome are related to the changing numbers of BA versus BS students in the program. The two groups do not take the same courses and do not perform at the same level. . We recognize the need to evaluate our capstone course and to develop ways to provide our students with the necessary basic field geology skills in a manner that takes advantage of our faculty strengths and does not stretch our faculty too thin. Additionally, we recognize the need to grow our faculty so that we can better cover the breadth of skills necessary for a traditional geology degree

Outcome 3 Majors in Geology will evaluate data gathered in the field and apply scientific methodology and knowledge of basic geologic concepts and processes to their interpretation of the data. They will demonstrate their ability to interpret the geologic record from available data gathered in the field and to understand geologic history and potential for mineral exploration.

Implementation Strategy: Capstone Course: GLY 4750C Field Methods

Assessment Method: Students in GLY 4750 are required to present a written report in which they will summarize their interpretations of the geologic history of a given site. The written report demonstrates the students' ability to perform data analysis, formulate a working hypothesis and clearly support it with the field data. Students apply qualitative and quantitative techniques to support their hypotheses and interpretations.
The evaluating committee reviews each field site report using the following criteria:
Geologic Information - Rock types, structures, orientation of features, rock layer thicknesses, geologic age - 20 points
Relationships - to tectonic province, to geologic history - 10 points
Interpretation - 1) Tectonic conditions 2)Paleoenvironmental conditions from local outcrop(s) 3) Diagenetic history - 10 points
Illustration of concepts, sequence of events, and/or structural features, as appropriate for the site - Includes sketches, photos, or drawings - 5 points Organization and Location description- Name and title, accurate description, spelling and grammar, report layout, proper attribution of sources - 15 points
The total is a 60 point scale. Individual results are averaged, and converted to percent.

Current Results: For the last seven years, the assessment committees average grades for the class have ranged from 81 to 85%. Each year, instructional material has been altered to correct problems observed in reports. For example, the instructor has given the students additional information on report preparation, based on previous years results, and this has resulted in

slow improvement from year to year.

Program Improvements: For the three previous years, the average grade has been in the "B" range. This confirms that students have the skills necessary to write field reports of good quality. These reports combine field data combined with a review of the literature of known geologic features at the site, and represent an excellent measure of the preparation level of students completing the course. No changes in this part of the program appear necessary.

The department will monitor the impact of more detailed instructions on report preparation for the students to see if the improved results continue.

B.S. Geology students gain further experience with research, data assessment, and writing when they take GLY 4822 Hydrogeology. Funds have been provided through FAU's undergraduate research initiative to incorporate an enhanced research project into this course. The impact of the enhanced research component of the course on student learning is being assessed using rubrics developed and approved through FAU's undergraduate research initiative. This should further enhance the skills of students moving into occupations requiring data collection, data synthesis, analysis and critical thinking skills.

Description of the Baccalaureate Programs:

Baccalaureate in Geology BA\BS

Review of Lower Level State approved prerequisites

Our Core Curriculum and General Education courses are GLY 2010c and GLY2010L, and GLY 2100 have been reviewed by FAU's Core Curriculum Committee for compliance with FL SUS requirements (6.017). The University Undergraduate Programs Committee has recommended their approval to the senate, and we fully expect that all courses will be approved at the next senate meeting, thus keeping all of our courses in compliance with these regulations.

Review of Lower Level State approved prerequisites

Our Core Curriculum and General Education courses are GEA 2000, MET 2010, GEO 2200C, and ENV 2017, GLY 2010C and GLY 2100. These courses have been reviewed by FAU's Core Curriculum Committee for compliance with FL SUS requirements (6.017). The University Undergraduate Programs Committee has recommended their approval to the senate, and we fully expect that all courses will be approved at the next senate meeting, thus keeping all of our courses in compliance with these regulations.

Admission Criteria

Admission to FAU Requirements
Initial application review is based on the applicant's academic profile as represented by the high school grade point average, rigor of curriculum and/or performance on standardized tests (SAT or ACT). An SAT or ACT is required of all applicants for freshman admission.
Requirements.
1. Test scores: the following are the minimum required.

	Critical Reading	Math	Writing
SAT	460	460	440
	English and Writing	**Math**	**Reading**
ACT	18	19	19

2. A minimum high school grade point average of 2.6 is required of all applicants.

University Baccalaureate Degree Requirements

To earn a baccalaureate degree, students must:

1. Earn a minimum of 120 credits in academic courses acceptable toward the degree (some programs require more than 120 credits). Attain a minimum 2.0 grade point average in the courses required for a major program at FAU.

2. Earn a minimum of 45 of these 120 credits at the upper division as indicated by the Statewide Course Numbering System (SCNS) designations or their equivalents. In some programs, graduate-level courses may be used to satisfy undergraduate requirements; however, no undergraduate will be required to take a graduate-level course as part of a normal degree requirement.

3. Apply no more than 60 credits of non-traditional credit toward the degree earned through Advanced Placement (AP), College Level Examination Program (CLEP), Correspondence Courses, International Baccalaureate (IB) or Military Service Schools, subject to limits for each as stated in the Academic Policies and Regulations section of this catalog. Credits earned in this manner will be considered transfer credits.

4. Earn the last 30 upper-division credits in residence at FAU. In programs requiring more than 120 credits, at least 25 percent of the total number of credits required for the degree must be earned in residence at FAU.

5. Earn at least 75 percent of all upper-division credits in the major department from FAU (effective for students who entered FAU in fall 2010 and going forward). Some major departments may require more than 75 percent. Consult the degree requirements section of the major for details. (The previous requirement, earn at least 50 percent of all upper-division credits in the major department from FAU, is still in effect for students who entered FAU prior to fall 2010.)

Enrollment information

Table 1 Annual Headcount

CIP: 400601	Geology		College Total	University Total
	2011-2012	2012-2013	2012-2013	2012-2013
Bachelors	83	72	5,617	28,523

Table 2 Annualized State-Fundable FTE Produced By Geosciences

Annualized State Fundable FTE Produced By Geosciences	Geosciences			College Total	University Total
	2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Undergraduate Total	343.2	374.4	367.4	3,948.6	15,335.0

This includes both Geography and Geology Bachelors degrees. The large numbers relative to the small size of the faculty are explained in the next table.

Table 3 Annualized State-Fundable FTE Produced In/Out of Department or College by Geosciences

		Courses offered by:				
		Geosciences			College of Science	University Total
		2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Course Level	**FTE produced by students who are:**	7.7	6.0	6.3	202.4	729.1
Lower Division Undergraduate	**Majors within the department**					
	Majors outside the department, but within the college	41.0	48.5	49.1	839.9	1,743.9
	Majors outside the college	176.8	195.5	213.8	1,606.2	4,111.2
	Total	**225.5**	**250.0**	**269.3**	**2,648.5**	**6,584.2**
Upper Division Undergraduate	**FTE produced by students who are:**	38.7	41.3	41.9	785.7	5,103.4
	Majors within the department					
	Majors outside the department, but within the college	20.0	22.7	18.1	268.5	2,343.8
	Majors outside the college	58.9	60.4	38.2	246.0	1,303.6
	Total	**117.6**	**124.3**	**98.2**	**1,300.2**	**8,750.8**

If we combine the production of FTE by majors outside the department within the college, and outside the college, we get for 2010-2011 217.8., which is 73% of the department FTE production reported in the previous table. Much of the FTE production outside the college comes from our five lower division IFP courses. Within the college, but outside the department the FTE production reflects the role that the Geoscience curriculum, especially the GIS and earth science curriculum plays in the Environmental Science areas in other programs in the college.

Table 4 Average Class Size and Faculty/Student Ratio

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	College Total	University Total
Lecture	**66**	**69**	**71.4**	**64.5**	**64.9**	**68.7**	**37.3**
Lab	**17.5**	**21.5**	**21.6**	**22.6**	**18.3**	**19.7**	**20.3**
Discussion	**30.5**		**37.3**	**35.5**	**29.3**	**31.9**	**27.9**

Our average class size is larger than average for the university and college due to to the large number of online undergraduate classes and large enrollment IFP classes we offer (10 per semester). As such, we have a poor faculty to student ratio in the classroom. We have developed some exciting ways of compensating for the low ratio of faculty to student and also for the disconnect between faculty and students in the new world of elearning, which will be discussed later in this document. For Geology bachelors students, the large role of field inquiry and research oriented curriculum is the primary mechanism to compensate for low faculty to student ratio.

Curriculum

Bachelor of Arts in Geology

The B.A. Geology is designed as a two year program for transfer students or as part of an overall four year program at FAU. The B.S. Geology program is designed as a two year plus one summer program for transfer students or as part of an overall four year program at FAU. The B.A. Geology is designed to train students as teachers for either high school or middle school. It leaves a block of 18 elective hours to be used by students for education courses required by the State of Florida for

licensure as teachers. The B.S. Geology degree is intended for students planning on careers in geology, or planning to go on for a graduate degree. The department strongly encourages all eligible students to seek an M.S. Geology degree.

The requirements for the **B.A. Geology** are as follows:

Minimum General Science Requirements		
Biodiversity and Lab	BSC 1011/1011L	or
Biological Principles and Lab	BSC 1010/1010L	4
General Chemistry 1 and Lab	CHM 2045/2045L	4
General or College Physics and Lab	PHY 2048 or PHY 2053 & 2048L	5
College Algebra	MAC 1105	3
Introductory Statistics	STA 2023	3
Total		**19**

Geology (Earth and Space Science) Major Course Requirements		
Introduction to Astronomy	AST 2002	3
Introduction to Mapping and GIS	GIS 3015C	3
Physical Geology/Evolution of the Earth	GLY 2010C	4
History of the Earth and Life	GLY 2100	3
Coastal and Marine Science	GLY 3730	3
Field Methods	GLY 4750C	3
Weather and Climate	MET 2010	3
Subtotal		**22**
Minimum of five courses chosen from the list below:		
Environmental Issues in Atmospheric and Earth Science	ESC 3704	3
Geology of Florida	GLY 3155C	3
Water, Waves and Caves: The Geologic Formation of National Parks and Monuments	GLY 3165	3
Paleontology	GLY 3603C	3
Mineralogy and Crystal Chemistry	GLY 4200C	4
Petrology of Igneous and Metamorphic Rocks	GLY 4310C	4
Structural Geology	GLY 4400C	4
Stratigraphy and Sedimentation	GLY 4500C	4
Geomorphology	GLY 4700C	3
Hydrogeology	GLY 4822	3
Subtotal		**15-19**
Total in Major		**37-41**

Bachelor of Science in Geology

The B.S. Geology curriculum includes course work in areas included on the *ASBOG* Fundamentals of Geology (FG) examination. *ASBOG* is the National Association of State Boards of Geology. They prepare examinations used by many states, including Florida, to determine eligibility for Professional Geology license. The FG examination has been developed to assess common knowledge and skills related to the practice of geology throughout the nation. The FG examination emphasizes knowledge and skills that are typically acquired in an academic setting leading to a baccalaureate degree. In particular, the courses Mineralogy and Crystal Chemistry, Petrology of Igneous and Metamorphic Rocks, Stratigraphy/Sedimentation, Structural Geology, Field Methods, Field Camp, Solid Earth Geophysics, Hydrogeology,

Engineering Geology, and Geomorphology are of primary importance.

Lower Division Requirements

In addition to the University's core curriculum requirements, all Geology majors applying for the B.S. degree must complete the following:

General Science Core*		
Calculus with Analytic Geometry 1	MAC 2311	4
Calculus with Analytic Geometry 2	MAC 2312	4
Physics for Engineers 1	PHY 2043	3
Physics for Engineers 2	PHY 2044	3
General Chemistry 1 and Lab	CHM 2045, 2045L	4
Introductory Statistics	STA 2023	3
Physical Geology/Evolution of the Earth	GLY 2010C	4
History of the Earth and Life	GLY 2100	3
Subtotal		**28**

* In addition, Biodiversity and Lab (BSC 1011/1011L, 4 credits) and General Chemistry 2 and Lab (CHM 2046/2046L, 4 credits) are strongly recommended.

Geology Core		
Mineralogy and Crystal Chemistry	GLY 4200C	4
Petrology of Igneous and Metamorphic Rocks	GLY 4310C	4
Stratigraphy/Sedimentation	GLY 4500C	4
Structural Geology	GLY 4400C	4
Field Methods	GLY 4750C	3
Field Camp	GLY 4790	6
Subtotal		**25**

Geoscience Core		
Introduction to Mapping and GIS	GIS 3015C	3
Solid Earth Geophysics	GLY 4451	3
Hydrogeology	GLY 4822	3
Subtotal		**9**

Electives ***Choose 15 credits from the following list. Nine of the 15 credits must be at the 4000 level.***		
Paleontology	GLY 3603C	3
Geology of Florida	GLY 3155C	3
Coastal and Marine Science	GLY 3730	3
Remote Sensing of the Environment	GLY 4035C	3
Principles of GIS	GIS 4043C	3
Environmental Geochemistry	GLY 4241	3
Geomorphology	GLY 4700C	3

Engineering Geology	GLY 4830	3
Introduction to Hydrogeology Modeling and Aquifer Testing	GLY 4832C	3
Water Resources	GEO 4280C	3
Subtotal		**15**
Total in Major		**77**

Curriculum Relative to Comparison Schools

The following schools were chosen for comparison purposes:
Florida International University
University of Southern Mississippi
Sam Houston State University
Western Kentucky University
University of North Carolina, Wilmington

Table 5 Comparison Schools

	FAU	FIU	Univ of S. Mississippi[a]	Sam Houston	Western Kentucky	UNC Wilmington
Mineralogy	R	R	R	R	R	R
Petrology	R	R	R	R	R	R
Stratigraphy	R	R	R	R	R	R
Structural	R	R	R	R	R	R
Field Methods	R	R	R	R	R	E[b]
Field Camp	R	E	R	R[c]	R	E[d]
Geophysics	R	E	R	E	E	E
Hydrogeology	R	R	E	E	E	E
Engineering Geol.	E	N	E	N	N	N
Geomorphology	E	E	R	E	E	E
Economic Geol./ Energy Resources	N	N	E	E	E	N
Number of Geology Faculty	6	15	7	6	7	14

R = Required E = Elective N =Not offered

a - also require Invertebrate palenotology b= 2 credits c - total of 6 credits of field work d= 4 credits

FAU's Bachelor of Geology program compares quite favorably with our peer institutions. Our field program is as strong as any other program, and stronger than two other schools. We offer an Engineering geology course, which only one other school does. The only "weakness" is the lack of an Economic Geology or Energy Resources course. This is actually by design, since most of our majors pursue careers or graduate school in the areas of Hydrogeology or Coastal Geology. Recently, however several students have obtained jobs in this area as mudloggers, working for oil companies or petroleum service companies.

Description of internships, practicum, study abroad, field experiences and Pedagogical Innovations

Internships and practicums

We currently do not have any structured internship or practicum programs for our undergraduate geology majors. However, our faculty maintain connections with employers and regularly facilitate our students obtaining internships. We do not track data about number of internships or the companies/agencies that students intern with. However, simply working off of faculty memory we have had several undergraduate students in temporary student positions with the U.S. Geological Survey, as well as students in intern positions with the Florida Department of Environmental Protection and with at least two environmental consulting firms.

Current Field Courses

Geology was always a field science. It remains a field science in the XXI century. Geologists make initial observations and collect data in the field. Formal classroom studies of charts, diagrams, and little rock specimens in cardboard boxes are, by themselves, not sufficient to produce a qualified geologist with the university diploma. There is nothing more important for a student of geology than to learn proper techniques of field observation, interpretation, and data collecting. Field geology courses are the pinnacles of the education of a geologist. They are designed as intensive hands-on outdoor courses in which students apply classroom and laboratory training to solving real geological problems in real time in the field. Geology field courses are the most comprehensive geology courses that students take during their college education. They are taught far from the university campus and entirely outdoors.

Junior Field Camp

All Geology undergraduates (B.A. and B.S.) take the course GLY 4750, Field Methods.
The Field Methods course is designed to introduce students to field geologic studies and familiarize them with basic procedures on the outcrop, techniques of data collecting, and making field observations. This course requires three field trips. Two are one day trips, to visit sites in the Miami, Dade County and Stuart, Martin County. The other trip is an 8 day trip in the southern Appalachians. This trip goes to large igneous plutons in Georgia (Stone Mountain and related sites), low grade metamorphic rocks, and regional faulting associated with the Great Smoky Fault along the Ocoee River Valley in SE Tennessee, examination of Paleozoic outcrops and structural features in NE Tennessee and one locality in Kentucky, and examination of high-grade metamorphic rocks along the Blue Ridge in North Carolina.

After this trip, each student is assigned a topic to write a detailed site report based on field observations made on one of the visited sites. In addition, students's field notes are being evaluated for clarity and completeness of information. Both the reports and field notebooks are graded by a faculty committee with expertise in different areas of geology.

Senior Field Camp

B.S. Geology students are required to take GLY 4790, Field Camp. Prerequisites include Physical and Historical geology, Mineralogy, Petrology, Stratigraphy and Sedimentation, Structural geology, and field methods. This is a six-week field camp emphasizing bedrock mapping. The Senior (Summer) Field Camp will require students to apply all knowledge they gathered during the core geology courses, in order to complete real hands-on projects based on the field data collected by themselves in the field. In a way, it is a test of practical application of all skills and knowledge that geology students received during the course of their education.

Currently, students do three individual mapping projects, one group mapping project, and a stratigraphy project, over a three week period while based in Durango, Colorado. They also do a number of geologic exercises and activities while traveling to the Durango area, and traveling from and returning to Florida. Students also participate in a ten day "Southwest Tour" which includes visits to the classical geological sites of North America, such as North Rim of the Grand Canyon, Zion, Bryce, Capitol Reef, and Black Canyon of the Gunnison National Parks, and the Colorado and Florissant Fossil Beds National Monuments. Additional work is done at selected sites in Colorado and Kansas on the return trip. While in Durango, students visit and conduct geologic activities at Mesa Verde, Arches, and Canyonlands National Parks. This course is designed to tie together knowledge students have gained in all of their lecture/laboratory courses, and to prepare them for careers as practicing geologists, or further work in graduate school.

Additional local field work is done as part of courses taught at FAU. This includes ground penetrating radar

exercises and planned work in seismic studies (a tech grant application to buy the necessary equipment is being submitted) as part of the Solid Earth Geophysics course. Dr. Anton Oleinik has taught a Special Topics Field Course in Carbonate Sedimentation, and is planning to introduce this course as part of the regular graduate curriculum.

There is debate within the department over whether to continue to offer the traditional Geology 6 week field camp in Colorado, or a more diverse field camp that would include a shorter version of the Colorado camp and two additional two week field camps in south Florida. The two week field courses would be oriented towards applied work in Florida wetlands, lagoons and coastal areas, and would emphasize more diverse field methods drawn from Geophysics, Hydrogeology, GIS and ecology/restoration science. Consequently there are several proposed two week field courses being developed, and they will certainly be utilized by the new Geoscience MS and BS degrees.

Proposed Coastal Geology 2 week Course

During a two-week field-based coastal geology course, students will learn methods and principles in scientific observation, analysis, and interpretation of coastal environments (e.g., beaches, lagoons, estuaries) through geomorphic data collection techniques (i.e., coastal surveying and mapping), acquisition and analysis of oceanographic processes (i.e., waves and tides), and sediment analysis (i.e., grain size statistics, coring). After completing the course, students will be able to identify and interpret tidal and wave energy variations, sediment distribution, and natural or anthropogenic impacts on coastal morphology with applied applications to issues concerning sea level rise, storm impacts, and coastal management.

Pedagogy/Pedagogical innovations

In addition to the above field intensive courses, many of our classroom based courses, including Hydrogeology and Engineering Geology, incorporate projects that involve a field data collection component. To further provide students with insight into the "real world" application of what they are learning in the classroom, guest speakers from consulting firms give guest lectures focusing on case studies they have worked on in both Hydrogeology and Engineering Geology.

Together with faculty in the Department of Biology and the Environmental Science Program, we have installed several environmental monitoring sites on the preserve on FAU's Boca Raton campus. These sites, include shallow wells, piezometers, lysimeters, and weather stations and serve as an on-campus field lab for students in Hydrogeology.

Beyond our regular course offerings, most of our faculty regularly supervise undergraduate independent study projects, which provide opportunities for students to work more independently on a larger project than is possible in their regular classes. With the environmental monitoring sites on the Boca campus preserve, the water analysis laboratory, and the environmental geophysics laboratory, our department has built exceptional resources and opportunities for undergraduate students to do independent studies using state of the art equipment without ever leaving campus.

Along with some of our geography courses, GLY4822 Hydrogeology, includes an enhanced undergraduate research project which is part of an internally funded initiative to increase undergraduate research in FAU classes.

Due to the intensive field and lab requirements, all of our geology core courses are currently offered as traditional face-to-face courses. However, our department as a whole has been very active in developing online courses. To that end, three of the electives for our undergraduate geology degree, Principles of GIS, Remote Sensing of the Environment, and Water Resources are fully online courses. Water Resources recently received Quality Matters (QM) certification after being peer reviewed to ensure the course meets the nationally recognized QM benchmarks for quality online instruction (https://www.qualitymatters.org/).

Scope of Institutional Contributions: Intellectual Foundations Courses

The department offers the following geology courses to a university wide audience. These are large class size courses that contribute significantly to our student to faculty ratio.

GLY 2010c Physical Geology
GLY 2100 History of Earth and Life

Student Profile

Table 6 Majors Enrolled (Annual Headcout) by Gender and Ethnicity, Geology (CIP:400601)

			Geology		College Total	University Total
			2011-2012	2012-2013	2012-2013	2012-2013
Undergraduate	**American Indian/Alaskan Native**	**Female**			23	96
		Male			13	77
		Total			**36**	**173**
	Asian or Pacific Islander	**Female**	2	4	247	776
		Male	2	1	145	664
		Total	**4**	**5**	**392**	**1,440**
	Black (Not of Hispanic Origin)	**Female**	1		769	3,535
		Male	1		334	2,129
		Total	**2**		**1,103**	**5,664**
	Hispanic	**Female**	6	6	952	3,922
		Male	9	2	435	2,855
		Total	**15**	**8**	**1,387**	**6,777**
	White (Not of Hispanic Origin)	**Female**	32	26	1,576	7,431
		Male	29	33	956	6,217
		Total	**61**	**59**	**2,532**	**13,648**
	Non-Resident Alien	**Female**			87	318
		Male	1		30	294
		Total	**1**		**117**	**612**
	Not Reported	**Female**			33	130
		Male			17	79
		Total			**50**	**209**
	Total	**Female**	41	36	3,687	16,208
		Male	42	36	1,930	12,315
		Total	**83**	**72**	**5,617**	**28,523**

In terms of gender the program is equally split between male and female students. There are small numbers of Blacks and Asians, and slightly larger numbers of Hispanics in the program.The percentages of the student body for these groups are lower for the Geology program than for the college or university. Most Geology students are classified as white, non-hispanic.

Student Scholarly Activity

Fall of 2103, DIS - Hawaiian Basalt. The product was an extensive web site.

Spring of 2013, DIS -Nearshore Turbidity North Palm Beach County. Report.

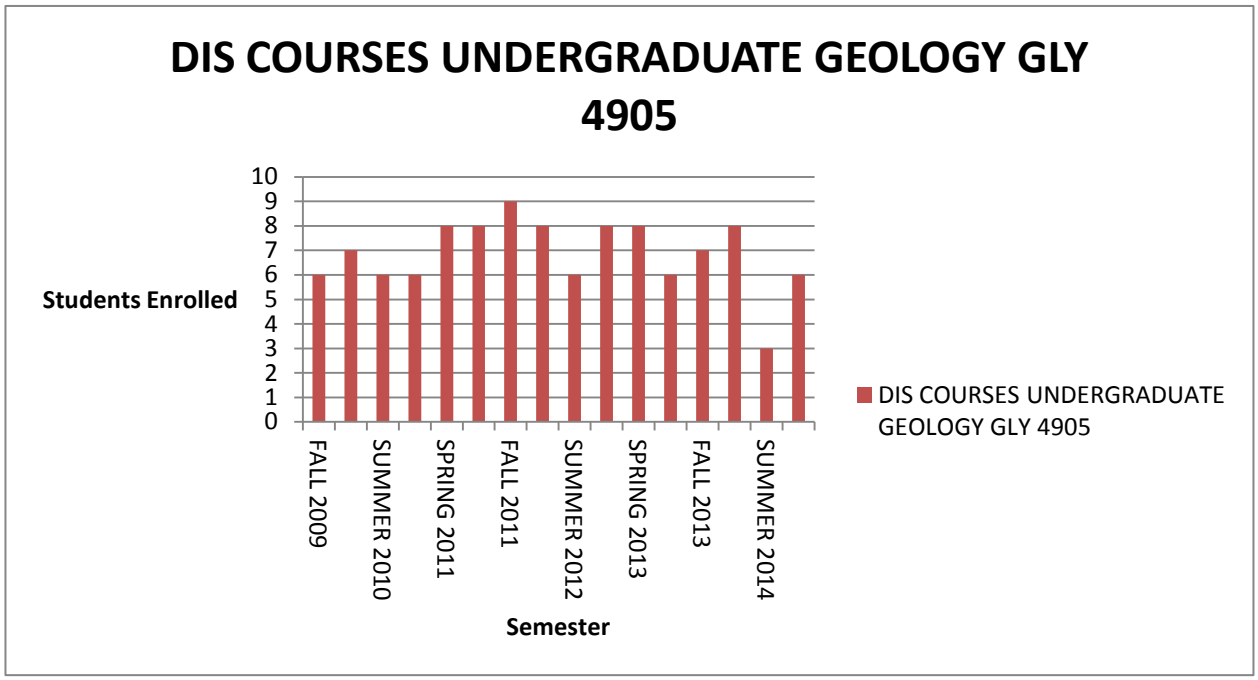
Publications:

Published Abstracts: FAU undergraduates and graduates attend annually and present at the AGU

AGU Abstracts

FAU Undergraduate Research Symposium

Table 7 GLY 4905 Undergraduate DIS course trend



This table shows Directed Independent studies coursework with faculty. These represent individual one on one research projects that usually involve advanced research and field work with geology faculty.

Advising Procedures

All undergraduate Geology majors (B.A. and B.S.) are advised by one advisor, Dr. David Warburton. Students are requested to meet with Dr. Warburton twice per year, before the enrollment period for Summer and Fall, and again before the enrollment period for Spring. During these meetings student progress is tracked, and enrollment recommendations are made for the following semester(s). Students experiencing difficulties are welcome to see their advisor at any time.

Placement Rates

Geology graduates tend to be employed by geological and engineering consulting firms and state agencies doing environmental assessments and water quality studies.

Retention Rates

The following table from IEA shows retention and graduation rates for first time in college students through year two.

Table 8 FTIC Second Year Graduation Rates

Outcomes through year 2		Entering Year												
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	#	3	2	3	2	1	2	1	-	1	-	-	1	2
	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-	100.0	-	-	100.0	100.0
Graduate @ FAU	#	-	-	-	-	-	-	-	-	-	-	-	-	-
	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Graduate @ other SUS Institution	#	-	-	-	-	-	-	-	-	-	-	-	-	-
	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Persist	#	2	1	3	2	1	2	1	-	1	-	-	1	-
	%	66.7	50.0	100.0	100.0	100.0	100.0	100.0	-	100.0	-	-	100.0	-
Transfer to other SUS	#	-	-	-	-	-	-	-	-	-	-	-	-	-
	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Leave	#	1	1	-	-	-	-	-	-	-	-	-	-	-
	%	33.3	50.0	-	-	-	-	-	-	-	-	-	-	-

Few incoming students choose geography or geology as a major. Usually we see students come into the department in their junior year. The programs are primarily upper division courses, and can be completed in two years. The fact that the students are persistant, but none of them are completing in two years suggests that they are primarily part time students.

The next table shows first time in college retention and graduation rates for first time in college students at four years.

Table 9 FTIC Fourth Year Graduation Rates

Outcomes through year 4		Entering Year												
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	#	1	2	4	1	4	1	3	3	3	3	4	2	1
	%	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Graduate @ FAU	#	-	-	1	-	-	-	-	-	-	-	-	-	-
	%	**-**	**-**	**25.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Graduate @ other SUS Institution	#	-	-	-	-	-	-	-	-	-	-	-	-	-
	%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Persist	#	1	2	2	1	2	1	3	3	2	3	-	-	-
	%	**100.0**	**100.0**	**50.0**	**100.0**	**50.0**	**100.0**	**100.0**	**100.0**	**66.7**	**100.0**	**-**	**-**	**-**
Transfer to other SUS	#	-	-	-	-	-	-	-	-	-	-	-	-	-
	%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Leave	#	-	-	1	-	2	-	-	-	1	-	-	-	-
	%	**-**	**-**	**25.0**	**-**	**50.0**	**-**	**-**	**-**	**33.3**	**-**	**-**	**-**	

This table shows first time in college students after four years. The numbers are larger now, and few graduate in their fourth year, further suggesting that they are primarily part time students, since they would most likely have only 60 credits of upper division courses to complete. Four of the thirty two students left the program in this twelve year period. About 12% of the fourth year, first time in college students left the program.

The next table shows second year retention rates for all transfers from community colleges.

Table 10 Second Year Graduation Rates

Outcomes through year 2		Entering Year												
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	#	6	2	2	4	6	-	2	6	4	3	6	8	5
	%	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**-**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Graduate @ FAU	#	-	-	2	-	-	-	-	-	-	-	1	-	-
	%	**-**	**-**	**100.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**16.7**	**-**	**-**
Graduate @ other SUS Institution	#	-	-	-	-	-	-	-	-	-	-	-	-	-
	%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Persist	#	5	2	-	4	5	-	2	4	3	2	5	7	-
	%	**83.3**	**100.0**	**-**	**100.0**	**83.3**	**-**	**100.0**	**66.7**	**75.0**	**66.7**	**83.3**	**87.5**	**-**
Transfer to other SUS	#	-	-	-	-	-	-	-	1	-	-	-	-	-
	%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**16.7**	**-**	**-**	**-**	**-**	**-**
Leave	#	1	-	-	-	1	-	-	1	1	1	-	1	-
	%	**16.7**	**-**	**-**	**-**	**16.7**	**-**	**-**	**16.7**	**25.0**	**33.3**	**-**	**12.5**	

The transfer from community college students are halfway to the degree when they come into the program. They should be able to complete the degree in two years if they are full time. We see that they also are taking longer to graduate, yet they are persisting. Six out of fifty four are leaving, which is 11%, slightly lower than the drop out rate for the first time in college students at four years. This also suggests that the slow rates of graduation are due to having to work and not attend school full time rather than dissatisfaction with the program.

Table 11 Four Year Graduation Rates

Outcomes through year 4		Entering Year												
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	#	6	2	2	4	6	-	2	6	4	3	6	8	5
	%	100.0	100.0	100.0	100.0	100.0	-	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Graduate @ FAU	#	3	-	2	2	3	-	1	4	1	1	-	-	-
	%	50.0	-	100.0	50.0	50.0	-	50.0	66.7	25.0	33.3	-	-	-
Graduate @ other SUS Institution	#	-	-	-	-	-	-	-	1	-	-	-	-	-
	%	-	-	-	-	-	-	-	16.7	-	-	-	-	-
Persist	#	-	-	-	-	1	-	-	-	1	1	-	-	-
	%	-	-	-	-	16.7	-	-	-	25.0	33.3	-	-	-
Transfer to other SUS	#	-	-	-	1	-	-	-	-	-	-	-	-	-
	%	-	-	-	25.0	-	-	-	-	-	-	-	-	-
Leave	#	3	2	-	1	2	-	1	1	2	1	-	-	-
	%	50.0	100.0	-	25.0	33.3	-	50.0	16.7	50.0	33.3	-	-	

At four years, we see higher rates of community college students graduating and higher rates of students leaving the program.

For first time in college students there is also a Six year graduation rates table:

Table 12 FITC Six Year Graduation Rates

Outcomes through year 6		Entering Year												
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	#	1	2	4	1	4	1	3	3	3	3	4	2	1
	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Graduate @ FAU	#	1	1	1	1	2	-	1	2	-	-	-	-	-
	%	100.0	50.0	25.0	100.0	50.0	-	33.3	66.7	-	-	-	-	-
Graduate @ other SUS Institution	#	-	-	-	-	-	-	-	-	-	-	-	-	-
	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Persist	#	-	1	2	-	-	-	2	-	-	-	-	-	-
	%	-	50.0	50.0	-	-	-	66.7	-	-	-	-	-	-
Transfer to other SUS	#	-	-	-	-	-	-	-	-	-	-	-	-	-
	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Leave	#	-	-	1	-	2	1	-	1	-	-	-	-	-
	%	-	-	25.0	-	50.0	100.0	-	33.3	-	-	-	-	

This last table shows the number of first time in college students graduation rates at six years into the program. Of the nineteen students who have been in the program for six years, 9 or 47% have graduated, 5 or 26% are still in the program and 5 or 26% have left the program.

Table 13 Graduation Rates By Year

	2008-2009	2009-2010	2010-2011	2011-2112	2012-2013	2013-2014
Geology BA	2	1	3	7	1	2
Geology BS	12	2	12	11	9	16

This table shows the number of students that have graduated each year. The numbers for the BS program are increasing, while the BA program is going down. Students are encouraged to go into the BS program over the BA program.

Student Recruitment

The department is very active in the Science Olympiad, hosting 3-5 events every year. Dr. Root has a booth at the Sun Coast High School Career Fair focusing on careers in Hydrology and other concentrations in the department. Dr. Warburton and James Gammack-Clark who advise undergraduates on courses and certificates also talk to them about department majors. Glen Malone in the Science Deans office advises students about majors in the Geoscience area.

Baccalaureate in Geography BA\BS

Review of Lower Level State approved prerequisites

Our Core Curriculum and General Education courses are GEA 2000, MET 2010, GEO 2200C, and ENV 2017. These courses have been reviewed by FAU's Core Curriculum Committee for compliance with FL SUS requirements (6.017). The University Undergraduate Programs Committee has recommended their approval to the senate, and we fully expect that all courses will be approved at the next senate meeting, thus keeping all of our courses in compliance with these regulations.

Admission to FAU

Requirements.
1. Test scores: the following are the minimum required.

	Critical Reading	Math	Writing
SAT	460	460	440
	English and Writing	**Math**	**Reading**
ACT	18	19	19

2. A minimum high school grade point average of 2.6 is required of all applicants.

University Baccalaureate Degree Requirements

To earn a baccalaureate degree, students must:

1. Earn a minimum of 120 credits in academic courses acceptable toward the degree (some programs require more than 120 credits). Attain a minimum 2.0 grade point average in the courses required for a major program at FAU.

2. Earn a minimum of 45 of these 120 credits at the upper division as indicated by the Statewide Course Numbering System (SCNS) designations or their equivalents. In some programs, graduate-level courses may be used to satisfy undergraduate requirements; however, no undergraduate will be required to take a graduate-level course as part of a normal degree requirement.

3. Apply no more than 60 credits of non-traditional credit toward the degree earned through Advanced Placement (AP), College Level Examination Program (CLEP), Correspondence Courses, International Baccalaureate (IB) or Military Service Schools, subject to limits for each as stated in the Academic Policies and Regulations section of this catalog. Credits earned in this manner will be considered transfer credits.

4. Earn the last 30 upper-division credits in residence at FAU. In programs requiring more than 120 credits, at least 25 percent of the total number of credits required for the degree must be earned in residence at FAU.

5. Earn at least 75 percent of all upper-division credits in the major department from FAU (effective for students who entered FAU in fall 2010 and going forward). Some major departments may require more than 75 percent. Consult the degree requirements section of the major for details. (The previous requirement, earn at least 50 percent of all upper-division credits in the major department from FAU, is still in effect for students who entered FAU prior to fall 2010.)

Lower Division Requirements for the BA in Geography

Generally speaking, Geography students are juniors who have completed lower level requirements of the University or through an AA degree before they declare their majors, and are advised in the Deans office about completing the lower division requirements. There are no lower level prerequisites specifically required for the Geography program. It has been pointed out that the upper division Quantitative Methods course GEO 4022 should require that students take STA 2023 Introductory Statistics and MAC 2233 Methods of Calculus but this is not currently the case, despite the fact that STA 2023 is listed as a prerequisite for the Quantitative Methods course.

Within the required core courses for the BA in Geography are three lower division courses, Geo 2000 World Geography, Geo 2200c Introduction to Physical Geography, and MET 2010 Weather and Climate.

Lower Division Requirements for the BS in Geography

Geography BS student must complete the University lower division requirements or hold an AA degree before they declare their majors. In addition, they must take the Science Core, which includes 20 credits of lower division courses.

Science Core Courses (all required)		
Biodiversity and Lab	BSC 1011/1011L	**or**
Biological Principles and Lab	BSC 1010/1010L	4
General Chemistry 1 and Lab	CHM 2045/2045L	4
Methods of Calculus (or higher)	MAC 2233	3
Introductory Statistics	STA 2023	3
Introduction to Physical Geography	GEO 2200C	3
Weather and Climate	MET 2010	3
Science Core Total		**20**

Enrollment Information

Table 14 Majors Enrolled by Level (Annual Headcount) Geography (CIP:450701)

	Geography		College Total	University Total
	2011-2012	2012-2013	2012-2013	2012-2013
Bachelors	54	67	5,617	28,523

The number of Geography majors is increasing slightly through time. The enrollment in Geography courses is much larger than the number of majors would suggest, even if we discount the IFP courses. Many students discover Geography late in their careers and they end up earning certificates rather than becoming majors. Yet their reaction to the curriculum is such that we should have significantly more majors if the students understood the field before they were committed to another degree program. With increased pressure to graduate ontime and without taking too many more than the minimum number of credits in the degrees, we can expect it to become more difficult for juniors and seniors who discover Geography to change majors.

Table 15 Annualized State-Fundable FTE Produced BY Level, Geosciences

	Geosciences			College Total	University Total
	2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Undergraduate Total	**343.2**	**374.4**	**367.4**	**3,948.6**	**15,335.0**

This includes both Geography and Geology degrees. The large numbers relative to the small size of the faculty are explained in the next table.

Table 16 Annualized State-Fundable FTE Produced In/Out of Department or College, Geosciences Courses

		Courses offered by:				
		Geosciences			College of Science	University Total
		2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Course Level	**FTE produced by students who are:**	7.7	6.0	6.3	202.4	729.1
Lower Division Undergraduate	**Majors within the department**					
	Majors outside the department, but within the college	41.0	48.5	49.1	839.9	1,743.9
	Majors outside the college	176.8	195.5	213.8	1,606.2	4,111.2
	Total	**225.5**	**250.0**	**269.3**	**2,648.5**	**6,584.2**
Upper Division Undergraduate	**FTE produced by students who are:**	38.7	41.3	41.9	785.7	5,103.4
	Majors within the department					
	Majors outside the department, but within the college	20.0	22.7	18.1	268.5	2,343.8
	Majors outside the college	58.9	60.4	38.2	246.0	1,303.6
	Total	**117.6**	**124.3**	**98.2**	**1,300.2**	**8,750.8**

If we combine the production of FTE by majors outside the department within the college, and outside the college, we get for 2010-2011 217.8., which is 73% of the department FTE production reported in the previous table. Much of the FTE production outside the college comes from our five lower division IFP courses. Within the college, but outside the department the FTE production reflects the role that the Geoscience curriculum, especially the GIS and earth science curriculum plays in the Environmental Science areas in other programs in the college.

Table 17 Average Course Section Size for Geosciences

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	College Total	University Total
Lecture	**66**	**69**	**71.4**	**64.5**	**64.9**	**68.7**	**37.3**
Lab	**17.5**	**21.5**	**21.6**	**22.6**	**18.3**	**19.7**	**20.3**
Discussion	**30.5**		**37.3**	**35.5**	**29.3**	**31.9**	**27.9**

Our average class size is larger than average for the university and college due to to the large number of online undergraduate classes and large enrollment IFP classes we offer (10 per semester). As such, we have a poor faculty to student ratio in the classroom. We have developed some exciting ways of compensating for the disconnect between faculty and students in the new world of elearning, which will be discussed later in this document.

Curriculum

Bachelor of Arts with Major in Geography

(Minimum of 120 credits required)

The core courses below (18 credits) are required of all students for the B.A. in Geography. Students then complete 6 credits from each of the three areas of concentration within geography (environmental systems, human systems and GIScience - 18 credits). The remaining 15 credits are additional courses chosen from the three areas of concentration mentioned above. Total credits for the B.A. in Geography are 51.

Prerequisite Coursework for Transfer Students

Students transferring to Florida Atlantic University must complete both lower-division requirements (including the requirements of the Intellectual Foundations Program) and requirements for the college and major. Lower-division requirements may be completed through the A.A. degree from any Florida public college, university or community college or through equivalent coursework at another regionally accredited institution. Before transferring and to ensure timely progress toward the baccalaureate degree, students must also complete the prerequisite courses for their major as outlined in the *Transfer Student Manual*.

All courses not approved by the Florida Statewide Course Numbering System that will be used to satisfy requirements will be evaluated individually on the basis of content and will require a catalog course description and a copy of the syllabus for assessment.

Core Courses (all required)		
World Geography	GEA 2000	3
Introduction to Physical Geography	GEO 2200C	3
Weather and Climate	MET 2010	3
Introduction to Mapping and GIS	GIS 3015C	3
Quantitative Methods	GEO 4022	3
Human-Environmental Interactions in South Florida	GEA 4275	3
Core Total		**18**

Concentration Areas (select 6 credits from each of the three areas below)		
Environmental Systems		
Biogeography	GEO 4300	3
Coastal and Marine Science	GLY 3730	3
Environmental Issues in Atmospheric and Earth Science	ESC 3704	3

Geomorphology	GLY 4700C	3
Hydrogeology	GLY 4822	3
Water Resources	GEO 4280C	3
Human Systems		
American Cultural Landscape	GEO 4422	3
Geography of Latin America and the Caribbean	GEA 4405	3
Tourism and Commercial Recreation	GEO 4542	3
Transportation and Spatial Organization	GEO 4700	3
Urban Geography	GEO 4602	3
GIScience		
Principles of GIS	GIS 4043C	3
Applications in GIS	GIS 4048C	3
Geovisualization and GIS	GIS 4138C	3
Remote Sensing of the Environment	GIS 4035C	3
Digital Image Analysis	GIS 4037C	3
Programming in GIS	GIS 4102C	3
Photogrammetry and Aerial Photograph Interpretation	GIS 4021C	3
Spatial Data Analysis	GEO 4167C	3
Introduction to Hydrogeology Modeling and Aquifer Test	GLY 4832C	3
Minimum credits required from Concentration Areas		**18**

Geography Concentrations The remaining requirements for the B.A. in Geography are 15 credits of additional courses chosen from the three areas of concentration within geography (environmental systems, human systems and GIScience) listed in the table above. The courses should be selected in consultation with the student's advisor based on the student's interests and career goals.	
Concentration Total	**15**

Bachelor of Science with Major in Geography

(Minimum of 120 credits required)

All B.S. in Geography students must complete a science core (20 credits), geography core (18 credits), and geoscience electives (27 credits) as listed below. Total credits for the B.S. in Geography are 65.

Prerequisite Coursework for Transfer Students

Students transferring to Florida Atlantic University must complete both lower-division requirements (including the requirements of the Intellectual Foundations Program) and requirements for the college and major. Lower-division requirements may be completed through the A.A. degree from any Florida public college, university or community college or through equivalent coursework at another regionally accredited institution. Before transferring and to ensure timely progress toward the baccalaureate degree, students must also complete the prerequisite courses for their major as outlined in the *Transfer Student Manual*.

All courses not approved by the Florida Statewide Course Numbering System that will be used to satisfy requirements will be evaluated individually on the basis of content and will require a catalog course description and a copy of the syllabus for assessment.

Science Core Courses (all required)		
Biodiversity and Lab	BSC 1011/1011L	**or**
Biological Principles and Lab	BSC 1010/1010L	4
General Chemistry 1 and Lab	CHM	4

	2045/2045L	
Methods of Calculus (or higher)	MAC 2233	3
Introductory Statistics	STA 2023	3
Introduction to Physical Geography	GEO 2200C	3
Weather and Climate	MET 2010	3
Science Core Total		**20**

Geography Core Courses (all required)		
Introduction to Mapping and GIS	GIS 3015C	3
Principles of GIS	GIS 4043C	3
Remote Sensing of the Environment	GIS 4035C	3
Quantitative Methods	GEO 4022	3
Biogeography	GEO 4300	3
Human-Environmental Interactions in South Florida	GEA 4275	3
Geography Core Total		**18**

Geoscience Electives (select 27 credits from the courses below)		
Coastal and Marine Science	GLY 3730	3
Environmental Issues in Atmospheric and Earth Science	ESC 3704	3
Geomorphology	GLY 4700C	3
Hydrogeology	GLY 4822	3
Field Methods	GLY 4750C	3
Water Resources	GEO 4280C	3
Tourism and Commercial Recreation	GEO 4542	3
Transportation and Spatial Organization	GEO 4700	3
Urban Geography	GEO 4602	3
Applications in GIS	GIS 4048C	3
Geovisualization and GIS	GIS 4138C	3
Digital Image Analysis	GIS 4037C	3
Programming in GIS	GIS 4102C	3
Photogrammetry and Aerial Photograph Interpretation	GIS 4021C	3
Spatial Data Analysis	GEO 4167C	3
Introduction to Hydrogeology Modeling and Aquifer Test	GLY 4832C	3
Geoscience Electives Total		**27**

Honors Program in Geography

Qualified students may apply to participate in the upper-division Honors Program in Geography for both the B.A. and B.S. degrees. The Honors Program recognizes research accomplishments of talented undergraduates. Students normally begin the program in their sophomore or junior year and conduct independent research with mentor supervision during their junior and senior years.

To enter the program, students must have:

1. A minimum of 9 credits in geography courses with GEA, GEO, GIS, EVR, ESC prefixes;

2. A cumulative GPA of at least 3.3, and must maintain a 3.3 to remain in the program;

3. The support of a faculty mentor. Interested students should contact the faculty member whose research interests are closest to those the student wishes to pursue.

To be awarded the Honors undergraduate degree, students must:

1. Complete all requirements for the B.A. or B.S. in Geography;

2. Complete 6 credits of: GEO 4920, Geosciences Honors Colloquium (1 credit, repeated twice); GEO 4948C, Field Experience (1 credit); GEO 4905, Directed Independent Study (3 credits);

3. Meet the capstone requirement, which entails presenting research findings from the Field Experience and the Directed Independent Study in both a written thesis format as well as an oral presentation at the Geosciences Colloquium Series or an appropriate academic conference approved by both the faculty mentor and the Department Chair;

4. Complete an honors compact with their faculty mentor, which is an agreement that the projects will be conducted at the honors level.

In the Honors Colloquium course, students are exposed to talks from prominent researchers and professionals in the various subfields of the geosciences, introducing them to current important research themes in the geosciences, as well as reinforcing the scientific method and appropriate methodologies for problem solving in the geosciences. Speakers change every semester. Students enroll in the Field Experience course while doing the field work, lab work and/or data collection for their research project and in the Directed Independent Study course while working in the analysis and write-up phases of their research.

Curriculum Relative to Comparison Schools

The following schools were chosen for comparison purposes:

George Mason (Aspirational Peer)
University of South Florida (Aspirational Peer)
University of Southern Mississippi
Sam Houston State
University of North Carolina, Wilmington

The first two aspirational peers are much larger programs but they are ones that are similar to ours and we can compare ourselves to the place that we would like to be if we were a larger program. The last three are Geology-Geography programs that are similar in size or emphasis to our department. The key thing to note is that with one faculty line serving as Interim Dean and soon as Associate Provost, we are down one full human geography position. With another urban geographer and remote sensing faculty serving as Associate Dean, the course offerings in both human geography and GIS are below previous years.

Table 18 Comparison Schools

School Course	FAU	George Mason	Univ of S. Mississippi[a]	Sam Houston	USF	UNC Wilmington
Physical Geography Conservation	5	12	19	2	8	11
GIS	8	22	8	10	6	4
Remote Sensing/ Digital Image Analysis	6	11	2	2	1	2
Urban Geography	4	7	4	3	3	6
Human Geography	2	10	5	4	8	5
Quantitative	2	5	1	0	1	1
Field Oriented	2	1	3	2	1	1
Regional	2	8	24	5	5	9
GIS certificate	4	3	1	2	1	1
Online Degree	No	No	NO	Yes	No	No
Online courses	Many	11	None	Many	2 GIS, 2 GEO	Few, 1 GIS
Number of Geography Faculty	5	24	11	5	9	6

Fau is compared to two aspirational schools, George Mason and FSU and a series of similar sized programs.

Two Geography-Geology programs with the same size of the same faculty would be Sam Houston State and UNC Wilmington.

Sam Houston state offers an online degree with a total of 12 remote sensing/GIS classes, slightly less than our 14, but we do not yet offer an online degree. The Texas state system was an early innovator offering faculty summer stipends to attend online training workshops and support for developing online curriculum in the 1990s, and their system is far ahead of FAU in this regard, but we are rapidly catching up, with more online courses, but no online degrees as of yet.

UNC Wilmington has many physical geography classes compared to ours, and more human geography classes but many fewer GIS classes.

In terms of GIS certificates we offer more than any other programs that were reviewed, and we have a lot of online courses, both GIS and human and physical geography. Regional geography remains a significant offering at the other schools, but in our case we have reduced the offerings to two courses. Our urban geography courses are less than Wilmington, but more than Sam Houston.

University of Southern Mississippi and University of South Florida have a Geography faculty twice the size of our department. They both have many more physical geography courses and regional geography courses, and more human geography courses, but our GIS and Remote Sensing courses equal or excel their numbers, and our quantitative analysis and field courses are comparable to theirs despite our smaller size.

Finally we compared ourselves to George Mason university, with nearly five times the number of faculty that we have. Only in the area of human geography does George Mason offer five times the number of courses that we offer. In one area, GIS certificates, we offer more, and we also have more online classes.

For a department of our size we have done an excellent job of delivering GIS curriculum, and we have held our own in quantitative courses, field method courses and physical geography courses. It is in the area of human geography courses that we are the weakest in. and in a science college, this area is difficult to expand and develop. While we have held our own up to now in urban courses, without new hires in the human side, developing this area of the department will be problematic. The human geography side is weak, having lost most of the human geographers to the Deans office, and the future of the urban focus is unclear.We have good curriculum in physical geography but not as much as our peer institutions have, but we rely on our relationship with the Environmental Science program, the up and coming Marine Science program to fill these gaps with many graduate courses in wetland and marine ecology.

Description of internships, practicum, study abroad, field experiences

The department has a long history of encouraging field work among its students and in its curriculum. Faculty are now proposing that we develop a series of two credit field oriented courses focused on their areas of expertise applied to the Florida environment.

Applications in GIS Field Course

In the spring there is a week long voluntary field GIS experience in the Florida Keys that is tied to a GIS applications course.

Currently faculty are discussing the possibility of developing two week, two credit field oriented courses around topics like water sampling, wetland ecology, vegetation mapping, coastal geology. These have not been implemented yet, but are planned for the future.

Wetland and Coastal Restoration Field Course 2 Week Course

This course will examine coastal restoration projects in the wide variety of environments found in our coastal environments. Sampling design for flora and fauna in these diverse environments

Study Abroad Courses

We offer a six study abroad experience in Venice, where students take a course on the cultural landscape and historical geography of Venice and choose between a urban or environmental landscape research project. The Venezian course is largely held outside on the streets of the city, with several field trips away from the city usually by boat each week. This course is offered every other summer since 2010.

A proposed study abroad program offered through the Department of Geosciences will be FAU's first completely environmental science oriented study abroad program, and will also include a course in introductory Portuguese. Courses at the undergraduate, Molluscan Biodiversity of Brazil, and graduate levels, Wetland and Coastal Biogeography of Brazil, will focus on field research in the Pantanal wetland and coastal Bahia state. The Pantanal supports approximately 263 species of fish, 41 amphibians, 113 reptiles, 582 birds and 170 mammals; the Atlantic Forest along Brazil’s coast supports the most diverse tree stands in the world; and the tropical coastal waters support an ecosystem familiar to South Florida, but unique in

many respects. The courses will examine the interactions of biotic and abiotic factors that influence the processes and patterns of species in freshwater wetlands and coastal ecosystem with field based primary research projects.

Pedagogy/Pedagogical Innovations

eLearning

The department is moving towards elearning with all but one of the GIS courses online currently, and many of the human and physical geography courses online. There is opposition at FAU to placing freshman IFP courses online, so the plan for the BA and BS in Geography is to have the upper division fully online by the spring of 2016. Many of our courses are already fully on line such as our urban and GIS courses, as they were developed for a professional student market, many of whom are working professionals, who in the past could only take classes at nights and on the weekends. For the GIS classes, we offer many hours of online technical assistance through Adobe Connect, where a TA can access a students computer while chatting with them, and we also maintain a 16 station lab with multiple TAs available in the lab from 5-8 most weekday evenings.

Since elearning is defined as courses that are 80% online, we are able to pursue a strategy of offering more research and inquiry oriented components to existing courses such as group discussions, advanced research projects and field based research and inquiry. This is being achieved in three ways. First, by placing more lecture courses materials online, faculty are free to develop more field inquiry and research intensive experiences for the undergraduates. A series of field oriented short courses are being proposed by several faculty members focused on the environments of south Florida. Second, by incorporating Academic Service Learning projects and other internship experiences into the curriculum, students are engaged in community service and hands on guided research experiences. Third, through FAU's Quality Enhancement Plan the Distinction through Discovery grant has funded a cross college program to expand the student-centered undergraduate research culture across the curriculum.

Quality Enhancement Plan: Distinction through Discovery

This proposal is in its second year in 2014-2015 and it involves both the revision of existing courses and the development of new courses. It was implemented for the first time in 2013-2014. A new 1 credit research course was developed, cross-listed and co-taught by faculty from Geoscience and Civil Engineering in the spring of 2014. The goal was to introduce undergraduates to the process of conducting research. It specifically addresses SLO 2,3,4 and 6 in a comprehensive manner. An assessment rubric was developed for the course, and presented to the students. The final project was an oral power point presentation and a poster presentation.

SLO2 Formulate Questions: Students will formulate research questions, scholarly or creative problems with integration of fundamental principles and knowledge in a manner appropriate to their discipline.

SLO3 Plan of Action: Students will develop and implement a plan of inquiry to address research and inquiry questions or scholarly problems.

SLO4 Plan of Action: Students will develop and implement a plan of inquiry to address research and inquiry questions or scholarly problems.

SLO 6 Communication: Students will convey all aspects of their research and inquiry

The second goal was to create a new culture based on undergraduate research and inquiry through building an enhanced research project utilizing the same SLOs discussed above, and assuming that students had already taken the research course.

Academic Service-Learning (A S-L) project

In the Geography degree program there is a capstone course that includes an academic service learning project. Each student will identify an agency/organization to complete a 10-12 hour A S-L experience with; providing service to the community and allowing you to apply knowledge from this course to a local, national, and/or global human-environmental issue. Students will complete a 2-3 page written reflection of their A S-L experience and well as a class oral presentation. This assignment may be done in small groups but should be relevant to your individual class research paper. Examples agencies/organizations in State Parks, non-profit animal rescue groups, nature centers, schools, government agencies such as FWC, ERM, SFWMD, etc. AS-L hours appear on a student's transcript and are administered by the FAU Weppner Center for Civic Engagement and Service – http://www.fau.edu/volunteer/ServiceLearning/AboutServiceLearning.php

Scope of Institutional Contributions: Intellectual Foundations Courses

The department offers the following courses to a university wide audience. These are large enrollment courses that contribute significantly to our student to faculty ratio. Only one, Blue Planet, is online, and World Geography is one of the largest classes offered at FAU in a traditional classroom. The others are offered multisection each term.

Foundations of Society and Human Behavior
ENV 2017 Environment and Society, 50 students, about 12 sections per year
Foundations in Global Citizenship
GEA 2000 World Geography. 250 students six sections per year
Foundations of Science and the Natural World
ESC 2070 Blue Planet, elearing, 100 students, 3 sections per year
MET 2010& D Weather and Climate, 246 students, 3 sections per year, 50 students one section

Certificate Programs

The department is a strong contributor to the University wide undergraduate Environmental Certificate program, and more recently the graduate Environmental Restoration Certificate program. Within the departments Geography program there are a number of certificates. The department contributes as many or more courses to both certificate courses as any other department and was actively involved in the creation of both of these university wide programs. Many interviews are held by former students that hold this certificate.

GIS certificate (15 years) This program has been around for a number of years and it is widely recognized in south Florida by GIS employers. No one has tracked the number of students that earn this certificate per year. They are open to non majors and non matriculated students so they are earned by most department majors and many out of department students, including working professionals.

Advanced GIS certificate (12 years) GIS programing and advanced spatial analysis distinquish this certificate.

Graduate Remote Sensing Certificate This one highlights five sequenced graduate remote sensing courses.

Graduate GIS Certificate. This one is not yet in the catalog at this writing, but will appear there in the spring.

Student Profile

Table 19 Majors Enrolled (Annual Headcount) by Gender and Ethnicity, Geography CIP:450701

			Geography		College Total	University Total
			2011-2012	2012-2013	2012-2013	2012-2013
Undergraduate	American Indian/Alaskan Native	Female			23	96
		Male			13	77
		Total			**36**	**173**
	Asian or Pacific Islander	Female	1		247	776
		Male			145	664
		Total	**1**		**392**	**1,440**
	Black (Not of Hispanic Origin)	Female	2	1	769	3,535
		Male	1	2	334	2,129
		Total	**3**	**3**	**1,103**	**5,664**
	Hispanic	Female	5	5	952	3,922
		Male	3	7	435	2,855
		Total	**8**	**12**	**1,387**	**6,777**
	White (Not of Hispanic Origin)	Female	16	24	1,576	7,431
		Male	25	26	956	6,217
		Total	**41**	**50**	**2,532**	**13,648**
	Non-Resident Alien	Female	1	1	87	318
		Male			30	294
		Total	**1**	**1**	**117**	**612**
	Not Reported	Female			33	130
		Male		1	17	79
		Total		**1**	**50**	**209**
	Total	Female	25	31	3,687	16,208
		Male	29	36	1,930	12,315
		Total	**54**	**67**	**5,617**	**28,523**

In terms of gender the program has slightly more males than females. There are small numbers of Blacks and Hispanics in the program. The percentages of the student body for these groups are lower for the Geography program than for the college or university. Most Geography students are classified as white, non-hispanic.

Student Scholarly Activity

These projects were from the GEA 4275 DTD course.

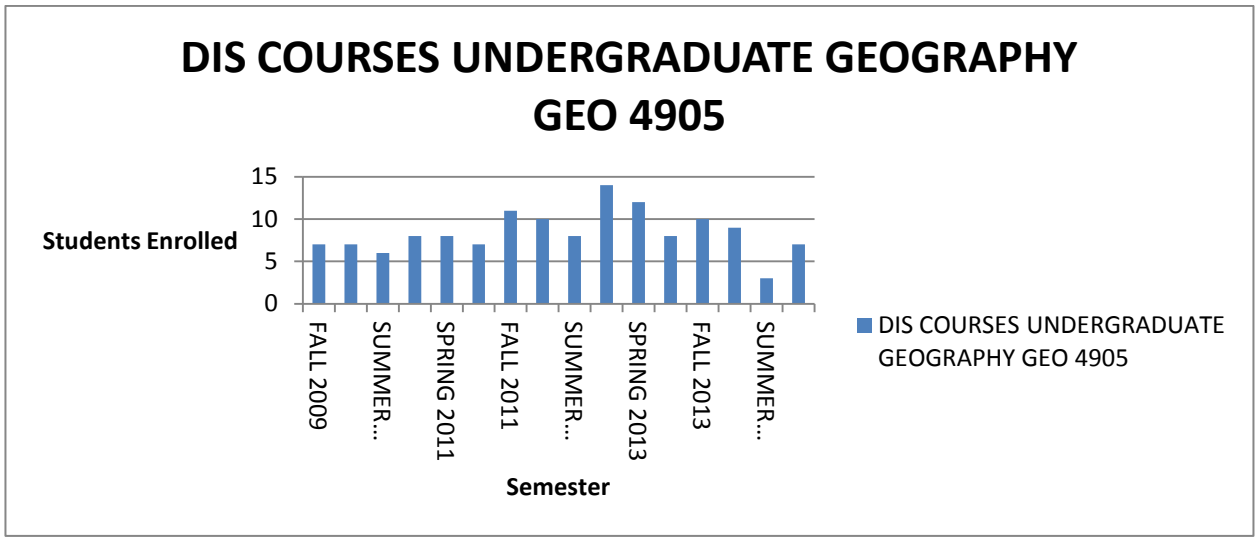
The Effects of Feeder Canals on Nutrient Levels in Florida's Canals
Presented at the Undergraduate Research Symposium 2014

Distinction through Discovery Research Projects

Comparing Drought Levels for Broward and Palm Beach Counties During Drought and Average Years- GEA 4275, Spring 2014

Mapping the Distribution of Salinity in Venetian Canals (2nd Prize, South Florida GIS Expo, Oct. 2014) FAU Study Abroad, Venice, 2014.

Table 20 GEO 4905 Undergraduate DIS course trend



The Directed Independent Study courses represent individual research courses that are one on one research project undertaken with faculty members.

Advising Procedures

There is no current mechanism that force students to seek advising, and we are discussing putting holds on their registration to force an advising session prior to enrollment. They will visit the advisor on their own volition. Sometimes they will figure out that this is necessary through word of mouth between their classmates, or on the occasion that they have had a class with the department advisor in which he makes a general announcement recommending that they do so. Advising notices are posted in the department's corridor. These techniques prove effective at directing the vast majority of our students to the advisors door, but there are cases where students prefer to follow their own advice. Sometimes this can lead to troubles, other times not. The single advisor system is a recommended change since the last program review in 2009.

Our students are typically juniors when they declare their major, and we have had no contact with them in their first two years. Therefore, when they come to us for advice, they are notified that they will actually need two advisors: the department advisor for advice specific to the major, and Glen Malone the College advisor regarding the College of Science's and University requirements for the lower level courses, intellectual foundations, etc.

When they meet with the department advisor, each student must identify whether they wish to obtain a Bachelor of Arts or a Bachelor of Science. The pros and cons of each degree as it pertains to their skills and career goals are discussed. The advisor then walks them through the audit process, notating which required classes that they have already completed, if any, and make substitutions where appropriate. Having completed that process, the student is then informed on how many more credits they have remaining prior to completing their degree. The advisor then works with the student to plan out the best sequence of courses that they should enroll in to ensure that they can graduate in as timely a manner as possible. This sequence would of course ensure that they complete any prerequisites as soon as possible. Further, it is recommended that they hold aside classes that are typically taught in the summer semester to ensure that they have the option of a full summer

schedule should they wish. This can have a big impact upon their anticipated graduation date. If the students are interested in GIS, we recommend a sequence of classes that will help them obtain the GIS certificate at a minimum, and potentially the Advanced GIS certificate. Finally, we ensure that they enroll in the capstone class, Human Environmental Interactions in South Florida, as close to their graduation date as possible. In their final semester, students should visit with the advisor to complete their audit one final time. (Should the student show potential for graduate work, the advisor have one final conversation with them about pursuing such opportunities. If they show interest, they are sent them to the graduate advisor, Dr.Tobin Hindle.) Having verified that they are on track to graduate, the student is then sent to Glenn Malone in the Undergraduate Dean's office so that he can check one last time that they have met the college's requirements. He then will complete their application for graduation with them.

Placement Rates

The undergraduate geography majors who go into the local job market tend to go into either urban planning or environmental analysis positions in both the public and private sectors. A third area that overlaps with the other two is into the field of GIS as technicians. A significant number go on to graduate school.

Second Year Retention Rates

The following table from IEA shows retention and graduation rates for first time in college students through year two.

Table 21 First Time In College outcomes through Year Two

Outcomes through year 2			Entering Year												
			2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total		#	3	2	3	2	3	3	1	-	1	-	4	1	2
		%	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**-**	**100**	**-**	**100**	**100**	**100**
Graduate @ FAU		#	-	-	-	-	-	-	-	-	-	-	-	-	-
		%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Graduate @ other SUS Institution		#	-	-	-	-	-	-	-	-	-	-	-	-	-
		%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Persist		#	2	2	3	2	3	3	1	-	1	-	4	1	-
		%	**66.7**	**100**	**100**	**100**	**100**	**100**	**100**	**-**	**100**	**-**	**100**	**100**	**-**
Transfer to other SUS		#	-	-	-	-	-	-	-	-	-	-	-	-	-
		%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Leave		#	1		-	-	-	-	-	-	-	-	-	-	-
		%	**33.3**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Only one student in this category left FAU. The next table shows first time in college retention and graduation rates for first time in college students at four years.

Table 22 First Time in College outcomes through Year Four

Outcomes through year 4		Entering Year												
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	#	3	3	3	2	3	2	1	-	1	-	4	1	2
	%	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**-**	**100**	**-**	**100**	**100**	**100**
Graduate @ FAU	#	-	-	-	-	-	-	1	-	-	-	-	-	-
	%	**-**	**-**	**-**	**-**	**-**	**-**	**100**	**-**	**-**	**-**	**-**	**-**	**-**
Graduate @ other SUS Institution	#	-	-	-	-	-	-	-	-	-	-	-	-	-
	%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Persist	#	2	3	2	2	1		-	-	1	-	-	-	-
	%	**66.7**	**100**	**66.7**	**100**	**33.3**		**-**	**-**	**100**	**-**	**-**	**-**	**-**
Transfer to other SUS	#	-	-	-	-	-	-	-	-	-	-	-	-	-
	%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Leave	#	1	0	1	-	1	2	-	-	-	-	-	-	-
	%	**33.3**	**100**	**33.3**	**-**	**33.3**	**100**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Only one student is show to have graduated in his fourth year. Five students out of sixteen leave the program, but they do not go on to other state universities. This is approximately a third of the first time in college students. This may be due to financial issues, such as the boom economy that was occurring in Florida at the time. Many part time students took permanent jobs during the early years of this decade. The multiple hurricanes of 2004 and 2005 were a good reason to leave as well.

The six year retention rate for first time in college students is shown next.

Table 23 First Time In College outcomes through Six Years

Outcomes through year 6		Entering Year												
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	#	3	3	3	2	3	3	1	-	1	-	4	1	2
	%	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**-**	**100**	**-**	**100**	**100**	**100**
Graduate @ FAU	#	1	1	1	-	-	-	1	-	-	-	-	-	-
	%	**33.3**	**50**	**33.3**	**-**	**-**	**-**	**100**	**-**	**-**	**-**	**-**	**-**	**-**
Graduate @ other SUS Institution	#	-	-	-	-	1	-	-	-	-	-	-	-	-
	%	**-**	**-**	**-**	**-**	**50**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Persist	#	1	-	1	1	-	-	-	-	-	-	-	-	-
	%	**33.3**	**-**	**33.3**	**50**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Transfer to other SUS	#	-	-	-	-	-	1	-	-	-	-	-	-	-
	%	**-**	**-**	**-**	**-**	**-**	**50**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Leave	#	1	1	1	1	1	2	-	-	-	-	-	-	-
	%	**33.3**	**50**	**33.3**	**50**	**50**	**50**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

This table shows eighteen first time in college students at six years. Seven, or 38% left FAU. Five of these probably left and did not finish their degrees elsewhere. One of these graduated at another state university and another transferred to another state university. Four of the eighteen graduated at FAU.

The next table shows second year retention rates for all transfers from community colleges

Table 24 Community College Transfer students through the second year

Outcomes through year 2		Entering Year												
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	#	5	5	1	4	2	7	2	6	3	3	4	3	6
	%	100	100	100	100	50	100	100	100	100	100	100	100	100
Graduate @ FAU	#	1	2	-	1	1	3	-	1	-	-	2	-	-
	%	25	25	-	25	25	23.3	-	25	-	-	50	-	-
Graduate @ other SUS Institution	#	-	-	-	-	-	-	-	-	-	-	-	-	-
	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Persist	#	4	3	1	2	-	3	2	5	1	3	1	3	-
	%	80	75	100	50	-	23.3	100	75	33.3	100	25	100	-
Transfer to other SUS	#	-	-	-	-	-	-	-	-	-	-	-	-	-
	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Leave	#	-	-	-	1	1	1	-	-	2	-	1	-	-
	%	-	-	-	25	25	14.3	-	-	66.6	-	25	-	-

Of the forty five students CC students that completed their second year at FAU in the Geography program, 11 or 24% graduated, while 6 or 13% left the university. None tranfered to another state university, and the remainder then stayed in the program.This next table shows fourth year retention rates for transfers from community colleges.

Table 25 Community College Transfer students outcomes at four years

Outcomes through year 4		Entering Year												
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	#	6	6	1	-	4	5	1	3	5	4	5	4	5
	%	100.0	100.0	100.0	-	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Graduate @ FAU	#	4	3	1	-	3	3	-	2	4	3	-	-	-
	%	66.7	50.0	100.0	-	75.0	60.0	-	66.7	80.0	75.0	-	-	-
Graduate @ other SUS Institution	#	-	-	-	-	-	-	-	-	-	-	-	-	-
	%	-	-	-	-	-	-	-	-	-	-	-	-	-
Persist	#	2	2	-	-	-	-	1	1	-	-	-	-	-
	%	33.3	33.3	-	-	-	-	100.0	33.3	-	-	-	-	-
Transfer to other SUS	#	-	-	-	-	-	-	-	-	-	1	-	-	-
	%	-	-	-	-	-	-	-	-	-	25.0	-	-	-
Leave	#	-	1	-	-	1	2	-	-	1	-	-	-	-
	%	-	16.7	-	-	25.0	40.0	-	-	20.0	-	-	-	-

Of the 49 Community College students twenty three (49%) had graduated within four years. Only one transferred to another state university, and five had left the university.

Graduation Rates

Table 26 Graduation Rates BA|BS Geography

	2008-2009	2009-2010	2010-2011	2011-2112	2012-2013	2013-2014
Geography BA	6	8	7	2	12	9.5
Geography BS	0	4	5	4	9	14

The Geography BS was a new degree in 2008-2009, so there were no graduates yet. Both the BA and the BS have grown in recent years and are expected to grow more as the program moves to an online format.

Student Recruitment

The department is very active in the Science Olympiad, hosting 3-5 events every year. Dr. Root has a booth at the Sun Coast High School Career Fair focusing on careers in Hydrology and other concentrations in the department. Dr. Warburton and James Gammack-Clark who advise undergraduates on courses and certificates also talk to them about department majors. Glen Malone in the Science Deans office advises students about majors in the Geoscience area.

Graduate Programs

MA in Geography

Background

The Department offers a thesis and a non-thesis option for the Master of Arts (M.A.) in Geography that provides excellent training for careers in GIScience, urban and regional planning and analysis, environmental consulting, community development, government, business and teaching, as well as training for advanced graduate work.

For the thesis and non-thesis options, students must complete a minimum of half of their graduate credits in geography at the 6000 level. No more than 3 credits of directed independent study (such as GEO 6908 or GLY 6908) may be used to fulfill the minimum credits for either degree option. Non-thesis students must complete a minimum of half of the credit requirements for the degree (i.e., 17 credits) prior to taking GEA 6277, Human-Environmental Interactions.

Admission Requirements

In addition to meeting the University and College admission requirements for graduate study, applicants for master's degrees in the Department of Geosciences must meet the following requirements:
1. Hold a bachelor's degree in an appropriate discipline from an accredited college or university;

2. Have earned a minimum grade point average of 3.0 (on a 4.0 scale) in the last 60 credits of undergraduate work attempted;

3. Have obtained a Graduate Record Exam (GRE) score of 146 or higher on the verbal portion and 144 or higher on the quantitative portion, or a quantitative-verbal combined score of 1000 or higher on the general portion of the previous version of the GRE. GRE scores more than five years old will not be accepted;

Enrollment

Table 27 MA in Geography

	Geography		College Total	University Total
	2011-2012	2012-2013	2012-2013	2012-2013
Masters/Specialist	5	10	228	4,675

The masters program in Geography is much smaller than it was ten years ago because the funding was moved to support the PhD program and there are no dedicated funded TA positions. Funding is sporadic, and no one is offered a TA commitment except on a semester by semester basis. Furthermore the stipend rate when we do have TA positions are not competitive with other universities. We are increasingly dependent on part time students.

Table 28 Annualized State-Fundable FTE Produced by Level, Geosciences

	Geosciences			College Total	University Total
	2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Graduate Total	**27.4**	**32.1**	**29.9**	**228.2**	**2,223.7**
Grad I	16.4	17.2	15.0	98.5	1,838.4
Grad II	11.0	14.9	15.0	129.7	385.2
Classroom	26.0	29.3	26.2	183.2	2,085.9
Thesis-Dissertation	1.4	2.8	3.8	45.1	137.7

Grad I is masters level research coursework, whereas Grad II is Dissertation level research coursework. Classroom is both traditional and online work. There are 92 graduate degrees at FAU. If each of then contributed equally to the Graduate Total FTE, the average contribution would be 24.17. Geoscience has exceeded this level of production in each year.

One FTE equals .75 person years. The Geoscience department with its 13 faculty positions has a healthy Graduate Total FTE output, considering that we are only looking at the graduate FTA production total. Much of this has to do with the number of online GIS courses that are graduate versions of undergraduate courses, supervised by faculty but administered by Ph.D. students. The graduate component of these courses are a light additional load for faculty once the online course is established and delivered, and there is currently assistance from the university in the form of release time and small bonuses for developing online curriculum.

Table 29 Annualized State-Fundable FTE Produced In/Out Of Department or College

		Courses offered by:				
		Geosciences			College of Science	University Total
		2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Graduate	**FTE produced by students who are:**	18.8	20.8	21.4	188.3	1,730.7
	Majors within the department					
	Majors outside the department, but within the college	4.4	8.4	6.3	17.0	348.5
	Majors outside the college	4.2	2.9	2.2	22.9	144.4
	Total	**27.4**	**32.1**	**29.9**	**228.2**	**2,223.7**

The trend in our FTE production is that it is increasingly concentrated in the department and decreasingly concentrated outside the college. Majors taking our courses outside the department but inside the college have gone up and down in recent years.

Average Class Size and Faculty/Student Ratio

Table 30 Class Size and Faculty Student Ratios

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	College Total 2012-2013	University Total 2012-2013
Classes offered	23	29	28	33	25	167	1,575
# enrolled	117	130	241	240	213	1,386	22,406
Class size	5.7	7.0	8.6	7.3	8.5	8.3	14.2
Research	43	33	47	71	63	756	1,951

These numbers are for the departments three graduate programs. Our class size is similar to the college as a whole and smaller than the university average. Since our online programs often run graduate courses with very low enrollments, the faculty student ratio for graduate classroom courses would be a bit larger, probably around 10 to one. The research numbers reflect the number of individual research courses such as DIS, advanced research, Thesis or Dissertation courses. This does not reflect the actual number of credits in each course.

Graduation Rates

Table 31 Graduation Rates MA in Geography

	Year Degree Granted											All
	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	
Masters	3.0	4.0	4.0	5.0	6.0	5.0	6.0	2.0	5.0	2.0	2.0	44.0
SCH							102	83	88	66	17	356

From 2009 to 2014, there have been seventeen students graduate with an MA in Geography. The decline is primarily due to the fact that the assistantships have been taken away to support the Ph.D program during this period. As of the current year, there are no lines for MA students in the Geoscience program, only when a Ph.D. line remains unfilled can we support an MA student. The development of the Masters along the way program will increase the number of masters degrees slightly, but unless a funding mechanism is found for the masters program, it can be expected that it will continue to decline.
Our hope for the future for the MA program is to take the program online in the spring of 2015, reducing the need for funded TA positions to support the MA program, and relying more on part time professional students to support our MA program. The migration of the MA degree to online status will begin in the spring of 2015, with eight faculty working on taking courses through the elearning Quality Matters approval process, and the degree through the program migration process. A proposal to create an MS in Geoscience will be revised and taken through the university committees in the Fall of 2015. This will be followed by a proposal to create an online MS in GIS in the Spring of 2016, for implementation in the Fall of 2016.

Curriculum

Curriculum Relative to Comparison Schools

The following schools were chosen for comparison purposes:
Florida International University
University of South Florida (Aspirational Peer)
University of Southern Mississippi
Western Kentucky University
University of North Carolina, Wilmington

Table 32 MA in Geography Thesis

Curriculum (# credits)	FAU	FIU*	USF	Univ of S. Mississippi	Western Kentucky*	UNC Wilmington*
Core Credits	7	3	9	6	12	4
Geography Credits	12	16	9	12	0	15
Electives	6	5	6	12	12	8
Thesis	6	6	6	6	6	3
Total Credits	31	30	30	36	30	30

* Geosciences degree

In our thesis option, we offer more geography courses and fewer electives than most of our peer programs. Our core courses are designed to quickly introduce graduate students to research question formulation, research design and literature reviews so that they can move into thesis proposals in their second semester.

Table 33 MA in Geography- Non-Thesis

Curriculum (# credits)	FAU	FIU*	USF	Univ of S. Mississippi	Western Kentucky*	UNC Wilmington*
Core Credits	4	0	0	NA	NA	4
Geography Courses	15	18	16	NA	NA	10
Electives	12	9	20	NA	NA	16
Capstone	3	3	0	NA	NA	3
Total Credits	34	30	36	NA	NA	33

Our non-thesis option starts with an introduction to research in the Geoscience course that forces students to define a thesis topic and put together a committee or identify with the nonthesis option, which requires a capstone course. The capstone course pulls the program together at the end and several of our peers have a similar course.

Table 34 Distribution of Geography Content in the Graduate Courses, compared to Peer Institutions

Courses Offered (# courses)	FAU	FIU	USF	Univ of S. Mississippi	Western Kentucky	UNC Wilmington
Environmental	4	23	1	9	4	0
GIS	8	3	8	3	5	3
Human	4	0	12	19	16	2
Remote Sensing	5	2	2	2	2	3
Total Courses	21	28	22	33	27	8
Number of Geography Faculty	7	16	14	11	11	5

FAU's MA in Geography program compares favorably with our peer institutions. Our degree requirements are similar to peer institutions in both thesis and non-thesis options. Our strength is that we offer a complete course offering among our four focus areas – Environmental, GIS, Human, Remote Sensing. Four of our five peer institutions primarily focus on just one area – FIU in Environmental and three others in Human Geography. We offer a non-thesis option, which not all peer institutions offer. We offer three courses for every faculty member, a record only matched by one other institution, yet we maintain a 2-2 teaching load. This is possible through the use of our fully online courses. Note that our remote sensing curriculum is the largest of any institution and our GIS curriculum is the equal of any other institution.

Master of Arts with Major in Geography

The Department offers a thesis and a non-thesis option for the Master of Arts (M.A.) in Geography that provides excellent training for careers in GIScience, urban and regional planning and analysis, environmental consulting, community development, government, business and teaching, as well as training for advanced graduate work.

For the thesis and non-thesis options, students must complete a minimum of half of their graduate credits in geography at the 6000 level. No more than 3 credits of directed independent study (such as GEO 6908 or GLY 6908) may be used to fulfill the minimum credits for either degree option. Non-thesis students must complete a minimum of half of the credit requirements for the degree (i.e., 17 credits) prior to taking GEA 6277, Human-Environmental Interactions.

Thesis Option Requirements		
Geography Seminar Core (Choose a minimum of four courses from the following list. **Note:** DIS courses cannot be substituted for any course on this list.)		
Environmental Restoration	EVR 6334	3
Restoration Implementation and Management	EVR 6358	3
Human-Environmental Interactions	GEA 6277	3
Seminar in Geographic Methodology	GEO 6117	3
Plants and People	GEO 6317	3
Culture, Conservation and Land Use	GEO 6337	3
Seminar in Urban Area Analysis	GEO 6608	3
Seminar in Regional or Systematic Geography	GEO 6938	3
Advanced Remote Sensing	GIS 6039	3
Topics in Geoinformation Science	GIS 6120	3
Hyperspectral Remote Sensing	GIS 6127	3
		12
Research Core		

Research in the Geosciences	GEO 6118	3
Geosciences Colloquium Series	GEO 6920	1
Thesis Seminar	GLY 6931	3
Master's Thesis	GEO 6971	6
		13
Electives		
Six credits that may include additional geography graduate coursework or graduate courses in cognate areas to fulfill individual needs. All elective coursework applied to the degree must be at the 5000 level or higher. No more than 3 credits of directed independent study (GEO 6908 or GLY 6908) may be used.		**6**
Total Minimum Credit Requirements for the Degree		**31**
Note: In addition to the required coursework, students on the thesis option must successfully defend both a thesis proposal and a written thesis. Students should select a thesis advisor before the end of their second semester in the program.		

Non-Thesis Option Requirements		
Human-Environmental Interactions	GEA 6277	3
Research in the Geosciences	GEO 6118	3
Geosciences Colloquium Series	GEO 6920	1
Geography Seminar Core (Choose a minimum of five courses from the following list. **Note:** DIS courses cannot be substituted for any course on this list.)		
Environmental Restoration	EVR 6334	3
Restoration Implementation and Management	EVR 6358	3
Seminar in Geographic Methodology	GEO 6117	3
Plants and People	GEO 6317	3
Culture, Conservation and Land Use	GEO 6337	3
Seminar in Urban Area Analysis	GEO 6608	3
Seminar in Regional or Systematic Geography	GEO 6938	3
Advanced Remote Sensing	GIS 6039	3
Topics in Geoinformation Science	GIS 6120	3
Hyperspectral Remote Sensing	GIS 6127	3
		15
Electives		
Twelve credits that may include additional geography graduate coursework or graduate courses in cognate areas to fulfill individual needs. All elective coursework applied to the degree must be at the 5000 level or higher. No more than 3 credits of directed independent study (GEO 6908 or GLY 6908) may be used.		**12**
Total Minimum Credit Requirements for the Degree		**34**

Description of Internships, practicum, study abroad, field experiences

These options are sporadic in the department as the focus has been on doing research that would expedite getting through the masters program. Internships have included working for the county on the Nearshore Reef GIS Database, The County Archaeology GIS Database, and others. If these projects are strongly linked to thesis research they can help expedite a students progress in the masters program, but they can also cause delays by diffusing their attention. Most of our Graduate Advisors strongly encourage field research, and engage graduate students in field projects. To date, one student has gone on the Venetian study abroad program and engaged a team of science undergraduate students in a study that resulted in several

undergraduate poster presentations at subsequent conferences, and the current movement is to enlist undergraduates as research volunteers to help graduates with their data collection and analysis.

Pedagogy/Pedagogical innovations

We are moving towards offering the MA degree as an online degree. This will involve having 80% of the course content online. Most of the remaining 20% will be traditional lecture or field oriented curriculum within a few years. We are also proposing an online MS in GIS degree, and a MS in Geoscience degree, which will open up opportunities for students in Geoscience areas that were not previously available, because the Geology MS degree required a BS in Geology or the equivalent, with a field camp. The MS in Geoscience will be broad based, with all the courses from geography and geology available to its students.

Scope of institutional contributions, cross-listed courses with Environmental Science

GIS 5051C Principles of Geographic Information Systems
GIS 5100C Applications In Geographic Information Systems
GIS 5103C Programming In Geographic Information Systems
GIS 5038C Remote Sensing Of The Environment
GIS 5033C Digital Image Analysis
GIS 6039 Advanced Remote Sensing
GIS 6127 Hyperspectral Remote Sensing
GIS 6120 Topics in Geoinformation Science
GEO 6318 Plants And People
GEO 5305 Biogeography
EVR 6334 Environmental Restoration
GEA 6277 Human-Environmental Interactions
GEO 6337 Culture, Conservation And Land Use
GEO 5435C Geographic Analysis Of Population

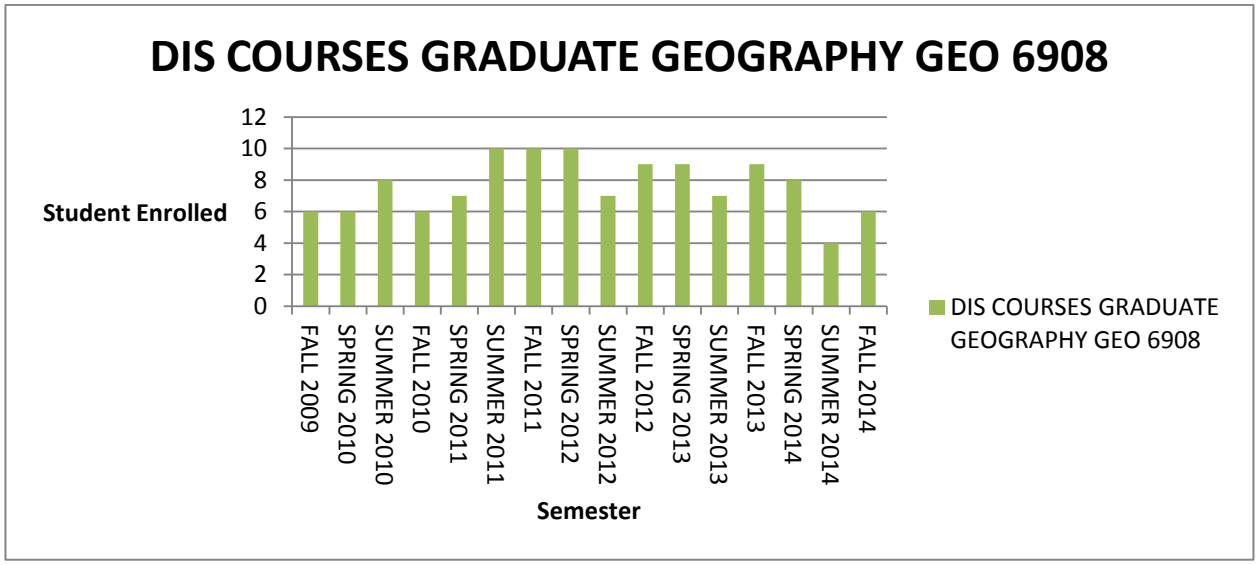
Student Profile

Table 35 Student Profile by Ethnicity and Gender

			Geography		College Total	University Total
			2011-2012	2012-2013	2012-2013	2012-2013
Graduate	American Indian/Alaskan Native	Female		1	2	11
		Male				8
		Total		1	2	19
	Asian or Pacific Islander	Female		1	14	155
		Male			13	119
		Total		1	27	274
	Black (Not of Hispanic Origin)	Female			10	624
		Male		1	20	265
		Total		1	30	889
	Hispanic	Female			27	495
		Male		1	25	318
		Total		1	52	813
	White (Not of Hispanic Origin)	Female	3	0	158	1,926
		Male	2	5	143	1,233
		Total	5	5	301	3,159
	Non-Resident Alien	Female			38	177
		Male	0		53	200
		Total	0		91	377
	Not Reported	Female		1	4	41
		Male				30
		Total		1	4	71
	Total	Female	3	3	253	3,429
		Male	2	7	254	2,173
		Total	5	10	507	5,602

Geography MA students are primarily white with occasional hispanics, blacks and Asians, fewer than you might expect given the ethnic mixtures of south Florida.

Table 36 GEO 6908 Graduate DIS course trend



The DIS research course enrollment in the graduate program is relatively high, the numbers reflect both MA students and beginning Ph.D. students. Both groups tend to do pilot projects prior to their thesis/dissertation proposals as DIS projects. There are few graduate courses offered in the summer, and until recently TAs were required to be enrolled in 6 credits in the summer. There is no longer a requirement that TAs enroll in more than one credit in the summer, so there were fewer DIS projects in the summer of 2014.
It should be noted that only one three credit DIS project may count towards a degree, each student may enroll only once in GEO 6908.

Scholarly Activity

Journals

Florida Geographer
Southeastern Geographer
Proceedings of the Applied Geography Conference

Conference Presentations

Southeastern Division of the Association of American Geographers Annual Conference
Florida Geographers Conference
Applied Geography Conference
Association of American Geographers Annual Conference

Advising Procedures

All newly admitted MA and MS students are considered non-thesis and are advised by the Graduate Program Director. Incoming students must take the Research in the Geosciences course at the first opportunity. In this course they must conduct a literature review of the topic or subfield they are interested in, and develop a relationship with a faculty member, establishing a thesis committee. If they fail to do this, they are advised to pursue the nonthesis option. Students wanting to do the thesis option are advised by the course instructor and by the graduate advisor to take Thesis Seminar at its first availability. During the Thesis seminar course, students must obtain a thesis advisor, who then takes over all advising for

their thesis student from that time forward until they graduate. Thesis seminar students are required to complete their Plan of Study during the Thesis Seminar course. Non-thesis students are required to complete their Plan of Student by the end of their first semester.

Once a non-thesis student's plan of student is completed, they only need to have further advising if they wish to take courses not on their Plan of Study. Thesis students are encouraged to be in regular contact with their thesis advisor, particularly once they start their thesis work. Also graduate students receive advising emails throughout the semester to remind them of important requirements and deadlines.

Placement rates/employment profiles

We have no data on this. What we have is self reported accounts: Pamela Maletik went to the National Geospatial Intelligence Agency, where she placed number 1 in the 200 student test for Geospatial Analyst, and number 1 in the 200 student test for Image Analyst. The night after she received the review, she was woken up by a phone call and asked to come in and play a major role in the team that mapped from real time imagery, the damage zones from the Indonesian tsunami. These maps were distributed by the State Department to aid agencies within 24 hours of the disaster. Dylan Kennard after graduating was the head of the Deepwater Horizons GIS, managing a team that grew to 200 GIS professionals working on mapping and monitoring the BP oil spill. Jennifer Zumbado is a GIS Executive for Shreveport, Louisiana.

Retention rates

Without funding for MA students, few faculty agree to supervise thesis projects, and there is no available staff who can devote time to finding ways to track an intermittent student population that come and go as their level of committment to the gradute program fluxuate with employment opportunities. Social media is our only realistic tool.

Student Recruitment

The recruitment grant program with the Graduate College at FAU provides funds that can be used to advertise to prospective students at academic conferences. We make active use of those funds to send faculty to conferences locally, nationally, and internationally to increase our visibility, promote our research programs, and to concomitantly staff recruitment booths with informational materials and face to face interactions. Since developing the Ph.D. program however, the funding for the MA in Geography program has reduced to an occasional trickle, and there is currently no permanent money earmarked for TA stipends for MA students. Prior to losing the MA money, we were losing students to other universities because the amount was lower than offered at other state universities. Without funding for masters students, there is little that can be done to encourage students to come, when other state universities fund positions and fund them better than FAU does.

Geology MS

Admissions Criteria

In addition to meeting the University and College admission requirements for graduate study, applicants for master's degrees in Geology must meet the following requirements:
1. Hold a bachelor's of science degree in Geology, or the equivalent, with an approved 6 week geological field camp experience.
2. Have earned a minimum grade point average of 3.0 (on a 4.0 scale) in the last 60 credits of undergraduate work attempted;
3. Have obtained a Graduate Record Exam (GRE) score of 146 or higher on the verbal portion and 144 or higher on the quantitative portion, or a quantitative-verbal combined score of 1000 or higher on the general portion of the previous version of the GRE. GRE scores more than five years old will not be accepted;
4. Receive the recommendation of the Department faculty.

General Degree Requirements (for all master's degrees)
1. Students must maintain a GPA of 3.0 or higher throughout their graduate program. Failure to do so will subject the student to dismissal from the program.

2. Students must achieve a grade of at least "C+" in order for a course to be counted as part of the minimum credits toward the degree.

Enrollment information (headcount and FTE production)

Table 37 Geology Headcount

Annual Headcount Geology CIP:400601	Geology		College Total	University Total
	2011-2012	2012-2013	2012-2013	2012-2013
Masters/Specialist	13	11	228	4,675

With only three funded masters TA positions, the Geology program is much smaller than it was ten years ago. Other state universities pay twice the stipend that our positions pay, and offer medical benefits and complete waivers of tuition and fees, while FAU only offers 80% waivers of tuition and fees.

Table 38 Annualized State-Fundable FTE Produced By Level, Geosciences

	Geosciences			College Total	University Total
	2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Graduate Total	**27.4**	**32.1**	**29.9**	**228.2**	**2,223.7**
Grad I	16.4	17.2	15.0	98.5	1,838.4
Grad II	11.0	14.9	15.0	129.7	385.2
Classroom	26.0	29.3	26.2	183.2	2,085.9
Thesis-Dissertation	1.4	2.8	3.8	45.1	137.7

One FTE equals .75 person years. The Geoscience department with its 13 faculty positions has a healthy Graduate Total FTE output, considering that we are only looking at the graduate FTA production total. Much of this has to do with the number of online GIS courses that are graduate versions of undergraduate courses, supervised by faculty but administered by Ph.D. students. The graduate component of these courses are a light additional load for faculty once the online course is established and delivered, and there is currently assistance from the university in the form of release time and small bonuses for developing online curriculum.
Grad I is masters level coursework, whereas Grad II is Dissertation level coursework. Classroom is both traditional and online work. There are 92 graduate degrees at FAU. If each of then contributed equally to the Graduate Total FTE, the average contribution would be 24.17. Geoscience has exceeded this level of production in each year.

Table 39 Annualized State-Fundable FTE Produced In/Out Of Department or College
Geosciences

		Courses offered by:				
		Geosciences			College of Science	University Total
		2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Graduate	**FTE produced by students who are:**	18.8	20.8	21.4	188.3	1,730.7
	Majors within the department					
	Majors outside the department, but within the college	4.4	8.4	6.3	17.0	348.5
	Majors outside the college	4.2	2.9	2.2	22.9	144.4
	Total	**27.4**	**32.1**	**29.9**	**228.2**	**2,223.7**

The trend in our FTE production is that it is increasingly concentrated in the department and decreasingly concentrated outside the college. Majors taking our courses outside the department but inside the college have gone up and down in recent years.

Average class size and faculty/student ratio

Table 40 Average Class size and Faculty Student Ratio

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	College Total 2012-2013	University Total 2012-2013
Classes offered	**23**	**29**	**28**	**33**	**25**	**167**	**1,575**
# enrolled	**117**	**130**	**241**	**240**	**213**	**1,386**	**22,406**
Class size	**5.7**	**7.0**	**8.6**	**7.3**	**8.5**	**8.3**	**14.2**
Research	**43**	**33**	**47**	**71**	**63**	**756**	**1,951**

These numbers are for the departments three graduate programs. Our class size is similar to the college as a whole and smaller than the university average. Since our online programs often run graduate courses with very low enrollments, the faculty student ratio for graduate classroom courses would be a bit larger, probably around 10 to one. The research numbers reflect the number of individual research courses such as DIS, advanced research, Thesis or Dissertation courses. This does not reflect the actual number of credits in each course.

MS in Geology Curriculum Relative to Comparison Schools

The following schools were chosen for comparison purposes:
Florida International University
University of South Florida (Aspirational Peer)
University of Southern Mississippi
Western Kentucky University
University of North Carolina, Wilmington

Table 41 MS Geology Thesis

Curriculum (# credits)	FAU	FIU	USF	Univ of S. Mississippi	Western Kentucky	UNC Wilmington
Core Courses	0	3	0	0	12	4
Geology Courses	15	16	10	18	0	15
Electives	9	5	14	6	12	8
Thesis	6	6	6	6	6	3
Total Credits	30	30	30	30	30	30

Table 42 MS Geology Non-Thesis

Curriculum (# credits)	FAU	FIU	USF*	Univ of S. Mississippi	Western Kentucky	UNC Wilmington
Core Courses	0	0	0	NA	NA	4
Geology Courses	21	18	10	NA	NA	10
Electives	12	9	14	NA	NA	16
Capstone	0	3	6	NA	NA	3
Total Credits	33	30	30	NA	NA	33

* Non-thesis option is a PSM degree

Table 43 Distribution of Geology Content in the Graduate Courses, compared to Peer Institutions

Courses Offered (# courses)	FAU	FIU	USF	Univ of S. Mississippi	Western Kentucky	UNC Wilmington
Coastal	4	3	1	1	0	6
Geophysics	1	2	1	3	1	1
Geochemistry	3	6	4	2	1	2
Hydrogeology	5	8	2	3	1	1
Paleontology	2	5	0	5	1	3
Total Courses	15	24	8	13	4	13
Number of Geology Faculty	6	15	19	7	7	14

FAU's MS in Geology program compares quite favorably with our peer institutions. Our decree requirements are similar to peer institutions in both thesis and non-thesis options. Within our main focus areas, we offer the second most number of courses yet have the fewest number of Geology faculty. We offer a non-thesis option, which not all peer institutions offer. The one area of program review that we should consider is that we do not require a Geology core course for either thesis or non-thesis and we do not have a capstone course for the non-thesis option.

Master of Science with Major in Geology

The Department offers a thesis and non-thesis option Master of Science (M.S.) in Geology. Students may develop a focus in hydrogeology, coastal processes or paleontology, or they may select from a broad range of courses for a more versatile degree. The program is excellent training for careers in geological and environmental consulting and staff positions at regulatory agencies, as well as for advanced graduate studies.

For both the thesis and non-thesis options, students must complete a minimum of five graduate (6000-level) courses in geology. No more than 9 credits of coursework from outside geology will be counted toward the degree. No more than 3 credits of directed independent study (such as GLY 6908 or GEO 6908) may be used to fulfill the minimum required credits for either degree option.

The thesis student must successfully complete a minimum of five graduate courses (15 credits at the 6000 level) in geology, 6 credits of master's thesis, including a successful thesis defense, and an additional minimum of 9 credits at the 5000 level or above from geology or related programs for a total of 30 credits. The thesis student should normally choose a thesis advisor during the second semester of study.

The non-thesis student must successfully complete a minimum of five graduate courses (15 credits at the 6000 level) in geology, plus 6 additional credits in geology at the 5000 level or above and an additional minimum of 12 credits at the 5000 level or above from geology or related programs for a total of 33 credits.

Thesis Option Summary		
Master's Thesis	GLY 6971	6
Cognate work in geology or other programs to fulfill individual needs		9
Required graduate courses from list below		15
Minimum credits for thesis degree		**30**

Non-Thesis Option Summary	
Geology electives at the 5000 level or above	6
Cognate work in geology or other programs to fulfill individual needs	12
Required graduate courses from list below	15
Minimum credits for non-thesis degree	**33**

Graduate Course Offerings in Geology		
Minimum of five courses from the following:		
Paleoecology	GLY 6661C	3
Regolith Geology	GLY 6707	3
Coastal Environments	GLY 6737	3
Ancient Marine Environments	GLY 6745	3
Global Environmental Change	GLY 6746	3
Groundwater Solute Transport Modeling	GLY 6828	3
Modeling Groundwater Movement	GLY 6836	3
Coastal Hazards	GLY 6888	3
Thesis Seminar	GLY 6931	3
Special Topics in Applied Geology	GLY 6934	3

The following courses are developed and are in the process of being added to the catalog:
GLY 6246 Advanced Enviromental Geochemistry
GLY 6457 Environmental Geophysics
GLY6838 Hydrogeology Methods
GLY 6897 Benchmark Developments in Hydrogeology

Scope of institutional contributions, Cross listed with Environmental Science MS

GLY 5243 Environmental Geochemistry
GLY 6246 Advanced Environmental Geochemistry
GLY 6836 Modeling Groundwater Movement
GLY 5736C Marine Geology
GLY 5934 Advanced Topics In Applied, Coastal And Hydrogeology
GLY 6707 Regolith Geology
GLY 6737 Coastal Environments
GLY 6838 Methods in Hydrogeology
GLY 5575C Shore Erosion And Protection
GLY 6746 Global Environmental Change
GLY 5457 Environmental Geophysics
GLY 6888 Coastal Hazards

Student Profile

Table 44 Student Profile by Ethnicity and Gender

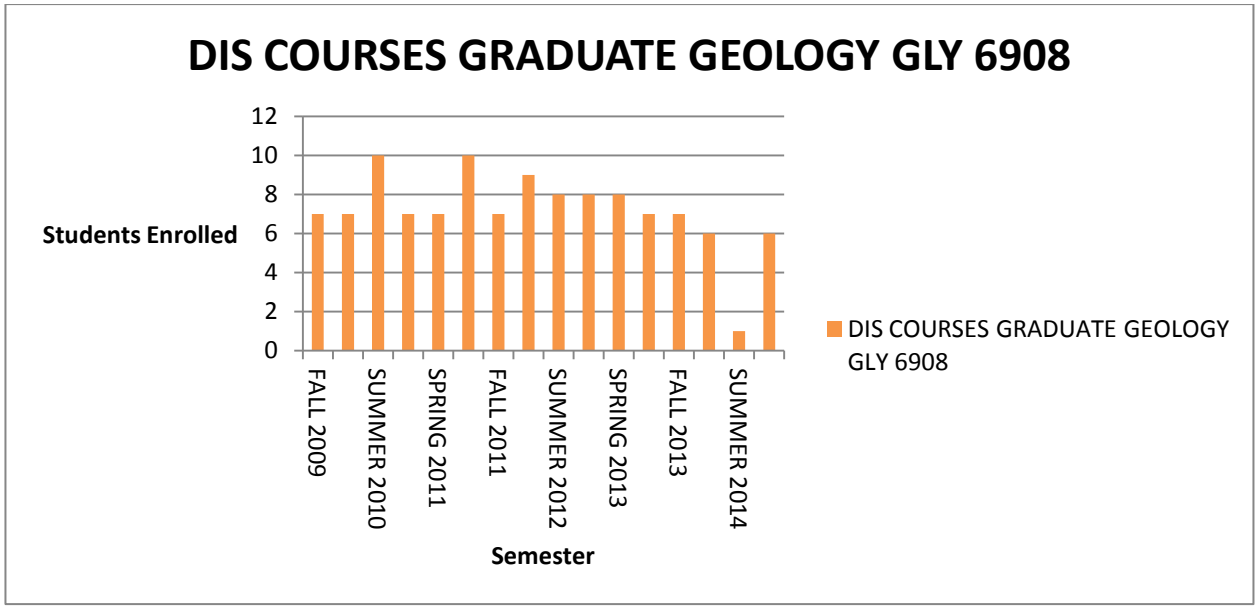
Graduate Geology	**American Indian/Alaskan Native**	**Female**			2	11
		Male				8
		Total			**2**	**19**
	Asian or Pacific Islander	**Female**	1	1	14	155
		Male			13	119
		Total	**1**	**1**	**27**	**274**
	Black (Not of Hispanic Origin)	**Female**			10	624
		Male			20	265
		Total			**30**	**889**
	Hispanic	**Female**			27	495
		Male		1	25	318
		Total		**1**	**52**	**813**
	White (Not of Hispanic Origin)	**Female**	8	6	158	1,926
		Male	4	3	143	1,233
		Total	**12**	**9**	**301**	**3,159**
	Non-Resident Alien	**Female**			38	177
		Male			53	200
		Total			**91**	**377**
	Not Reported	**Female**			4	41
		Male				30
		Total			**4**	**71**
	Total	**Female**	9	7	253	3,429
		Male	4	4	254	2,173
		Total	**13**	**11**	**507**	**5,602**

There are twice as many female as male students in the MS in Geology program. The Geology graduate students are overwhelmingly white, non-hispanic, with only one Hispanic and two Asian graduate students in the program. The diversity is much less than the college or university.

Scholarly Activity

Our Geology M.S. students actively present at conferences as well as publish their research in peer reviewed journals. Conferences that our students have presented at include, the Geological Society of America, The American Geophysical Union, the Applied Geography Conference, and the FAU Graduate Research Symposium. Journals that our M.S. Geology students have published in include, the Journal of Environmental Management, the Florida Geographer, and Papers of the Applied Geography Conferences. Additionally, our students have published white papers and articles in newsletters.

Table 45 GLY 6908 Graduate DIS course trend



The DIS research course enrollment in the graduate program is relatively high, the numbers reflect both MS students and beginning Ph.D. students. Both groups tend to do pilot projects prior to their thesis/dissertation proposals as DIS projects. There are few graduate courses offered in the summer, and until recently TAs were required to be enrolled in 6 credits in the summer. There is no longer a requirement that TAs enroll in more than one credit in the summer, so there were fewer DIS projects in the summer of 2014. It should be noted that only one three credit DIS project may count towards a degree, each student may enroll only once in GEO 6908.

Advising procedures

All newly admitted MS students are considered non-thesis and are advised by the Graduate Program Director. Students wanting to do the thesis option are advised to take Thesis Seminar at its first availability. During the Thesis seminar course, students must obtain a thesis advisor, who then takes over all advising for that student from that time forward until they graduate. Both Thesis are required to complete their Plan of Study during the Thesis Seminar course. Non-thesis students are required to complete their Plan of Student by the end of their first semester.

Once a non-thesis student's plan of student is completed, they only need to have further advising if they wish to take courses not on their Plan of Study. Thesis students are encouraged to be in regular contact with their thesis advisor, particularly once they start their thesis work.

Also graduate students receive advising emails throughout the semester to remind them of important requirements and deadlines

Placement rates/employment profiles

There is no information available on this topic. One former MS student works at Exelis Aerospace Defense Contractor. Her starting salary, one year out of the masters program was $89,000, and she was told that no one, in a global search had her mixture of skills, including geology, gis, digital image analysis, and lidar. The broad Geoscience mixture of our program really helped her. Below is a list of other former Geology MS students' job placement based on faculty memory

- Project Manager, Bureau of Reclaimation, Sacramento District, U.S. Army Corps of Engineers
- Stable Isotope Geochemist, Dolan Integration Group
- Hydrologist, U.S. Geological Survey, Raleigh, North Carolina
- Hydrologist, U.S. Geological Survey, Davie, Florida (2 of our M.S. Geology alumni)
- Hydrogeologist, South Florida Water Management District
- Hydrogeologist II, Dept. of Regulatory and Economic Resources-Division of Environmental Resources Management, Miami-Dade County
- Atlantic Engineering Group, Braselton, Georgia
- Adjunct Professor, Broward Community College
- Ph.D. student Texas A & M

Retention rates

The only retention data that exists is from the college starting in the Spring of 2013. Since that time, there has been one part time Geology masters student who has left the program.

Graduation Rates

Table 46 Gradutation Rates, MS in Geology

	Year Degree Granted												All
	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2010-2011	2011-2012	2012-2013	2013-2014	
Masters	8.0	5.0	4.0	7.0	7.0	5.0	3.0	7.0	6.0	4.0	2.0	2.0	60.0

Our graduation rates have been declining in general due to the lack of TA funding for the masters program, and also due to the amount of TA funding when we had it, which was not competitive with nearby FIU. We used to offer $5,000 a semester, and an 80% waiver of tuition and fees, FIU has offered $10,000 a semester, 100% waivers of tuition and fees, and health insurance.

Student Recruitment

The recruitment grant program with the Graduate College at FAU provides funds that can be used to advertise to prospective students at academic conferences. We make active use of those funds to send faculty to conferences locally, nationally, and internationally to increase our visibility, promote our research programs, and to concomitantly staff recruitment booths with informational materials and face to face interactions. Since developing the Ph.D. program however, the funding for the MA in Geography program has reduced to an occasional trickle, and there is currently no permanent money earmarked for TA stipends for MA students. Prior to losing the MA money, we were losing students to other universities because the amount was lower than offered at other state universities. Without funding for masters students, there is little that can be done to encourage students to come, when other state universities fund positions and fund them better than FAU does.

Doctoral Program

Background

The Department of Geosciences at Florida Atlantic University offers advanced graduate training leading to the degree of Doctor of Philosophy (Ph.D.) in Geosciences. This professionally oriented program combines department specialties in geography and geology with other cognate areas in the College and the University through an innovative curriculum that includes environmental science, earth science, ecology and conservation biology, chemistry, anthropology, civil engineering, geomatics engineering, ocean engineering and urban and regional planning. The program provides advanced research and technical training to allow its graduates to find solutions to problems. While the main focus of the degree is on traditional, full-time students, the degree program also welcomes part-time students who wish to maintain their professional employment while earning their doctoral degree. Doctoral students in the program specialize in one of the following three areas, hydrology and water resources, urban development and sustainability, and cultural and spatial ecology.

Admissions Criteria

Individuals may be admitted to the doctoral program in Geosciences based on the following requirements:

1. Minimum of a Bachelor's degree in a field of geosciences or related area. Students who have already earned a Master's Degree or equivalent in geography, geology or related field may be admitted to the doctoral program and may be awarded up to 30 credits toward the Ph.D. in Geosciences. Geosciences-related areas include anthropology, biology, chemistry, civil engineering, geomatics engineering, ocean engineering, environmental science, public administration, and urban and regional planning.
2. International students whose native language is not English must score at least 550 on the paper-based TOEFL or at least 213 on the computer-based test.
3. A minimum score of 146 verbal and 144 quantitative on the New GRE or a combined score of 1000 or above in the Quantitative-Verbal sections (minimum of 500 on each section) on the old GRE. GRE scores older than 5 years are not accepted.
4. A cumulative GPA of at least 3.0 in the last degree program of the applicant.
5. Three satisfactory professional and/or academic letters of reference, one of which must show an indication of support from a Geosciences faculty member with doctoral faculty status at FAU, or an approved cognate faculty member with doctoral faculty status at FAU, of a willingness to supervise doctoral research of the applicant, if admitted.

Student applications are accepted for the Fall semester cycle only. Completed applications must be received by March 15 for residents and by February 15 for international students. The Graduate Admissions Committee for the doctoral program meets within one week of the deadline and selects candidates for recommendation to the Graduate College.

Enrollment Information

The first students entered the program in the August 2009 with 10 students, 7 full-time and 3 part-time. Currently, the program has the capacity to support 19 full-time students on teaching assistantships (TA). Typically, there are limited funds available for research assistantships (RA), depending on faculty advisor's grants. During the 2014-2015 academic year there are 2 students funded by grants as RA's. In addition, because our program is designed to cater to the professional community of our service area, approximately 25% of our enrolled students are part-time (7 during the 2014-2015 academic year).

Table 47 Analysis of Headcount Activity

Number of Students	2009-10	2010-2011	2011-2012	2012-13	2013-14
Beginning of year	10	16	21	24	27
Admitted for following fall	6	5	5	7	4
Graduated			(2)	(4)	(4)
End of year	16	21	24	27	27

The IEA data does not separate Geoscience Ph.D. information from the Geography and Geology masters program information, and so this table was produced by hand counting department records.

Average Class Size and Faculty/Student Ratio

Table 48 Average Class Size and Faculty Student Ratio

	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	College Total 2012-2013	University Total 2012-2013
Classes offered	**23**	**29**	**28**	**33**	**25**	**167**	**1,575**
# enrolled	**117**	**130**	**241**	**240**	**213**	**1,386**	**22,406**
Class size	**5.7**	**7.0**	**8.6**	**7.3**	**8.5**	**8.3**	**14.2**
Research	**43**	**33**	**47**	**71**	**63**	**756**	**1,951**

These numbers from the IEA data, are for the departments three graduate programs. Our class size is similar to the college as a whole and smaller than the university average. Since our online programs often run graduate courses with very low enrollments, the faculty student ratio for graduate classroom courses would be a bit larger, probably around 10 to one. The research numbers reflect the number of individual research courses such as DIS, advanced research, Thesis or Dissertation courses. This does not reflect the actual number of credits in each course.

Peer review

The Geoscience Ph.D. program at FAU was compared to similar programs at FIU, USF, Universith of Southern Mississippi and University of Arkansas. FIU is our usual competitor, USF is an aspirational peer program, University of Mississippi is nearly the same size of faculty as our program, and University of Arkansas is a Geography-Geology program, but with a Geology Ph.D.

Table 49 Comparison of the Geoscience Ph.D. program to other Peer Review Instititutions

Curriculum (# credits)	FAU	FIU	USF Geography	Univ of S. Mississippi (Geography)	U of Arkansas
Core Courses	9	13	6	12	3
Req Geoscience Courses	48	12	39	54 or unclear	48
Electives	36	26	27	0?	6
Dissertation	18*	24	18	12	18
Total Credits	90	75	90	84	75
Courses Offered (# courses)	FAU	FIU	USF	Univ of S. Mississippi	U Arkansas
Environmental	5	32	8	9	2
GIS/Remote Sensing	10	6	8	5	7
Climatology	1	15	1	3	3
Geology	11	77	14	18**	15
Geography	5	0	27	19	10
# Courses	32	130	58	33	37
Number of Geoscience Faculty	12	38	51	11	23

*12 credits research credits/6 credits dissertation
**Not part of the geography Ph.D.
+electives

Several of our peer institutions used in the Masters and Bachelors programs do not offer a Ph.D. Those that do offer a Ph.D. either in Geography, Geology, Environmental Science or both, but do not offer a Geoscience Ph.D. One Geography-Geology program that does offer a Geoscience Ph.D. is University of Arkansas so they were used as an aspirational peer institution.

The University of Arkansas is a Geography-Geology department that offers a Geoscience Ph.D. program that is primarily applied to Geological research, but includes GIS curriculum. Most of the human Geography coursework is applied to a Geography masters degree. The required geoscience courses and the elective courses are the same as at FAU, but there are no Geography courses other than GIS courses. The number of graduate GIS courses is smaller. The faculty is twice our size, so we appear to be doing a good job producing a program with half the faculty that is comparable in size. Ours is more diverse, theirs is more focused.

FIU Earth Science department represents a recent merger of the geology and environmental science departments. Their Ph.D. in Earth Systems Science has a concentration in Geoscience and one in Natural Resource Science and Management. Our Geoscience Ph.D. will be compared to their Ph.D. With their 38 faculty, they are able to offer many more courses in Geology Climatology and Environmental science than we can offer. We are significantly stronger in GIS curriculum, and require 48 credits of Geoscience courses in our Ph.D. whereas they only require 12 credits of Geosciences in their degree. While they have many more environmental science courses than we have, we draw heavily from FAU's Environmental Science and soon to be launched Marine Science programs.

University of Southern Mississippi is a Geography-Geology deparment with a Ph.D. in Geography. Their curriculum is stronger in environmental science and geography, but ours is stronger in GIS, and we do not focus on regional geography which accounts for many of their geography courses. Our program is focused more on applied environmental issues in urban and natural systems.

University of South Florida has a school of Geosciences with separate geography and geology Ph.D. programs. The Geography Ph.D. program has 14 geography faculty, but 51 faculty overall, while we have 14 geography, geology, and geophysics faculty. USF have far more Geography and Geology courses than our program does, but we have slightly more GIS courses than they do.

Curriculum

The Doctoral degree in Geosciences was unique in the state of Florida at the time that it was developed in that it was conceived as an applied degree in Geoscience, much like a PSM degree. It was applauded by the state legislative committee as a model for this new type of degree program, focused on existing job markets. The principle was that there were working professionals in the state that had backgrounds in some areas of environmental, urban or geoscience who needed additional, multidisciplinary training in related fields. For instance, an environmental analyst who needed to learn to work with remote sensing, digital image analysis and GIS for vegetation mapping with satellite imagery, or an urban planner who needed to work with LiDar data and GIS to better map and monitor urban elevations and sea levels in coastal areas.

Doctoral students in the program specialize in one of the following three areas, hydrology and water resources, urban development and sustainability, and cultural and spatial ecology.

Degree Requirements

A total of 90 credits beyond the bachelor's degree or 60 credits beyond an earned master's degree in a related field (as defined under Admission Requirements), admission to candidacy and successful defense of a research dissertation in an approved area within the geosciences will earn students the Ph.D. in Geosciences.

A minimum of 54 credits out of the 90 credits presented for the degree must be earned from the Geosciences Department (courses with EVR, ESC, GEA, GEO, GIS and GLY prefixes). No more than 36 credits of the 90 total credits submitted for the degree may come from outside the Geosciences Department. This allows students the flexibility of an interdisciplinary type of degree, but still maintains the integrity of a degree program that builds upon the foundations of the Geosciences. Thus, students who are admitted to the program with a master's degree in an approved related or cognate area as opposed to a master's degree in geography or geology, may apply the 30 credits from that related area to the doctoral in Geosciences and may take up to 6 more credits in approved cognate areas outside of geosciences.

1. Students must earn a cumulative grade point average of 3.0 or higher and a grade "B" or higher in any course applied to the degree program.

All students are required to complete a core of 9 credits in the Geosciences as listed below. All must be completed prior to applying for candidacy.

Geosciences Core (9 credits required)		
Research in the Geosciences	GEO 6118	3
Thesis Seminar	GLY 6931	3
Geosciences Colloquium Series*	GEO 6920	3

* This is a 1-credit course with content that varies each semester. Students are required to take this course for three semesters for a total of 3 credits. Students may not apply for candidacy until all colloquium requirements have been completed.

Additional Courses

The remaining 57 credits for students entering directly from their bachelor's degree program or remaining 27 credits for students entering with a master's degree in geography, geology or a related field will be made up of coursework in geography, geology and interdisciplinary cognates as appropriate to the student's research plan. No more than 3 credit hours of GEO 6908 Directed Independent Study or GLY 6908 Directed Independent Study may be used to meet this requirement without doctoral committee and Department Chair approval. All courses will be at the 5000 level or above, however, no more than 9 credits of 5000 level work may be applied to the degree. The student's major advisor and committee must approve all coursework in the student's program.

Note: Courses designated as undergraduate proficiency courses, generally for students coming into the program with a non-related undergraduate degree, may not be used to satisfy course requirements for the degree. Undergraduate proficiency courses will be outlined in the admissions notification.

The candidate must also complete dissertation research under the direction of a faculty member in the Department or other Department-affiliated units. During the dissertation research and writing phase the student must take 24 research and dissertation credits, a minimum of 12 credits of GEO 7978 Advanced Research and 6 credits of GEO 7980 Dissertation must be included. The candidate must submit a written dissertation, present it publicly, and satisfactorily defend the research dissertation. The defense includes an oral examination of the research presented.

Learning Goals
The overall learning goals for the PhD Program in Geosciences are as follows.

- Students will be well prepared for professional positions in the modern workforce.

- Students will have developed a set of advanced skills associated within their specialization.
- Students become engaged in appropriate academic and social activities within their field.

The following table summarizes the approach used to assess these learning goals.

Table 50 Geoscience Ph.D. Learning Goals and Assessments

Learning Goal	Program Component	Content	How Assessed
Students will be well prepared for professional positions in the modern workforce			The department tracks students as they graduate and gathers employment information for placement analysis
Students will have developed a set of advanced skills associated within their specialization	Candidacy exams and successful defense of the doctoral dissertation	Written and oral major and minor examinations and independent research projects performed under faculty guidance	Committee evaluations of subject knowledge and application with independent research
Students become engaged in appropriate academic and social activities within their field			Record of attendance/participation at professional meetings and other professional activities

Scholarly Activity:

Natural Hazards Review

International Journal of Mass Emergency and Disasters

UNEP Reports

USGS Carbonate Aquifer Laboratory

Everglades National Park Reports

Southeastern Geographer

Florida Geographer

Journal of Applied Meteorology

Proceedings of the Applied Geography Conference

Advising Procedures

The program is administered by the Director of the Doctoral Program in Geosciences. The Graduate College Governance Document requires that each doctoral candidate have an advisor and a Supervisory Committee. These roles are fulfilled by each student's Faculty Advisor and the student's Dissertation Committee, as discussed more fully in following paragraphs.

Director

The Director of the Doctoral Program in Geosciences is a Graduate Faculty member from the Department of Geosciences and is appointed by the department Chair. The Director is responsible for monitoring the PhD Program on a day-to-day basis, carrying out the administrative duties, and processing applications to the program and making decisions on admissions in consultation with Ph.D. Program Admissions Committee (3 additional faculty).

Faculty Advisor

Before the student submits an application for admission the program, each prospective student must identify and have a mutually agreed upon Faculty Advisor who is willing to commit in writing to the Ph.D. Program Admissions Committee their intent to advise the incoming student. Thus, all students enter the program with a Faculty Advisor. The responsibilities of this advisor include the following:

- Work with the student to develop/modify a plan of study.
- Supervise the qualifying research project.
- Provide general guidance to the student regarding the student's overall teaching, academic and career development.

Dissertation Committee

Within their first year in the program, the student is responsible, in consultation with their Faculty Advisor, for finding 3 additional program graduate faculty to serve on their dissertation committee. The Dissertation Committee serves as the Supervisory Committee during the dissertation stage and is responsible for approval of the dissertation topic and proposal, oral and written comprehensive examination, evaluation of the dissertation defense, and approval of the final document. The Dissertation Committee consists of at least four Graduate Faculty members, one of whom is the Faculty Advisor/chairperson. In summary, advising for PhD students is multi-faceted and personal. Each student has numerous opportunities for receiving advice and guidance throughout his or her program.

Placement Rates

Although a young program, we have already had success placing graduates in faculty positions in institutions of higher education. However, our emphasis on professional training also results in placement in non-academic positions in the public and private sectors.

Placements over the past four years are as follows:

- University of Texas, San Antonio, Tenure Track
- Indiana University of Pennsylvania, Tenure Track
- University of Louisiana, Lafayette, Tenure Track
- Radford University, Visiting Assistant Professor
- Florida Atlantic University, Adjunct
- Institute for Global Environmental Strategies
- Office Depot, Headquarters
- Coastal Education and Research Foundation, Inc.
- Casa Jardin, Co.

Retention Rates

The only retention data for the Ph.D. program is from the college, and it only goes back to the Spring of 2013. Since that time, there have been four Ph.D. students who have left the program. Two were part time, and their job pressure increased and caused them to withdraw. A third that was a GTA took outside employment and withdrew from the program. A fourth changed relationships and moved out of state. Of the 44 students admitted to the Ph.D. program since 2009, 10 have graduated, 30 are still in the program and 4 have withdrawn from the program.

Graduation Rates

The first 2 graduates of the program were in the Spring of 2012 with 4 graduating in each of the following 2 years. For the current academic year, 5 students have defended their dissertations and will graduate in December of 2014.

Recruitment Strategies

Initially, little effort was placed on recruiting efforts because of the pent-up demand for the degree; word of mouth has been extensively relied upon. However, we do also pursue several proactive approaches to recruitment that have promise.

First, the recruitment grant program with the Graduate College at FAU provides funds that can be used to advertise to prospective students at academic conferences. We make active use of those funds to send faculty to conferences locally, nationally, and internationally to increase our visibility, promote our research programs, and to concomitantly staff recruitment booths with informational materials and face to face interactions.Second, we use the recruitment grant funds to provide fellowships, President and Provost Fellowships, to our top applicants to our graduate programs. These funds increase stipends and are helpful in attracting the best talent.

Faculty

Administrative Structure

The Interim Department Chair, Charles Roberts is also the Associate Dean of Graduate Studies for the College of Science. A permanent chair is needed. There are two assistant chairs: Dr. David Warburton represents Geology and Dr. Scott Markwith represents Geography. The assistant chair of Geography is also the director of the Ph.D. in Geoscience program, while the assistant chair of Geology is the undergraduate advisor for Geology. A third faculty member, Dr. Tobin Hindle is the director of the both the Geography and Geology masters programs, and a fourth faculty member, James Gammack Clark is the undergraduate advisor for the Geography majors. Dr. Xie is the director of the GIS center. Colin Polsky is tenured in the Department of Geosciences, but he is administratively outside the department with the Center for Environmental Studies, a college level center.

Profile

The department in 2014-2015 consists of 13 faculty, with 2 Asians, 1 Catalan, 1 Russian, 1 from the U.K and the rest are Americans. In terms of Gender there are 4 females and 11 males. All are full time, however two members, Dr. Roberts and Dr. Xie are Associate Deans and are half time appointments in the Deans office. Most faculty are on 9 month appointments, but Associate Deans and Instructors are on 12 month appointments. With the loss of Dr. Ivy to the Dean position, and Dr. Roberts and Dr. Xie, we are down two full time positions at the same time that we are up on online course offerings. We are woefully short of faculty that can deliver graduate courses and supervise graduate students. We need another Ph.D. level instructor position to help with online course delivery, and a Ph.D. faculty position to help with GIS Dissertation supervision and research, and a Ph.D. faculty position in the area of Human Geography, probably Coastal Hazards, to help with research and dissertations related to the south Florida urban environment, to support the Geoscience, Coastal and Marine Science, and Center for Environmental Studies research and education agendas. On the Geology side, we have one hydrochemist, but she cannot satisfy the demand for advising in the hydrogeology areas we may need to consider

hiring a hydrological modeler. There is also a need for additional help in the area of stratigraphy and structural geology and in field geology for the field camps.

Table 51 Geoscience Faculty

Name	Rank-Position	Percent time/months	Academic Specialty
James Gammack Clark	Instructor	100%/12	Geovisualization, Field GIS
Dr. Tobin Hindle	Senior Research Sci.	100%/9	Human/Environmental
Dr. Zhixhiao Xie	Professor, Assoc, Dean	50%/12	Object Oriented GIS
Dr. Caiyun Zhang	Assistant Professor	100%/9	Hyperspectral, Lidar
Dr. Charles Roberts	Associate Professor Associate Dean Interim Chair	50%/12	RS/Digital Image Analysis Urban Historical Cultural Landscapes
Dr. Maria Fadiman	Associate Professor	100% (sabbatical)	Ethnobotany, Human/Env
Dr. Scott Markwith	Associate Professor Associate Chair	100%/9	Biogeography, Restoration Ecology
Dr. Tara Root	Associate Professor	100%/9	Hydrogeology
Dr. Xavier Comas	Associate Professor	100%/9	Geophysics, GPR
Dr. Edward J. Petuch	Professor	100%/9	Paleontology
Dr. David Warburton	Associate Professor Associate Chair	100%/9	Geochemistry
Dr. Anton Oelenik	Associate Professor	100%/9	Stratigraphy, Paleontology
Dr. Tiffany Briggs	Assistant Professor	100%/9	Coastal and Marine Geology
Dr. Russell Ivy	Professor, Interim Dean	Promoted to Associate Provost	Tourists, Transportation
Dr. Colin Polsky	Professor, Director of the Center for Environmental Studies	0	Sustainability Science

Table 52 Instructional Faculty and Adjuncts by Gender and Ethnicity, Geosciences

Adjuncts		Geosciences		College Total	University Total
		2010-2011	2011-2012	2012-2013	2012-2013
American Indian/Alaskan Native	Female				1
	Total				1
Asian or Pacific Islander	Female			1	11
	Male			1	11
	Total			2	22
Black (Not of Hispanic Origin)	Female			3	33
	Male				14
	Total			3	47
Hispanic	Female				10
	Male				10
	Total				20
White (Not of Hispanic Origin)	Female			14	288
	Male	2	2	13	219
	Total	2	2	27	507
Total	Female			18	343
	Male	2	2	14	254
	Total	2	2	32	597

Source: Instruction and Research File

Faculty teaching loads and methods of calculation

Teaching loads in Florida are based on the 12 hour rule, where a 3 credit course is defined as 3 contact hours plus seven hours of preparation and office hours. A work week then is composed of four 10 hour units, so the maximum teaching assignment would be four 3 credit courses with no other assignments possible. The model in the department is 2 courses for 50% of the assignment, plus 25% research assignment, mandated by the collective bargaining agreement, plus an additional 25% based on some combination of research, service and teaching.

Normally, a faculty member in the Geoscience department with two peer reviewed publications per year or an active grant program or a significant service role such as managing a degree program, will teach two courses per semester, one graduate and one undergraduate. If they are doing several of research and service activities, for instance large grants, or two publications and managing a graduate program, they may have a two-one teaching program.

Some courses are considered less of a teaching load. For instance, Remote Sensing of the Environment is taught online at both the graduate and undergraduate level. The graduate level has an additional research project to justify the graduate credits. The graduate students do the full undergraduate course and labs, and also do the graduate research project. Both courses were developed by the faculty, but a Ph.D. student is assigned to deliver the undergraduate course and grade the undergraduate components of the graduate course. The faculty member is assigned as instructor to both courses, but only

grades the graduate research project. The work for the graduate instructor is light, less than two hours a week. He would then get a third course assignment as if the graduate course plus the undergraduate course, managed primarily by a TA count as one. In practice, this 3 course experience is often lighter than a 2 course classroom assignment.

Strategic Planning for New Hires

The department strategic plan called for five new positions. The top position, Coastal Processes was filled last year by Dr. Briggs. Since the strategic plan was developed additional faculty have been lost to the Deans office and the Provost office, greatly weakening the human geography side of the curriculum.

Position 1 Human Geography: Sustainability Science and Urban Coastal Hazards

Currently the department has lost its urban faculty, but owns a series of urban planning oriented courses. In addition a close connection exists with the Center for Environmental Studies, "The vision of CES is to improve Florida's sustainability through research, education and outreach on ecology, climate change, and society." Is supported by developing undergraduate and graduate level coursework within the Geoscience and particularly Human Geography curriculum. Currently there are no courses or faculty who emphasize sea level rise, sustainable cities, urban planning or policy applications, because these faculty have moved on to the Deans office and Provost office. A new position, focusing on the urban side of coastal hazards through sustainability science would stabilize this side of the Geography program as well as the coastal side of the proposed Coastal and Marine Science degree program. While much of the emphasis in the Geography programs has been urban, and while many of the employment opportunities for our graduates are in urban planning and urban GIS. In fact, more than half of the undergraduates go on to careers in urban planning and policy, and the south Florida megalopolis, laying between the Atlantic ocean and the everglades is strategically located around the FAU campuses.

Position 2 Coastal Zone Restoration

The department strategic plan calls for a new position in the area of human/environmental interactions with an emphasis on native and invasive species and restoration science in the coastal zone. This is a growing area of research in the department and a hire in this area will contribute strongly to the Environmental Science degree program and the Coastal and Marine Science proposed degree program.

Position 3 Quantitative Methods/ Spatial Data Analysis/Remote Sensing GIS Position

With the loss of Dr. Roberts and Dr. Xie to administration, there is a need for additional faculty whose primarly research area involves Geographical Information Systems applications but who can also teach the quantitative methods course for Geography degree programs. Currently there is one Ph.D., Dr. Zhang, left in the full time faculty in the department and this is not enough to sustain a department research mission and to supervise the large number of graduate students who want to work in this area.

Beyond the department Strategic Plan:

GIS Online Curriculum Position

The department has been expanding online curriculum online curriculum offerings even while the faculty have been shrinking, due to promotions to the Deans office. Immediate future needs are for a GIS instructor and course developer to support and manage the increasingly large number of online courses developed by faculty but owned by the department.

Faculty assignments for these courses are reduced to overseeing content development, but someone needs to be responsible for migrating courses from older formats to newer ones. For instance, the move from department servers to the cloud involved reformatting course components, which is too much work for a faculty member who is not receiving full credit for the course. Since faculty roles have been reduced to updating content, technical expertise from a background within GIS is needed to migrate online components from older formats to newer formats every few years and to deliver undergraduate and graduate versions of courses. This would be a Ph.D. in Geosciences or related fields, with expertise in online course development and delivery. Currently, we have more online GIS courses to offer than we can deliver on a semester by semester basis, which will become important when we start to offer an online MS degree in GIS. We currently offer many of the online graduate courses only once a year.

Hydrogeology Modeling/Stratigraphy/Structural Geologist with Field Capabilities

Our Hydrologist cannot currently handle the large number of graduate students wanting to work in her water chemistry lab. We are currently experiencing bottlenecks with structural geology, junior field camp and other courses, which indicate that there is a need to add additional faculty to the program. We are rarely able to offer a sufficient number of graduate courses in Geology. We do not have two faculty members going into the senior field camp course. A paleoscientist retirement in 2016 will result in a vacant line and it will be important to think about what area of expertise is important for the future of the department. Part of this thinking must involve the department decision about the future of field courses in the curriculum.

Research

Table 53 FTE Devoted to Research

Faculty Person Years and FTE Devoted to Research					Geosciences			College Total	University Total
					2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Departmental Research	Tenured & tenure-earning faculty	Professor, Assoc Professor, Asst Professor	Person-Years		1.7	2	1.1	20	92.7
			FTE		2.3	2.6	1.5	26.7	123.6
	Non-tenure-earning faculty	Instructors, Lecturers, Visiting Faculty	Person-Years		0.4			1.4	4.1
			FTE		0.5			1.8	5.5
	Other personnel paid on faculty pay plan		Person-Years					1.6	15.9
			FTE					2.1	21.2
	Total		Person-Years		2.1	2	1.1	22.9	112.8
			FTE		2.7	2.6	1.5	30.6	150.4
Sponsored Research	Tenured & tenure-earning faculty	Professor, Assoc Professor, Asst Professor	Person-Years		0.7	0.9	0.7	6.4	24.9
			FTE		1	1.2	0.9	8.5	33.2
	Non-tenure-earning faculty	Instructors, Lecturers, Visiting Faculty	Person-Years			0.1		0.3	3.7
			FTE			0.1		0.4	4.9
	Other personnel paid on faculty pay plan		Person-Years			0		7.3	38.2
			FTE			0		9.8	50.9
	Total		Person-Years		0.7	0.9	0.7	14	66.8
			FTE		1	1.2	0.9	18.7	89

Our department of 13 has an interim chair and associate dean, and two instructors without a significant research assignment. That leaves 10 faculty members who contribute to the research of the department. The annual FTE of the department averages to slightly over 1, or the equivalent of one full time researcher, where as the college average is slightly greater, about 1.8 for some 100 faculty, but this number includes instructors.

Table 54 Scholarly Productivity of Faculty

Research/Scholarly Productivity		Geosciences			College Total	University Total
		2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
1. Books (including monographs & compositions)	#	0	5	1	22	146
2. Other peer-reviewed publications	#	5	16	21	229	1,161
3. All other publications	#	5	8	4	31	501
4. Presentations at professional meetings or conferences	#	22	29	39	308	1,435
5. Productions/Performances/Exhibitions	#	0	0	0	36	377
6. Grant Proposals Submitted	#	10	11	9	109	385
Sponsored Research & Program Expenditures						
7. Organized Research	#	$114,523	$134,483	$235,537	$8,625,887	$15,603,749
8. Sponsored Instruction	#	$28,037	$69,555	$37,964	$1,242,409	$6,138,254
9. Other Sponsored Activities	#	$124,833	$0	$0	$620,037	$2,565,16

The production of books and monographs for the department tends to be uneven in most years, with most of the production resting on Dr. Petuch, who is prolific in writing books. Other faculty are prolific at peer reviewed publications, the numbers are high in the years prior to tenure. In the years shown here, three of the ten faculty went up for tenure, one went up for promotion to full professor, and one will go up next year. Since publications are valued more than grants, the tendency is to get sufficient grant funding then concentrate on peer reviewed articles. In general, the department faculty present at conferences at a higher rate than others in the college.

Table 55 Scholarly Output of Tenure earning Faculty

Scholarly output per tenured and tenure earning faculty member		Geosciences			College Total	University Total
		2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
1. Books (including monographs & compositions) per faculty member		0.0	0.5	0.1	0.2	0.2
2. Other peer-review publications per faculty member		0.5	1.5	1.9	2.1	1.8
3. All other publications per faculty member		0.5	0.7	0.4	0.3	0.8
4. Presentations at professional meetings or conferences per faculty member		2.0	2.6	3.5	2.9	2.3
5. Productions/Performances/Exhibitions per faculty member		0.0	0.0	0.0	0.3	0.6
6. Grant proposals submitted per faculty member		0.9	1.0	0.8	1.0	0.6
Sponsored Research & Program Expenditures						
7. Organized research expenditures per faculty member		$10,411	$12,226	$21,412	$80,616	$24,534
8. Sponsored instruction expenditures per faculty member		$2,549	$6,323	$3,451	$11,611	$9,651
9. Other sponsored activity expenditures per faculty member		$11,348	$0	$0	$5,795	$4,033

This DDI takes the number of research, creative and scholarly activities reported in C1 – 7 and divides by faculty headcount (tenured and tenure-earning faculty only.) The resulting ratios indicate the volume of research, creative and scholarly activity per capita in the department. Numbers in red are higher than the college and university average, numbers in green are lower than the college and university average.

Interdisciplinary Efforts and Community Engagement Efforts

The department of Geoscience is an interdisciplinary department, with its faculty holding terminal degrees in a variety of earth science fields. It has always played a significant role, second only to biology, in the Environmental Science programs participating in the creation of the original certificate and masters degree programs, and it contributes the largest number of courses to the MS degree in Environmental Science. The GIS curriculum is part of the Geomatics degree in Civil Engineering, and three of the GIS faculty are listed as faculty in the Geomatics program in the College of Engineering. Dr. Hindle and Dr. Root have worked with faculty in the College of Education on environmental education initiatives. Dr. Roberts and James Gammack Clark have participated in initiatives with the Department of Anthropology in the College of Arts and Letters, and Dr. Roberts has served on a variety of Archaeology MA thesis committees. Dr. Roberts participates in the Study Abroad program in Venice, run by Ilaria Serra of the Italian Studies program in the department of Languages, Linguistics and Comparative Studies of the College of Arts and Letters. Dr. Edward Petuch has collaborated with and chaired searches for faculty positions in the department of Music, College of Arts and Letters.
The interdisciplinary nature of the Ph.D. program in Geosciences has faculty cochairing committees from Urban Planning, in the College of Social Inquiry and Design, Anthropology in the College of Arts and Letters, and there are many faculty from other programs serving on committees, and many graduate courses from other departments that are utilized by our graduate students in the Ph.D. program.

Community Engagement activities include a strong presence in the Science Olympiad, with three or four Geoscience sponsored and run events each year.

Table 56 Service Productivity

Service Productivity For Geosciences (Source: Dean's Office)		Geosciences			College Total	University Total
		2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
1. Faculty memberships on department, college or university committees	#	56	58	70	273	2,348
2. Faculty memberships on community or professional committees	#	44	24	21	69	972
3. Faculty serving as editors or referees for professional publications	#	22	12	8	96	611

The number of committees that faculty must serve on at FAU is high, and the Geoscience department has performed well in this area, which is one reason why three of its members have migrated to the Dean's office. Service on professional committees and on journals has recently gone down, probably as a result of the large number of faculty who have gone forward for tenure and promotion in the last few years, focusing more on publication in the years before promotion than service on committees.

Table 57 Professional Service Productivity

Faculty Committee memberships and faculty serving as editors or referees per tenured and tenure earning faculty member	Geosciences			College Total	University Total
	2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
1. Faculty memberships on department, college or university committees per faculty member	5.1	5.3	6.4	2.6	3.7
2. Faculty memberships on community or professional committees per faculty member	4.0	2.2	1.9	0.6	1.5
3. Faculty serving as editors or referees for professional publications per faculty member	2.0	1.1	0.7	0.9	1.0

This next table looks at the membership of committees per faculty member compared to the college and university. We can see for FAU committees the department membership is quite high compared to either the college or university average. This is also true for professional committees, there is a decided effort to get the name of the department out to the disciplines. Even with the decline in the overall number of faculty serving as reviewers or editors, the department average was until last year higher than the College or University average.

Establishment of Goals for Service

College Goal 1 Enrich the Educational Experience

Strategy 2 Improve the Advising system: This has succeeded for both the College and Department as outlined in the beginning of this review, better advising system than before.

Strategy 5 Increase online course offerings by 5% a year- the department in conjunction with elearning is doing very well with this, averaging two course conversions per semester.

College Goal II Inspire Research, Scholarship and Creative Activity

Strategy 1 Provide access for students to be engaged in Undergraduate Research. The Department has participated successfully in the largest multidisciplinary QEP Distinction through Discovery multidisciplinary undergraduate research curriculum project with Civil Engineering developing one new research course and enhancing three existing Geoscience courses with advanced undergraduate research projects. Some student success has been noted with one student winning second place at a professional conference five months after completing the courses. An honors college student won the Broward undergraduate research award for his work in the Geophysics lab in Davie. Other efforts from the Geophysics lab have involved undergraduates in NSF funded projects, working with environmental geophysics in northern peatlands in Maine in the summer.

College Goal 1 Enrich the Educational Experience

Strategy 1 Recruit additional positions has not materialized. Instead the department has lost positions to the Deans office, and has fewer faculty than it did ten years ago. This badly needs to be addressed as new online courses are being added, new

programs are being proposed, and course conversions to online require that new types of faculty positions are needed. It is possible to continue to develop department owned online courses, but they cannot be delivered without hiring additional instructors with backgrounds in Geoscience and online course production and delivery.

Objective B: Strategy 1 Develop BS/MS programs: This effort has failed because SACS has stopped the use of graduate courses to simultaneously be counted towards senior level courses and graduate degrees.
Other goals are restricted by intermittent budget cuts that make expansion of any agenda or initiatives difficult. Most critical are:

Graduate stipends are not competitive with other institutions. The top candidates for the Ph.D. program are lost each year.

Intermittent funding for the masters program makes the program unsustainable. In addition the funding level is considerably less than at nearby institutions, students go to FIU graduate programs then ask FAU faculty to provide data, methods, software, training and serve on their committees.

No medical coverage for FAU graduate students while other institutions now provide coverage as part of the student aid package.

Tuition and fees are not entirely covered by tuition waivers, as they are at other graduate programs

Cost of living is higher in southeast Florida than in other parts of Florida or the nation

Assessment of how well goals are being met

From Part III, Assessment Service evaluation by the Dean, 2011-2012 (latest available)

Service activity by the department is more than acceptable, with outside service activities increased from the previous year, and in all cases exceeded college and university means for faculty.

A service assessment plan is in place.

Weaknesses and threats that impede program progress for the Department

Enrollment targets for undergraduate courses are usually 24 students. We are frequently called upon to close courses with 48+ students due to lack of funding for instructors. With three faculty moved completely or partially out of the department and into the Dean's office we are critically understaffed, particularly in the Geography and GIS areas.

Lack of funding for Masters level TA positions has significantly reduced our graduate programs. Our graduate courses are often difficult to fill. The funding that exists for both the Masters and Ph.D. program is so non-competative that we routinely lose the top tiered applicants to other state universities. Less than 50 miles away is another state university that can offer a masters student $19,000 a year, plus medical benefits plus a full waiver of tuition and fees. We can offer no medical benefits, a partial waiver of tuition and fees and slightly more than half that stipend.

Future Directions for the Department

More research faculty and teaching faculty (instructors) are needed for the department to grow and deliver multidisciplinary research oriented curriculum. To offer the MS in GIS will require a large number of graduate GIS courses every semester, so an instructor with a Ph.D. and online learning course development experience, will be needed, while the Ph.D. program demands will require additional faculty researchers with experience in applied GIS. The loss of the two human urban geographers to the Deans office leaves the program weak in the urban area, however by adding an urban geographer focused on sustainability science, emphasizing urban coastal hazards, we could build on the mission of the Center for Environmental Studies. A plan is underway through working with the CES to develop a sequence of courses related to sustainability science

and climate change issues within the human geography curriculum. On the earth science side of the department, there is a need to expand the hydrology expertise, the field expertise and have additional faculty that can cover structural geology and basic introductory geology courses.

Better support is needed for the graduate students, both in terms of stipends and health care coverage, and more positions at the Masters level are needed.

Participation in the new proposed Coastal and Marine Science degree should continue and expand.

Taking the Bachelors degrees in Geography and considering taking the BA in Geology online, along with the MA in Geography should be the highest immediate priority. All can be online degrees by the spring of 2016. Only a few course conversions are needed.

Developing the MS in GIS as a new online degree should be a priority. It lacks one course from being viable, and that course is under development in the fall of 2014.

The next phase of merging the geology and geography sides of the program together, the development of the Geoscience MS and Geoscience BS, need to be completed in the next two years. When the degree proposals are ready, the curriculum will already be sufficiently online to market as a pair of blended online degrees.

Developing Market equity pricing for the online degrees should be investigated, and potentially follow the approval of online degrees.

Working with the Center for Environmental Studies, a focus for new human geography curriculum related to sustainability science, sea level rise and climate change impacts on urban south Florida should be considered.

Strengthening the relationship between the department and the professional Florida Association of Professional Geologists has resulted in the knowledge that the first step of certification for professional geologists can begin right after graduation, formerly this began after five years of professional employment. The possibility exists to develop a preparation course to sit for the first exam. The Earth Science committee should consider developing such a course as no other university offers such an opportunity.

Student Feedback

In 2012-2013, the exit survey for Geography graduating seniors included 8 individuals. Two said they would definitely choose the same major, while 6 said that they probably would choose the same major. None said that that they would not choose the same major. Five said that they would go into the job market, while three said that they were going to and had been accepted into graduate school. Six said they will live in south Florida while two said that they would live elsewhere.

As far as the program prepared them for the job market, non said that they were very satistfied, but five were satisfied while three were dissatisfied. One was very satisfied with preparation for graduate school, while five were satisfied and one was dissatisfied with preparation for graduate school. In terms of the overall quality of the program, one was very satisfied, six were satisfied, and one was dissatisfied.

For Geology graduates in the exit survey of 2012-2013, there were four individuals. Two said they would definitely choose the same major, while 1 said that they probably would choose the same major and 1 said that that they would probably not choose the same major. Five said that they would go into the job market, while three said that they were going to and had been accepted into graduate school. Six said they will live in south Florida while two said that they would live elsewhere.

As far as the program prepared them for the job market, none said that they were very satistfied, one was satisfied while two were dissatisfied. Four were satisfied with preparation for graduate school. In terms of the overall quality of the program, one was very satisfied and three were satisfied.

Graduate Exit Survey

What is your Major	MA Geography 4	MS Geology 4	PhD Geoscience 2
Rating	**Excellent**	**Good**	**Fair**
Quality of instruction	**5**	**5**	
Opportunity to Interact With Faculty	**8**	**2**	
Funding Opportunity	**7**	**2**	
Avail finance support	**4**	**4**	**1**
Adequacy financ support	**4**	**1**	**4**
Research facilities good	**2**	**6**	**2**
Quality dept research	**6**	**2**	**2**
Avail courses	**1**	**7**	**2**
Avail campus you want	**4**	**4**	**2**
Avail time you want	**4**	**5**	**1**
Opportunity research experience/practical skills	**4**	**5**	**1**
Opportunity computer skills	**6**	**3**	**1**
Job preparation	**7**	**2**	**1**
Prep further education	**5**	**2**	**2**
FAU Impact How much Did your graduate education contribute to your ability to:	**Very Much**	**Somewhat**	**Not at all**
Effectively communicate in writing?	**8**	**2**	
Effectively communicate orally	**6**	**4**	
Think logically	**9**	**1**	
Apply research skills	**8**	**2**	
Apply ethical standards	**4**	**5**	
Present at Conferences	**8**	**2**	
Submit to Journals with confidence	**8**	**2**	

In the years that were recorded there were ten respondents, two were Ph.D. students and the others were equally split between the MA in Geography and the MS in Geology. While there was a Poor category and a Don't Know category, these were not used by the respondents. Note that the worst categories are related to budget issues, notably graduate financial support and course availabilities. Online education is the only cost effective tool we have to remedy course offerings, but this is limited to certain types of graduate courses.

Questions for Program Review team

1) Geography, Geology and Geoscience degree programs are not degrees that students think about when they enter the university, yet many of the things that we do are immediately attractive to students. What recommendations do you have for improving the profile of the department to increase the number of majors and the visibility of the degree programs to the public and to throughout the university?

2) There is a debate in the department about whether the geology degree should remain as a separate and distinct program from the geoscience degree at the masters level. To do so requires additional faculty lines and additional stipends for the MS students, so that the program can sustain a level of degree production that is comparable to other institutions. Currently, there are three funded TA positions, this number needs to increase for the program to be sustainable. The Geology faculty are stretched thin trying to cover both the BS and the MS courses. On the other hand, for some areas in Geoscience, the Geology degree requires nearly the equivalent of a BS in Geology including field camp, which blocks many potential geoscientists who plan to work in south Florida in fields such as hydrogeology and environmental analysis from entering the MS program. The Geoscience degree will not have as rigid restrictions on entrance requirements. It is thought that the marketability of the Geoscience degree in some areas is different than the Geology degree. Should the department try to maintain two distinct masters degrees, MS in Geoscience and MS in Geology or does it make sense to offer one degree with a variety of options that include all areas of emphasis within the department?

3) The department is devoted to offering more field courses, and yet it is strained to support the two Geology field courses now required for undergraduate geology BS majors. Should we maintain the current field courses, or revise the field courses to incorporate a greater variety of department expertise and strengths, with more emphasis on Geoscience professional opportunities within Florida?

3) The geography degree is probably going to be replaced with the geoscience degree. Approximately half of the positions for Geographers are human oriented positions in urban planning, environmental analysis and policy and GIS. Should we offer only a Geoscience degree with a focal area that involves less science prerequisite courses for the human geographers, or should we require the human geographers to take the same science courses as the physical scientists?

4) Should the department pursue merger options with other degree programs and units of the university to create curriculum and research synergisms and improve the public awareness and marketability of the FAU earth, environment, coastal and marine sciences?

5) Should the department pursue merger with other units within the university to create curriculum and research synergisms and improve marketability of FAU in the environmental sciences?

Xavier Comas, PhD

A. Professional Preparation

Ph.D. Environmental Sciences, Rutgers University and New Jersey Institute of Technology (Newark, New Jersey), 2005.

B.S. Geology, Universitat de Barcelona (Barcelona, Spain), 2000.

B. Appointments

Associate Professor, Dept. of Geosciences, Florida Atlantic University, Boca Raton, FL (8/13-present): Environmental Geophysics.

Assistant Professor, Dept. of Geosciences, Florida Atlantic University, Boca Raton, FL (8/07-7/13): Environmental Geophysics.

Post Doctoral Fellow, Dept. of Earth Sciences, University of Maine, Orono, ME, (9/06-7/07): Environmental Hydrogeophysics (Geophysical evaluation of biogenic gases in peatlands, continuation of NSF funded project); Dept. Earth and Environmental Sciences, Rutgers University, Newark, NJ, (9/05-9/06): Environmental Geophysics (Geophysical evaluation of biogenic gases in peatlands, NSF funded project); University of Maine / US National Parks Service (10/05-11/05): Environmental Geophysics as part of collaborative research (Nutrient loading to the Sieur de Monts spring, Acadia National Park).

Lecturer, Dept. Earth and Environmental Sciences, Rutgers University, Newark, NJ, (9/05-12/05): instruction of undergraduate courses in Physical Geology, and Environmental Disasters; Academic Foundations Center (AFC), Educational Opportunity Fund (EOF) Program, Summer Session. Rutgers University, Newark, NJ (7/04-8/04; 7/05-8/05): lecture and laboratory instruction of undergraduate courses in Introduction to Geology.

C. Selected Peer-Reviewed Publications

Mount*****, G. and **Comas, X.** In Press. Estimating porosity and solid dielectric permittivity in the Miami Limestone using high frequency ground penetrating radar measurements at the laboratory scale. Water Resources Research, *doi: 10.1002/2013WR014947.*

Comas, X. and Wright*****, W. 2014. Investigating carbon flux variability in subtropical peat soils of the Everglades using hydrogeophysical methods. Journal of Geophysical Research-Biogeosciences, 119, *doi:10.1002/2013JG002601*.

Mount*****, G., **Comas, X.**, and Cunningham, K. 2014. Characterization of the porosity distribution in the upper part of the karst Biscayne aquifer using common offset ground penetrating radar, Everglades National Park, Florida. Journal of Hydrology, *515: 223-236.*

Yeboah-Forson*****, A, **Comas, X.**, and Whitman, D. 2014. Integration of electrical resistivity imaging and ground penetrating radar to investigate solution features in the Biscayne Aquifer. Journal of Hydrology. *515: 129-138.*

Pellicer, X., Linares, R., Gutiérrez, F. , **Comas, X**., Roqué, C., Carbonel, D., Zarroca, M., and Rodríguez, A. 2014. Morpho-stratigraphic characterization of a tufa mound complex in the Spanish Pyrenees using ground penetrating radar and trenching, implications for studies in Mars. Earth and Planetary Science Letters, 388: 197-210.

D. Selected Other Publications or Products/Grants

Comas, X., Kettridge, N., Binley, A., Slater, L., Parsekian, A., Baird, A. J., Strack, M., and Waddington, J. M. 2013. The effect of peat structure on the spatial distribution of biogenic gases within bogs. Hydrological Processes, 28 (22), 5483-5494, *doi:* 10.1002/hyp.10056.

Kettridge, N., Binley, A., **Comas X.**, Cassidy, N., Baird, A., Harris, A., van der Kruk, J., Strack, M., Milner, A., Waddington, J. M. 2012. Do peatland microforms move through time? Examining the developmental history of a patterned peatland using ground penetrating radar. Journal of Geophysical Research-Biogeosciences, 117, G03030, *doi:10.1029/2011JG001876*.

Comas, X. and Wright*****,W. 2012. Heterogeneity of biogenic gas ebullition in subtropical peat soils is revealed using time-lapse cameras, Water Resources Research, *48, W04601, doi:10.1029/2011WR011654.* 2

Comas, X., Slater, L., and Reeve, A. 2011. Atmospheric Pressure Drives Changes in the Vertical Distribution of Biogenic Free-Phase Gasses in a Northern Peatland. Journal of Geophysical Research-Biogeosciences, *116, G04014, doi:10.1029/2011JG001701.*
doi:10.1029/2010JG001543.
Comas, X., Slater, L., and Reeve, A. 2011. Pool patterning in a northern peatland: geophysical evidence for the role of postglacial landforms. Journal of Hydrology, 399 (3-4): 173-184

E. Synergistic Activities

Fall Meeting Program Representative of the American Geophysical Union (AGU) Near-Surface (NS) Focus Group, January 2013-present.
Near Surface Geophysics (FG) Fellows Committee, American Geophysical Union (AGU), February 2013-present
Editor of the American Geophysical Union (AGU) Near-Surface (NS) Focus Group newsletter, January 2010-2013.
Coordinator, Outstanding Student Paper Award, AGU Near Surface Focus Group; 2010, 2011, 2012, and 2013.
Research affiliate , Carbonate Aquifer Characterization Laboratory (CACL), U.S. Geological Survey
Faculty affiliate, Environmental Sciences Program, Florida Atlantic University

F. Collaborators and Other Affiliations

Collaborators and co-Editors: Dr. Andrew Baird (University of Leeds, UK); Dr. Lisa Belyea (Queen Mary, University of London, UK); Dr. Brian Benscoter (Florida Atlantic University); Dr. Ronnie Best (USGS); Dr. Andrew Binley (Lancaster University, UK); Dr. Nigel Cassidy (Keele University, UK); Dr. Jeff Chanton (Florida State University); Dr. Kevin Cunningham (USGS); Dr. Don DeAngelis (USGS); Dr. Vic Engel (Everglades National Park); Dr. Paul Glaser (Univ. Minnesota); Dr. Angela Harris (University of Manchester, UK) ; Dr. Ross Hinkle (University of Central Florida); Dr Harry Jol (University of Madison-Wisconsin); Dr. Nick Kettridge (McMaster University); Dr. Dimitrios Ntarlagiannis (Rutgers University); Dr. Andrew Reeve (University of Maine) ; Dr. Len Scinto (Florida International University); Dr Lee Slater (Rutgers University); Dr Michael Sukop (Florida International University); Dr. David Sumner (USGS); Dr. Maria Strack (University of Calgary); Dr. Jan van der Kruk (Forschungszentrum, Germany); Dr. Mike Waddington (McMaster University).

G. Courses Taught

GLYC6934: Environmental Geophysics, Dept Geosciences, FAU, Fall 2008, 2010, 2012
GLYC6934: Ground Penetrating Radar, Dept Geosciences, FAU, Fall 2009
GLYC6934: Wetlands Geosciences, Dept Geosciences, FAU, Spring 2009
GLYC4451: Solid Earth Geophysics, Dept Geosciences, FAU, Spring 2010, Fall 2011, 2012
GLYC4700: Geomorphology, Dept Geosciences, FAU, Fall 2007-2011
GLYC4400: Structural Geology, Dept Geosciences, FAU, Spring 2008-2012
GLYC4790: Senior Field Camp, Dept Geosciences, FAU, Summer 2008
GLY 4750: Field Methods, FAU, Spring 2011
460:103:01: Planet Earth, Dept Earth & Env Sciences, Rutgers, Spring 2005
460:34186: Environmental Disasters, Dept Earth & Env Sciences, Rutgers, Spring 2005

H. Community Engagement or Out-reach

Comas, X. Successful Grantsmanship Seminar: Federal Funding, Successful Grantsmanship Professional Development Seminars, Charles E. Schmidt College of Science's Master Research Program, *Florida Atlantic University*, April 17, 2014, Boca Raton, FL.
Comas, X. Application of hydrogeophysical methods for near-surface investigations, Pegrum Lecture Series, Department of Geology, *University at Buffalo*, January 23, 2014, Buffalo, NY.
Comas, X. Characterizing carbon dynamics in the Everglades using hydrogeophysical methods, Geology Colloquium, *University of South Florida*, November 22, 2013, Tampa, FL.
Comas, X. Carbon Dynamics in the Greater Everglades, International Student 2013 Training Session for the UNESCO-IHE Institute for Water Education, *US Geological Survey*, June 5, 2013, Davie, FL. \
Usual convener and co-convener in sessions at the American Geophysical Union (AGU) Annual Fall Meeting (more than a dozen since 2005)

James Gammack-Clark
FAU Geosciences, 777 Glades Rd., Boca Raton, FL. 33431
Phone: 561-2970314, Email: jgammack@fau.edu

A. Professional Preparation

Master of Arts, Geography, Geographical Information Sciences emphasis, Florida Atlantic University, Boca Raton, Florida. 2001. Thesis: Image Rectification/Registration from a Project Manager's Perspective: A Review of Various Software. Advisor: Dr. Charles Roberts.

B. Appointments

Instructor, Florida Atlantic University Geosciences Department, Boca Raton, Florida. August 2006 to Present. This is primarily a teaching, rather than research, position. Specifically, classes taught include introductory and intermediate GIS/Cartography, introductory Geography and introductory Meteorology. Each of these classes is partially taught via the World Wide Web. In addition, the position calls for instruction in the field as part of an annual Geology Field Camp. Other duties include serving upon various committees and performing Academic Advising.

Adjunct Professor, Florida Atlantic University Geosciences Department, Boca Raton, Florida. January 2002 to May 2006. Commissioned to instruct FAU's Geosciences department's "Introduction to Mapping & GIS" course. The course is the cornerstone of the department's GIS sequence. This course is designed to introduce students to basic map design, map interpretation and appreciation, and an introduction to the art and science of GIS.

Senior Planner, Palm Beach County Planning Division, West Palm Beach, Florida, February 2004 to August 2006. This is considered an intermediate level professional and supervisory planning position in the Intergovernmental Section. The position involved the daily over sight of Planner I's and II's, a Planning Technician, Student Interns and a Secretary. Further responsibilities include: coordinating with Commissioners' offices to address specific intergovernmental projects; liaising with municipalities in coordination of both Future Land Use Amendments and Annexations; the design and management of GIS databases; in-depth analysis of spatial data from multiple sources (imagery, GIS, CAD, MDB, Shapefile, etc) for the development and maintenance of various data products and maps; leading and/or conducting data gathering; manipulation of remotely sensed data to detect change in the urban environment; and the interpretation of municipal comprehensive plans and elements. Also prepares technical and non-technical reports, and makes oral and written public presentations

Planner II, Palm Beach County Planning Division, West Palm Beach, Florida, July 2003 to February 2004. This is an intermediate level professional planning position in the Intergovernmental Section. Responsibilities included: managing GIS databases; 2

performing analysis of spatial data from multiple sources for the development and maintenance of various GIS products and maps; preparing, updating, and managing databases based on various sources of information using complex software programs; develops and maintains a listing of all approved developments on a countywide scale; and interprets municipal comprehensive plans and elements. Also prepares technical and non-technical reports, and makes oral and written public presentations. Supervises professional and technical staff in the conduct of assigned duties.
Planner I, Palm Beach County Planning Division, West Palm Beach, Florida, June 2002 to July 2003. This entry-level position involves the application of planning principals and methodology in the formulation of various planning studies and projects.

C. Selected Peer-Reviewed Publications

N/A. Research is not part of the Instructor's assignment.

D. Selected Other Publications or Products/Grants

N/A. Research is not part of the Instructor's assignment.

E. Synergistic Activities

Production Editor of ***The Florida Geographer***, 2008 - 2013
CEL1001R: eLearning Designer/Facilitator and Quality Matters Certification
GIS Expo, 2012

F. Collaborators and Other Affiliations

The Florida Society of Geographers
FAU Geosciences GIS Center

G. Courses Taught

GEA 2000: World Geography
MET 2010: Weather & Climate
GISC 3015: Introduction to Mapping & GIS
GISC 4043: Principles of GIS
GIS 4138: Geovisualization & GIS
GIS 4048C: Applications in GIS

H. Community Engagement or Out-reach

Instructed various professional development GIS classes
GIS/Redistricting consultant to local municipalities
Science Olympiad judge
Co–coordinator/presenter: S. Broward High School GIS field trip to FAU February, 2007

Tobin K. Hindle
FAU Geosciences, 777 Glades Rd., Boca Raton, FL. 33431
Phone: 561-297-2846, Email: thindle@fau.edu

Professional Preparation

Doctor of Philosophy, Comparative Studies, Environmental Studies concentration, Florida Atlantic University, Boca Raton, Florida. August 2006. Dissertation: The Regeneration of Nature: an alternative to ecological restoration. Advisor: Dr. Robin N. Fiore.

Graduate Certificate, Environmental Studies, Florida Atlantic University, Boca Raton, Florida. August 2006.

Master of Science, Biology, Geographical Information Systems emphasis, Florida Atlantic University, Boca Raton, Florida. G.P.A. 4.0/4.0, August 1997. Thesis: Determination of Wetland Impact Due to Groundwater Drawdown: the application of aerial photo-interpretation, GIS analysis, and groundwater modeling. Advisor: Dr. Alex Marsh.

Bachelor of Science, Limnology, Minor in Computer Science, University of Central Florida, Orlando, Florida. G.P.A. 3.4/4.0, December 1986.

Appointments

Associate Scientist and Faculty, Geosciences, FAU, Boca Raton, Florida. August 2013 to present.

Assistant Scientist and Faculty, Geosciences, FAU, Boca Raton, Florida. August 2006 to August 2013.

Graduate Program Director, Geosciences, FAU, Boca Raton, Florida. August 2011 to present.

Coordinator, Research Programs and Services, Geosciences, FAU, Boca Raton, Florida. May 1996 to August 2006.

Selected Peer-Reviewed Publications

Mulcan, A., Mitsova, D., **Hindle, T**., Hanson, H., and Coley, C. "Environmental Siting Suitability Analysis for Commercial Scale Ocean Renewable Energy Offshore Southeast Florida," Journal of Coastal Research, in review 2014.

Scholl, P., **Hindle, T**., Frazier, E., "Population Structure and Burrow Placement of Gopherus polyphemus in a Small, Declining Southeast Florida Conservation Area." FAU Undergraduate Research Journal, Vol. 1, No. 1, 2012

Raines, T., Ricci, P., Brown, S., Eggenberger, **T., Hindle**, T., and Schiff, M. "Cheating In Online Courses: The Student Definition," Journal of Effective Teaching 11.1 (2011): 80-89.

Selected Other Publications or Products/Grants

FAU QEP Distinction Through Discovery Curriculum grant, "Expanding the Student-Centered Undergraduate Research Culture Across the Curriculum". 2013.

Scholl, P., Calle, L., Frazier, E., **Hindle, T.,** "Distribution and habitat use of the gopher tortoise (Gopherus polyphemus) in a declining southeast Florida conservation area." 96th ESA Annual Meeting, Austin, TX. August 2011.

Lewis, S., **Hindle, T**., and Peterson, C. "Using GIS to investigate environmental factors contributing to the presence of an endangered plant (*Campanula robinsiae*)." 75th Anniversary Meeting of the Florida Academy of Sciences Florida Institute of Technology, Melbourne, Florida. March 2011

Remote Education and Assessment of Critical Habitats (REACH), Florida Atlantic University technology grant, 2011-2014.

Hindle, T. "Everglades Restoration." Encyclopedia of Geography. 2010. SAGE Publications. 1 Oct. 2010. <http://www.sage-ereference.com/geography/Article_n401.html>.

FAU interdisciplinary Cross-College Research Pre-Proposal on Climate Change, FAU Division of Sponsored Research, 2010.

Earth System Science Education Alliance partnership, a National Science Foundation GEO-Teach project, funded through the Institute for Global Environmental Strategies. 2007 – 2009.

Synergistic Activities

CEL1001R: eLearning Designer/Facilitator and Quality Matters Certification
SEDAAG annual meeting, Southeastern Division of the Association of American Geographers
Teaching with Technology Showcase, FAU Center for Teaching and Learning, 2009, 2010, 2011
ESSEA annual meeting, Earth System Science Education Alliance, 2007, 2008, 2009, 2010
Faculty Learning Community, Advanced Topics Online Teaching/Learning, member, 2010/2011
Citrix virtualization seminar "From Wow to How", 2010, 2012
GIS Expo, 2007, 2010
Faculty Learning Community, Sustainable Pedagogy, Facilitator, 2009/2010
Web conference on developing a Carbon Action Plan for universities, 2009.
Faculty Learning Community, Challenges and Opportunities to Distance Learning, 2009
Teaching Learning Center and The Center for Civic Engagement and Service workshop, 2008

Collaborators and Other Affiliations

SouthEastern Division of Association of American Geographers
Florida Society of Geographers' (FSG) webmaster
FAU Geosciences GIS Center
FAU Conservation committee
FAU Sustainability committee

Courses Taught

GEA 6931 – Thesis Seminar, 2013 to present.
GEA 6277 - Human-Environmental Interactions, 2009 to present.
GEA 4275 - Human-Environmental Interactions in South Florida, 2009 to present.
GEO 6920 - Geosciences Colloquium Series, 2009-2012.
ESC 2070 – The Blue Planet, 2007-present.
SLS 1412 - The Learning Community Experience, 2009-2012.
GLY 6934/ESC 6206 – Earth Science for Educators, 2007-2009.
GLY 3870 – Geoscience Computer Applications, 1998-2001.

Community Engagement or Out-reach

Science Olympiad judge,
Graduate Research Day poster judge
Invited panel judge for student projects in EGN 2935, 2009
Invited speaker for EGN 2935, Sustainability Leadership in Engineering, Fall 2009
Focus the Nation conference steering committee, 2009
Represented FAU at the non-profit organization Hurricane Warning! at the Disaster Survival House, 2008
Co–coordinator and presenter for the South Broward High School GIS field trip to FAU. February, 2007
Coordinated and conducted a 5th grade filed trip for students from Morikami Elementary school. 2007

Biosketch:

Scott H. Markwith, Associate Professor

Professional Preparation:

• Ph.D., Biogeography, University of Georgia, May 2007.
• M.S., Biogeography, University of Georgia, December 2001.
• B.A., Physical Geography, University of Mary Washington, May 1997.

Appointments:

• Associate Professor, Department of Geosciences and Environmental Science Program, Florida Atlantic University, August 2007 – Present.

Selected Peer Reviewed Publications:

• de Souza, J. C., da Cunha, V. P., and Markwith, S. H. 2014. Spatiotemporal Variation in Human-Wildlife Conflicts Along Highway BR262 in the Brazilian Pantanal. *Wetlands Ecology and Management* DOI: 10.1007/s11273-014-9372-4.
• Markwith, S. H., Mezza, G., Kennard, S., and Bousquin, S. 2014. Intra-Floodplain Seed Dispersal Limitation and Wetland Community Restoration. *Ecological Restoration* vol. 32, no. 3, p. 249-259.
• Markwith, S. H. 2013. Stream Restoration and Hydrochory: Seed Dispersal Variation in Restored and Degraded Reaches of the Kissimmee River, Florida. *Papers in Applied Geography* vol. 36, p. 27-36.
• Monette, D. and Markwith, S. H. 2012. Hydrochory in the Florida Everglades: Temporal and Spatial Variation in Seed Dispersal Phenology, Hydrology, and Restoration of Wetland Structure. *Ecological Restoration*, vol. 30, no. 3, p. 180-191.
• Markwith, S. H. and Leigh, D. S. 2012. Comparison of Estimated and Experimental Subaqueous Seed Transport. *Ecohydrology*, vol. 5, p. 346-350.

Selected Other Publications:

• Markwith, S. H. 2011. Biogeography and Environmental Restoration: An Opportunity in Applied Research. *Geography Compass*, vol. 8, p. 531-543.
• Markwith, S. H. 2009. Temporal Change and Disturbance in a Mixed Hardwood Forest in Blood Mountain Wilderness Area. *Florida Geographer*, vol. 40, p. 14-30.
• Markwith, S. H., Davenport, L. J., Shelton, J., Parker, K. C., Scanlon, M. J. 2009. Ichthyochory, the Suwannee Strait, and Population Divergence in *Hymenocallis coronaria*. *Florida Scientist*, vol. 72, no. 1, p. 28-36.
• Markwith, S. H and Leigh, D. S. 2008. Subaqueous Hydrochory: Open-Channel Hydraulic Modeling of Non-Buoyant Seed Movement. *Freshwater Biology*, vol. 53, no. 11, p. 2274-2286.
• Parker, K. C. and Markwith, S. H. 2007. Expanding Biogeography's Horizons with Genetic Approaches. *Geography Compass*, vol. 1, no. 3, p. 246-274.

Synergistic Activities:

• Development and oversight of FAU's Environmental Restoration Certificate program.
• Organization of the Spring 2011 1st International Forum for Environmental Issues for the Encontro Regional de Estudantes de Engenharia Ambiental - EREEAMB, Marabá, Pará, Brazil, involving FAU and Universidade do Estado do Pará.
• Session Organizer and Chair for Biogeography and Geomorphology Specialty Groups Paper Session at the Association of American Geographers Annual Meeting in Washington D.C., Session Title: Environmental Restoration Research, Spring 2010 .

• Development of TETRASAT, a program specifically designed to analyze genetic diversity and differentiation among populations with allotetraploid microsatellite data.
• Editorial board membership of both Freshwater Biology and Southeastern Naturalist.

Collaborators and Other Affiliations:

Collaborators:

• Steve Bousquin, South Florida Water Management District
• Vanessa da Cunha, Universidade Federal de Mato Grosso do Sul
• Sharon Ewe, Ecology and Environment, Inc.
• Stevee Kennard, Kaiser University
• David Leigh, University of Georgia
• Garren Mezza, Patch Market Garden
• Dean Monette, Florida Atlantic University
• Julio de Souza, Universidade Federal de Mato Grosso do Sul

Graduate Advisor:

• Kathleen C. Parker, Emeritus Professor, University of Georgia

Thesis and Dissertation Advisees (Total advised = 4 Ph.D. and 2 Master's; Committees = 2 Ph.D. and 9 Master's**):**

Ph.D.

• Dean Monette, Fall 2009 – Present
• Danielle Romais, Fall 2012 – Present
• Alana Edwards, Fall 2012 – Present
• Anthony Planas, Fall 2014 – Present

Master's

• Stevee Norman, Environmental Sciences Program, Spring 2011 – Spring 2013
• Garren Mezza, Environmental Sciences Program, Fall 2010 – Fall 2012

Courses Taught:

• Environment and Society, EVR 2017, Spring 2009, 2010, Summer 2008, 2010, 2011, 2013.
• Introduction to Physical Geography, GEO 2200, Fall 2009 – 2013, Summer 2014.
• Biogeography, GEO 4300/5305, Fall 2007, 2008, 2009, Spring 2011, 2012, 2013, 2014.
• Seminar in Geographic Methodology, GEO 6117, Fall 2008, Spring 2010.
• Environmental Restoration, EVR 6334, Spring 2008, 2009, Fall 2010 – 2014.
• Restoration Implementation and Management, EVR 6358, Spring 2013, 2014.

Community Engagement or Outreach:

• Science Olympiad Judge, Spring 2008.

ANTON EDUARD OLEINIK

Address:
Department of Geosciences Phone: (561) 297-3297
Florida Atlantic University E-mail: aoleinik@fau.edu
777 Glades Road
Boca Raton, FL 33431-0991

Professional Preparation.

Ph.D. Purdue University, West Lafayette, IN - Geology 1998
B.S. Moscow State University, Moscow, Russia – Geology 1985

Appintments.

2006-Present **Associate Professor**
Department of Geosciences
Florida Atlantic University
1999 – 2006 **Assistant Professor**
Department of Geosciences
Florida Atlantic University
1998 – 1999 **Visiting Assistant Professor**.
Department of Geography and Geology
Florida Atlantic University
1994 **Research Geologist**
New Business Development Group, Mobil Oil, Dallas, Texas.
1992-1998 **Research Assistant** and **Teaching Assistant**
Department of Earth and Atmospheric Sciences, Purdue University.
1986-1992 **Research Scientist**
Russian Academy of Sciences Institute of Geology, Moscow, Russia

Selected Peer-Reviewed Publications.

Oleinik, A. E., Marincovich L, Jr., Barinov, K. B, and Swart, P. K., 2008. Magnitude of Middle Miocene
warming in North pacific high latitudes: stable isotope evidence from *Kaheharaia* (Bivalvia,
Dosiniidae). Bulletin of the Geological Survey of Japan, vol. 59 (7/8), p. 39-53.
M. G. Harasewych, Oleinik, A. E**.**, and W. J. Zinsmeister. 2009. The Cretaceous and Paleocene
Pleurotomariid (Gastropoda; Vetigastropoda) fauna of Seymour Island, Antarctica. Jouranl of
Paleontology Vol. 83, No 5, pp. 750-766
Oleinik, A. E., Petuch, E. J., Aley, W. C. IV., 2012. Bathyal Gastropods of Bimini Chain, Bahamas.
Proceedings of the Biological Society of Washington 125(1): 19-53.
Strauss, J., Oleinik, A., Swart, P., 2014. Stable isotope profiles from subtropical marine gastropods of
the family Fasciolariidae: growth histories and relationships to local environmental conditions.
Marine Biology 161: 1593-1602.
Oleinik, A. E., 2014. Biodiversity and habitats of reef mollusks of families Conidae and Conlithidae

(Neogastropoda) off northern Roatan Island (Honduras). Marine Biodiversity records, 7: 1-6.

Selected Other Publications or Products/Grants.

2005 – 2007 National Science Foundation. "Collaborative Research: The Cold Late Oligocene Arctic Ocean and its Unique Biota", OPP-0425103, co-PI; Total funding: $145,529

Oleinik, A. E., 2010**.** Hooks and Shafts come together in a fragile giant from Antarctica. Feature
Article (with my painting on the cover of the magazine) in the American Paleontologist, Vol. 18,
No 2, pp. 10 - 13.

Oleinik, A. E., Comas, X., 2012. New data on the stratigraphy and depositional environments of the
Anastasia Formation in southeastern Florida. Geological Society of America Annual Meeting
Abstracts with Programs, 44(7), 74-2, p. 196

Chrpa, M. E., Oleinik, A.E., 2013. Morphometric analysis of Astarte borealis (Mollusca: Bivalvia) of
Camden bay, Northern Alaska. 2013 GSA Annual Meeting, Denver, CO, p.108.

D'Antonio, H., Oleinik, A. E., 2013. Mollusks of the Late Pleistocene oolitic facies of the Miami
limestone in the Miami Dade County, South Florida. 2013 GSA Annual Meeting, Denver, CO,
p.327.

Zhang, Y. G., Affek, H., Oleinik, A., Wang, Z., Hu, P., 2013. Oligocene-Early Miocene North Pacific
temperatures based on clumped isotopes in Kamchatka Bivalves. Goldschmidt 2013 Conference Abstracts, Mineralogical Magazine 77(5): 2597

Synergistic Activities

1993 – Present Reviewer for several journals in the field of specialization:
1998 - Present Associate editor of "Ruthenica" - Russian Journal of Malacology.
2000 – Present Review board of the Office of Polar Programs, National Science Foundation
2002 – Present Reviewer of the Petroleum Research Fund (research grants)
2002 - Present Reviewer for the National Geographic Society (research grants)
2009 - Present Chair of the Florida Atlantic University Diving and Boating Safety Committee.

Collaboarators and Other Affiliations.

California Academy of Sciences
Rosenstiel School of Marine and Atmospheric Sciences
American Association of Petroleum Geologists
Geological Society of America
Paleontological Research Institution
Paleontological Society of America

Courses Developed and Taught:

1998 -Present Global Environmental Issues in Earth and Atmospheric Sciences, Petroleum
Geology, Sedimentation and Stratigraphy, Global Environmental Change, Coastal and Marine Science; Geology Field Camp, Geology Field Methods; Marine Geology; History of the Earth and Life, Comparative Carbonate Sedimentology..

CURRICULUM VITA

EDWARD JAMES PETUCH
ADDRESS Business: Department of Geosciences
Florida Atlantic University
Boca Raton, Florida 33431
(561) 297-2398
Home: 1191 Dolphin Road
Singer Island
Riviera Beach, Florida 33404
(561)308-1492 (cellular)
STATUS Professor of Geology
BIRTH 4 November 1949; Bethesda, Maryland, USA
MARITAL STATUS Married, 3 children

EDUCATION

1976-1980 University of Miami, Rosenstiel School of Marine and Atmospheric Science: Ph.D., Oceanography, May, 1980
1973-1975 University of Wisconsin-Milwaukee: M.S., Zoology, June, 1967-1972 University of Wisconsin-Milwaukee: B.A., Zoology, Sept.

ACADEMIC HISTORY AT PRESENT INSTITUTION

1995-present Professor
1991-1995 Associate Professor
1987-1991 Assistant Professor (tenured 1991)
1986-1987 Visiting Professor

AREAS OF EXPERTISE

Oceanography, Molluscan Paleontology, Paleoceanography, Florida Geology, Marine Environmental Science, Molluscan Systematics

BOOKS AUTHORED

In Press *Cone Shells of the Okeechobean Sea*. ConchBooks.
2014 *Molluscan Communities of the Florida Keys and Adjacent Areas: Their Ecology and Biodiversity*. CRC Press, 310 pp.
2013 *Biogeography and Biodiversity of Western Atlantic Mollusks.* CRC Press. 320 pp.
2012 *Rare and Unusual Shells of Southern Florida*. Conch Republic Books, Mount Dora, Florida. (with Dennis Sargent). 189 pp.
2011 *Rare and Unusual Shells of the Florida Keys and Adjacent Areas*. MdM Publishers, Wellington, Florida. (with Dennis Sargent), 159 pp.
2011 *Compendium of Florida Fossil Shells*. *Volume 1*. MdM Publishers, Wellington, Florida (with Mardie Drolshagen), 413 pp.

2009 *The Molluscan Paleontology of the Chesapeake Miocene*. CRC Press, Boca Raton, New York, London. 160 pp.
2008 *The Geology of the Florida Keys and Everglades: An Illustrated Field Guide To Florida's Hidden Beauty*. Thomson/Cengage Publishers, Mason, Ohio, 84 pp.
2007 *The Geology of the Everglades and Adjacent Areas.* CRC Press, Boca Raton, New York, London (with Charles Roberts), 250 pp.
2004 *Cenozoic Seas: The View From Eastern North America.* CRC Press, Boca Raton, Florida, 320 pp.
1997 *Coastal Paleoceanography of Eastern North America (Miocene-Pleistocene).* Kendall-Hunt Publishing Co., Dubuque, Iowa. 351 pp.
1994 *Atlas of Florida Fossil Shells (Pliocene and Pleistocene Marine Gastropods).* Chicago Spectrum Press and the Graves Museum of Archaeology and Natural History, Dania, Florida. 394 pp., 100 plates.
1992 *Edge of the Fossil Sea. Life Along the Shores of Prehistoric Florida.* Bailey-Matthews Shell Museum, Sanibel, Florida. 168 pp.
1989 *Field Guide to the Ecphoras.* Coastal Education and Research Foundation, Charlottesville, Virginia. 140 pp.
1988 *Neogene History of Tropical American Mollusks.* Coastal Education and Research Foundation, Charlottesville, Virginia. 217 pp., 39 plates.
1987 *New Caribbean Molluscan Faunas.* Coastal Education and Research Foundation, Charlottesville, Virginia. 168 pp., 29 plates.
1986 *Atlas of the Living Olive Shells of the World.* Coastal Education and Research Foundation. Charlottesville, Virginia. 250 pp., 39 color plates. (with Dennis Sargent)

PAPERS PUBLISHED (over 150 papers)

Highlights include:

1998 The Molluscan Fauna of the Wawa River region, Miskito Coast, Nicaragua: Ecology, Biogeographical Implications, and Descriptions of New Taxa. *The Nautilus* 111 (1): 22-44
1997 A New Gastropod Fauna from An Oligocene Back-Reef Lagoonal Environment in West Central Florida. *The Nautilus* 110 (4): 122-138
1995 Molluscan Diversity in the Late Neogene of Florida: Evidence for a Two-Staged Mass Extinction. *Science* 270 (13 October): 275-277.

ABBREVIATED FACULTY CV

TIFFANY ROBERTS BRIGGS, PH.D.

A. Professional Preparation

University of South Florida Environmental Science B.S. (*cum laude),* 2006
Honors College
University of South Florida Geology M.S., 2008
University of South Florida Geology Ph.D., 2012

B. Appointments

1. Assistant Professor, Department of Geosciences, Florida Atlantic University, 2014-present
2. Instructor & Course Coordinator, Department of Geology & Geophysics, Louisiana State University, 2012-2014
3. Adjunct Professor, Polk State College, 2011-2014
4. Coastal Coordinator Internship, Pinellas County, Florida Department of Environmental Management, 2011-2012
5. Corporate Secretary, Coastal Sediments Conferences, Inc., 2009-present
6. Research Associate, University of South Florida, 2008-2012
7. Graduate Research Associate, Coastal Research Lab, University of South Florida, 2006-2012
8. Graduate Teaching Assistant, Department of Geology, University of South Florida, 2006-2009
9. Undergraduate Research Assistant, Coastal Research Lab, University of South Florida 2005-2006

C. Selected Peer-Reviewed Publications

1. Wang, P. and **Roberts Briggs, T.M.**, 2014. Storm-Induced Morphology Changes along Barrier Islands and Post Storm Recovery. In: Ellis J. and Sherman, D. (Eds.), Sea & Ocean Hazards, Risks and Disasters, Elsevier, *in press*.
2. **Roberts, T.M.,** Wang, P., and Puleo, J., 2013. Storm-Driven Cyclic Beach Morphodynamics of a Mixed Sand and Gravel Beach along the Mid-Atlantic Coast, USA. *Marine Geology* 346, 403-421.
3. Wang, P., and **Roberts, T.M.,** 2013. Distribution of Surficial and Buried Oil Contaminants Across Sandy Beaches Along Northwest Florida and Alabama Coasts Following the Deepwater Horizon Oil Spill in 2010. *Journal of Coastal Research* 29(6A), 144-155. Coconut Creek (Florida), ISSN 0749-0208.
4. **Roberts, T.M.** and Wang, P., 2012. Four Year Performance and Associated Controlling Factors of Several Beach Nourishment Projects along Three Adjacent Barrier Islands in West-Central Florida, USA. *Coastal Engineering* 70, 29-39.
5. **Roberts, T.M.,** Rosati, J.D., and Wang, P. **(eds.)** 2011. *Proceedings, Symposium to Honor Dr. Nicholas C. Kraus*, Journal of Coastal Research, Special Issue 59. West Palm Beach (Florida), 290 p., ISSN 0749-0208.

Tiffany Roberts Briggs*, Ph.D., Assistant Professor, Department of Geosciences, Florida Atlantic University Geosciences SE470, 777 Glades Road Boca Raton, FL 33431, (561) 297-4669, briggst@fau.edu *Roberts – maiden name

D. Selected Other Publications

1. **Roberts, T.M.,** 2012. Natural and Anthropogenic Influences on the Morphodynamics of Sandy and Mixed Sand and Gravel Beaches. Doctorate Dissertation, University of South Florida, Tampa, FL.
2. Wang, P., Rosati, J.D., and **Roberts, T.M. (eds.)** 2011. *Proceedings, Coastal Sediments 2011 International Conference,* World Scientific Publishing, Singapore. 2639 p.
3. **Roberts, T.M.** and Wang, P., 2011. Profile Change and Post-Storm Recovery of Delaware Beaches Resulting from Three Consecutive Storms in 2009. *Proceedings, Coastal Sediments 2011 International Conference,* World Scientific Publishing, Singapore. 1304-1317.
4. Wang, P., **Roberts, T.M.,** Dabees, M., and Horwitz, M.H., 2011. Beach Changes Associated with Active 2009-2010 El Nino Winter Along the West-Central Florida Barrier Islands. *Proceedings, Coastal Sediments 2011 International Conference,* World Scientific Publishing, Singapore. 1229-1242.
5. Wang, P. and **Roberts, T.M.,** 2010. Ongoing Beach Cleanup of the BP Oil Spill – A Superficial Job, Literally. National Science Foundation RAPID Response Grant Progress Report.

E. Synergistic Activities

1. Student Short Course Organizer, Professional Preparation, American Shore & Beach Preservation Association National Coastal Conference, 2014, Virginia Beach, Virginia
2. Invited Speaker, Mythbusters: 5 Reasons Active Learning Won't Work in Large Courses at LSU, 2014 Center for Academic Success Faculty Focus Workshop, Louisiana State University
3. Workshop Attendee, Future of Undergraduate Geoscience Education Summit, 2014, University of Texas at Austin, Texas
4. National Academies Fellow, Gulf Coast Summer Institute on Undergraduate Education, Howard Hughes Medical Institute and National Academies, 2013, Baton Rouge, Louisiana
5. Workshop Attendee, Communication Across the Curriculum (CxC) Summer Institute, Louisiana State University Office of Academic Affairs, 2013, Baton Rouge, Louisiana

F. Collaborators and Other Affiliations

1. Jack Puleo, Ph.D., Coastal Engineering, University of Delaware
2. Julie Dean Rosati, Ph.D., Engineering Research & Development Center, Army Corps of Engineers
3. Ping Wang, Ph.D., School of Geosciences, University of South Florida

G. Courses Taught

1. Coastal and Marine Science, GLY3730
2. Graduate Research, GLY6918

H. Community Engagement or Outreach

1. Chair, Student & New Professional Involvement Committee, American Shore & Beach Preservation Association

Vitae

Charles E. Roberts Date of Birth: April 3, 1953
Place of Birth: Houston, Texas

Degrees:

PhD. (Geography) The Pennsylvania State University, 1992.
"Textural Analysis of Urban Thematic Mapper Data."
M.A. (Geography) The Pennsylvania State University, 1987.
"From Parkway to Freeway: Roadside Design before the Interstate, 1858-1956".
A.B. (Geography/Anthropology) Vassar College, 1983.
"Farmland Preservation in the Northeast."

Appointments:

First Year at FAU: Fall 1990
Tenured and Promoted to Associate Professor, 1996
Promoted to Associate Dean of Graduate Studies,
Charles E. Schmidt College of Science, 2011
Appointed to Interim Chair, Geosciences, Fall 2013

Selected Peer Reviewed Publications

Zhang, C., D. Selch, Z. Xie, C. Roberts, H. Cooper, and G. Chen, 2013. Object-based Benthic Habitat Mapping in the Florida Keys from Hyperspectral Imagery. *Estuarine, Coastal and Shelf Science*, 134, 88-97. (2013)

Zhang, C., Z. Xie, C. Roberts, and L. Berry, 2012 Salinity Assessment for Northeastern Florida Bay Using Landsat TM Data. Southeastern Geographer, Vol. 52, Number 3.

Delahunty, J.L, Phelps, Jack, Roberts, Charles and Sawicki, Ben,
2010 Quantification of Historical Urban Growth in a Dallas Suburb
Southwestern Geographer.

Mary Beth Crile and Charles Roberts,
2009 Paleoterrain Model of the Yamato Marsh, Palm Beach County. Florida,
International Geoscience and Remote Sensing Symposium Proceedings of the IEEE.

J.l.Delahunty, Charles Roberts, Gullian Breary,
2009 Arvida and the Planned Sprawl of West Boca Raton,Florida
Florida Geographer,Vol. 40, 2009.

Xie, Zhou, Charles Roberts and Brian Johnson
2008 Object based target search using remotely sensed data: A case study in detecting the invasive exotic Australian Pine in south Florida. ISPRS Journal of Photogrammetry and Remote Sensing.

Edward J. Petuch and Charles E. Roberts,
2007 The Geology of the Everglades and Adjacent Areas, CRC Press; Boca Raton

Selected Other Publications or Products/Grants

2008 "Nearshore Reef Analysis and Quantification project" $58,000. Funded

Teaching Experience Undergraduate Courses: 2

Map Analysis and GIS (now online, both graduate and undergraduate versions)
Geovisualization and Geographic Information Systems
Remote Sensing of the Environment (online now, both undergraduate and graduate versions)
Digital Image Analysis (online now, both undergraduate and graduate versions)
Introductory Physical Geography, emphasizing water resource issues
Field methods in the Mapping Sciences
Geography Field Camp
Regional Geography of U.S. and Canada
Urban Geography (online now)
American Cultural Landscapes (online now)
Human-Environmental Interactions in south Florida
Art, Architecture and Environment: The Cultural Landscape of Venice
Graduate Courses:
Cultural Geography Seminar, Field Camp,Advanced Remote Sensing, Research in the Geoscience
Human-Environmental Interactions. Historical Preservation

Synergistic Activity

Department Level
GIS Lab and Center Director, 1992-1996, 2006-2011
Graduate Program Chair 1991-1999
Graduate Program Coordinator 2006-2011
Undergraduate curriculum chair, 1991-1997,2001-2006
Graduate curriculum chair 1991-1999,2006-2011
Chair, College of Science graduate programs committee, 2006-2013
Science representative of the University Graduate Programs committee, 2006-2013 **Contributions to New Program Creation and Implementation**
Development of a PSM in GIS (in process)
Development of an MS in Coastal and Marine Science (in process)
Updated the Environmental Science MS degree, University
Environmental Certificate, Biology
GIS certificate, Geography
Advanced GIS certificate, Geoscience
Medical Physics Minor, Physics
PSM in Medical Physics, Physics
PSM in Business Biotechnology, Biology-Business College
Neuroscience Graduate Certificate, Complex Systems program
Geoscience PhD , Geosciences
College Level Committee Membership
Public Intellectuals PhD committee, Arts and Humanities, 1999
Graduate Environmental Certificate committee, Arts and Humanities, 1999
Graduate curriculum committee chair, 2006-2008, College of Science
Undergraduate curriculum committee, 2001-2006, College of Science
Environmental Science MS degree (college wide) curriculum chair
Strategic Planning Committee, 2011-2012
University Level Committee Membership
Member and Chair University, Environmental Affairs Committee, 1992-1996 3

Science representative , University Graduate Council, 2006-present
Science representative, University Graduate Programs Council, 2006-present
Provost Committee on SACS Credentialing, 2012-2013
Provost Strategic Planning committee 2011-2012, 2012-2013
Graduate College Academic Affairs Committee, 2009-2014

Tara L. Root, Ph.D.
Associate Professor, troot@fau.edu, https://www.sites.google.com/site/drtararootshomepage/

A. Professional Preparation

- *Ph.D. in Geology*, August 2005

Minor in Environmental Chemistry and Technology
University of Wisconsin-Madison

- *M.S. in Geology, December 2000*

University of Wisconsin – Madison

- *B.S. in Geological Engineering, June 1998*

Colorado School of Mines – Golden, Colorado

B. Appointments

- *Associate Professor and supervisor of Water Analysis Lab,* August 2013– Present

Department of Geosciences, FAU

- *Assistant Professor, August 2006 – August 2013*

Department of Geosciences, FAU

- *Visiting Assistant Professor*, August 2005 – August 2006

Department of Geosciences, FAU

- *Graduate Teaching Assistant/Research Assistant*, August 2002-August 2004

Department of Geology and Geophysics, University of Wisconsin – Madison

- *Fellow, September 1999 – August 2002*

U.S. Department of Energy, Office of Civilian Radioactive Waste Management Fellowship Program at the University of Wisconsin – Madison (included three months of research at Los Alamos National Laboratory, NM)

C. Selected Peer-Reviewed Publications *(Bold font indicates student author)*

Survis, F. and Root, T. 2012. Evaluating the effectiveness of water restrictions: A case study from southeast Florida. *Journal of Environmental Management* 112:377-383.

Root, T. and **Survis, F.D.** 2012. Human-climate-water interactions in the context of managing Florida's water supplies. *The Florida Geographer* 43:4-16.

Kuhn, T. and Root, T., 2012. Environmental controls on the distribution and vigor of an endangered grass (*Panicum abscissum* Swallen).

Root, T., Gotkowitz, M., Bahr, J., and Attig, J. 2009. Arsenic geochemistry and hydrostratigraphy in Midwestern U.S. glacial deposits. *Ground Water* 48:903-912.

Lakhan, S., Root, T., and Fadiman, M. 2009. Household water in northern Trinidad: Source, collection, storage, and socioeconomics. *The Florida Geographer* 40:48-61.

D. Selected Other Publications or Products/Grants

Root, Tara (2014) "Book Review: Review of Groundwater for the 21st Century: A Primer for Citizens of Planet Earth." *Groundwater*, 52: 647-648.

Berry, L., Bloetscher, F., Hernández Hammer, N., Koch-Rose, M., Mitsova-Boneva, D., Restrepo, J., Root, T., Teegavarapu, R., 2011: White Paper on Florida water management and adaptation in the face of climate change, Florida Climate Change Task Force.

Collaborator: Expanding the student-centered undergraduate research culture across the curriculum

Funding period: Fall 2013 – Spring 2015
Funding source: FAU Distinction through Discovery Program
Funding amount: $20,000

Co-Principle Investigator: Remote education and assessment of critical habitats
Funding period: 2010-2013
Funding source: FAU Technology Fee Program
Award amount: $74,155

Principle investigator: Earth systems science teacher education at FAU.
Funding period: June 2007 – October 2009
Funding agency: Institute for Global Environmental Strategies
Award amount: $40,000

E. Synergistic Activities

Selected Service:

Chair, FAU Environmental Sciences Undergraduate Curriculum Committee (2013-present)
Member, FAU Environmental Sciences Program Committee (2011-present)
Member, FAU Dept. of Geosciences, Geology Curriculum Committee (2006 – present)
FAU excellence and innovation in undergraduate teaching award (2013)
President South Florida Hydrologic Society (2012-2013)
Faculty advisor for 1) FAU's Chapter of Sigma Gamma Epsilon, Earth Sciences Honor Society (2006-present), 2) FAU's student chapter of the American Institute of Professional Geologists (present)
Campus representative for Geologic Society of America (2008-present)

F. Collaborators and Other Affiliations (affiliation = FAU unless otherwise noted)

***Collaborators and co-editors*:** Dr. Len Berry , Dr. Fred Bloetscher , Dr. Evelyn Frazer , Nicole Hernández Hammer , Dr. Tobin Hindle , Dr. Marguerite Koch-Rose , Tina Kuhn (unaffiliated), Dr. Dianna Mitsova-Boneva , Dr. Dianne Owen , Dr. Jorge Restrepo , Lisa Survis , Dr. Ramesh Teegavarapu , Dr. Caiyun Zhang

Graduate advisor: Dr. Jean Bahr (University of Wisconsin – Madison)

M.S. advisees and committee participation (15 total): Dominick Antolino (USGS), Brain Banks (USGS), Carrie Beaudreau (USGS & FAU), Keren Bolter , Eric Carlson (USGS), Heather D'Antonio , Michelle Infande (Palm Beach County Water Utilities) Siana Lakhan, Zach Mester, Garren Mezza (Patch Market), Elizabeth Quinn (SFWMD), Corrie Rainyn, (DDS Inc.), Lisa Survis , Richard Westcott (USGS & FAU), William Wright , Tania Leung

Ph.D. advisees and committee membership (5 total): Troy Bernier, Keren Bolter, Rachelle Grein, Greg Mount (Indiana University of Pennsylvania), Lisa Survis

G. Courses Taught

Hydrogeology (GLY 4822) Engineering Geology (GLY 4830)
Benchmark Developments in Hydrogeology (GLY 6897) Hydrogeology Methods (GLY 6838)
Env. Issues in Atmos. & Earth Sci (ESC 3704) Water Resources (GEOC 4280)
Earth Science for Educators I (ESC 6206) Geology Field Methods (GLY 4750)

H. Community Engagement or Out-reach

Suncoast High School, Riveria Beach, FL, Career Showcase (2013, 2014)
Volunteered for GetWet, a high school program designed to inform students about private well drinking water quality (2012, 2014)
Judge for Science Olympiad (2011, 2012)

Abbreviated C. V.

David Lewis Warburton

Professional Preparation

Undergraduate Study - UNIVERSITY OF CALIFORNIA, San Diego, California - B.A. degree awarded June, 1969.
Major: Chemistry Minor: History of Science/Economics
Graduate Study: UNIVERSITY OF CHICAGO, Chicago, Illinois - Ph.D. degree awarded June, 1978.
Major: Geochemistry
Major Professor: Professor Stefan Hafner

Appointments:

Assistant and Associate Professor of Geology, FLORIDA ATLANTIC UNIVERSITY, Boca Raton, Florida, September 1975- present.
Assistant Chairperson, Department of Geosciences, FLORIDA ATLANTIC UNIVERSITY, Boca Raton, Florida, January 2005 - present.

Selected Peer-Reviewed Publications

None

Selected Other Publications or Products/Grants

Registered Professional Geologist, State of Florida, 1989 - present, License # 1074.

Synergistic Activities

Academic Advisor, B.A. and B.S. Geology Degrees

Collaborators or Other Affiliations

Planning Committee, International Limnogeology Congress 6 (ILIC6)
Webmaster, GSA Limnogeology Division

Courses Taught (last 7 years)
Physical Geology/Evolution of the Earth (GLY 2010) -Su08, Su09, Su10, Su11, Su12, Su13, Su14
Geology of the National Parks - Water, Waves, and Caves (GLY 3165) - F11
Environmental Issues in Earth and Atmospheric Sciences (EVR 3019, later ESC 3704) - F08, F09, F10, S12, S12, F12
Mineralogy and Crystal Chemistry (GLY 4200C) - S09, F09, F10, F11, F12, F13, F14
Environmental Geochemistry (GLY 4240 or 4241) - F08, S11, F14
Petrology of Igneous and Metamorphic Rocks (GLY 4310) - S08, S10, S11, S12, S13, S14
Field Methods (GLY 4750) - S08, S09, S13
Environmental Geochemistry, graduate (GLY 5243) - S11, F14
Advanced Environmental Geochemistry (GLY 6246) - S10, F13
Global Environmental Change (GLY 6746) S14
Geosciences Colloquium Series (GEO 6920) - F12, S13
Legend: F = Fall, S = Spring, Su = Summer, digits refer to 20xx, where xx are digits shown

Community Engagement or Outreach
Liaison, Canaveral Mineral and Gem Society

ZHIXIAO XIE

A. Professional Preparation

Peking University Geography B.S. 1990
Chinese Academy of Sciences Ecology M.S. 1993
State University of New York at Buffalo Computer Science M.S. 2002
& Engineering
State University of New York at Buffalo Geography Ph.D. 2002

B. Appointments

2014-present Associate Dean for Research and Partnership Initiatives, College of Science, Florida Atlantic University
2014-present Professor, Department of Geosciences, Florida Atlantic University
2009-2014 Associate Professor, Department of Geosciences, Florida Atlantic University
2003-2009 Assistant Professor, Department of Geosciences, Florida Atlantic University,
2002-2003 Visiting Assistant Professor, Department of Geography and Urban Planning,
Temple University,

C. Selected Peer-Reviewed Publications

1. Xie, Z. and J. Yan 2013. "Detect Traffic Accident Clusters with Network Kernel Density Estimation and Local Spatial Statistics: An Integrated Approach". *Journal of Transport Geography*, 31: 64-71.
2. Zhang, C., **Z. Xie**, and D. Selch, 2013. Fusing LiDAR and Digital Aerial Photography for Object-based Forest Mapping in the Florida Everglades. *GIScience and Remote Sensing*, 50 (5), 562-573.
3. **Xie., Z.,** Z. Liu, and Y. Li, 2013. "Validation of the Everglades Depth Estimation Network (EDEN) Water-Surface Models", *Papers in Applied Geography*, 36:98-106.
4. Zhang, C., D. Selch, **Z. Xie**, C. Roberts, H. Cooper, and G. Chen, 2013. Object-based Benthic Habitat Mapping in the Florida Keys from Hyperspectral Imagery. *Estuarine, Coastal and Shelf Science*, 134, 88-97.
5. Johnson,B. ‡ and **Z. Xie** 2013. "Classifying a high resolution image of an urban area using super-object information". *ISPRS Journal of Photogrammetry and Remote Sensing*, 83: 40-49.

D. Selected Other Publications or Products/Grants

1. Zhang, C. and **Z. Xie** 2013. "Data fusion and classifier ensemble techniques for vegetation mapping in the Everglades". *Geocarto International*, 1-16, DOI:10.1080/10106049.2012.756940.
2. Zhang, C. and **Z. Xie** 2013. "Object-based Vegetation Mapping in the Kissimmee River Watershed Using HyMap Data and Machine Learning Techniques". *Wetlands,* 33:233–244.
3. **Xie, Z**., L. Pearlstine, and D.E. Gawlik 2012. "Develop a Finer Resolution DEM to Support Hydrological Modeling and Ecological Study in the Northern Everglades Freshwater Wetland". *GIScience & Remote Sensing*, 49(5): 664-686.
4. Zhang, C. and **Z. Xie** 2012. Combining Object-based Texture Measures with a Neural Network for Vegetation Mapping in the Everglades from Hyperspectral Imagery". *Remote Sensing of Environment*, 124: 310-320.
5. **Xie, Z**. , Zhang, C., and L. Berry 2012. Geographically Weighted Modeling of Surface Salinity in Florida Bay Using Landsat TM Data. *Remote Sensing Letters,* **4(1), 76-84.**

E. Synergistic Activities

 Extensive experiences in diverse large-scale spatial modeling. Started Cellular Automata modeling in early 1990s (won the best paper award in the 3rd Chinese National Land

Resource Symposium), key modeler in a NGA funded image retrieval system, leading modeler in USGS Everglades-wide surface water modeling system, and leading modeler in network-based cluster analysis and modeling system.

 PIs and Co-PIs for multiple interdisciplinary research and teaching grants, sponsored by USGS, NPS, FFWC,FHI, and etc. Established collaborations with scientists from diverse disciplines including Biology, Computer Science, Ecology, Environmental Sciences, and Urban Planning

 Associate Dean for Research and Partnership Initiatives, College of Science, Florida Atlantic University

 Director of Center of GIS sited in Geosciences Department, Florida Atlantic University

 Chair of Master Researcher Committee in the College of Sciences, Florida Atlantic University

 Chair of College Graduate Curriculum Committee in the College of Sciences, and College Representative in the University Graduate Program Committee and the University Graduate Council, Florida Atlantic University

 Editorial Advisory Board member of the *ISPRS Journal of Photogrammetry and Remote Sensing*.

 Served on and program committee of the Second and Third International Workshop on Earth Observation and Remote Sensing Applications (EORSA 2012, EORSA 2014). Served on program committee of Southeastern Division of AAG annual meetings in 2008 and 2009.

 An invited reviewer for NSF proposals, FFWC proposal, and reviewed papers for multiple national/international journals.

F. Collaborators and Other Affiliations

Brian Johnson, Florida Atlantic University
Dale Gawlik, Florida Atlantic University
Caiyun Zhang , Florida Atlantic University
Len Berry, Florida Atlantic University
Zhongwei Liu, University of Nevada
John W. Jones, the USGS
Aaron L. Higer, Florida Atlantic University
Pamela A. Telis, the USGS
L. Pearlstine, National Park Services

G. Courses Taught

 Advanced Topics in Geographic Information Systems

 Applications of Geographic Information Systems

 Programming in Geographic Information Systems

 Internet Geographic Information Systems

 Advanced Remote Sensing

 Principles of Geographic Information Systems

 Spatial Data Analysis

H. Community Engagement or Out-reach

2014 Participant in FAU Harbor Branch IRL Observatory Science and Technology Advisory Committee meetings, July 29, 2014. FAU HBOI, FL
2010 Participant in “Inundation Mapping and Vulnerability Assessment Workshop”, Sept 2, 2010. Davie, FL
2009 Co-presenter in one of the UNESCO Lectures (organized by USGS), June 10- 11, 2009, Davie, FL

CAIYUN ZHANG
Assistant Professor, Department of Geosciences, Florida Atlantic University
777 Glades Road, Boca Raton, Florida 33431
Phone: 561-297-2648; Email: czhang3@fau.edu; web: http://home.fau.edu/czhang3/web/

Professional Preparation

Ocean University of China Marine Geology B.S. 1998
Ocean University of China Marine Geology M.S. 2003
Ocean University of China Ocean Remote Sensing Ph.D. 2007
University of Texas at Dallas Geospatial Information Sciences Ph.D. 2010

Appointments

2011.01 - present Assistant Professor, Florida Atlantic University (FAU), USA
2010.08 - 2010.12 Instructor, Florida Atlantic University (FAU), USA
2010.01 - 2010.06 Satellite Oceanographer, NODC/NOAA, USA
2007.01 - 2009.12 Teaching Assistant, Program of GIS, University of Texas at Dallas, USA
2006.07 - 2006.12 Research Assistant, Ocean University of China, China
2005.07 - 2006.06 Visiting Scholar, IPRC, University of Hawaii at Manoa, USA
2000.09 - 2005.06 Research Assistant, Ocean University of China, China
1998.09 - 2000.08 Instructor, Zhejiang Ocean University, China

Selected Peer-reviewed Publications

1) **Zhang, C**., 2014. Combining Hyperspectral and LiDAR Data for Vegetation Mapping in the Florida Everglades. *Photogrammetric Engineering & Remote Sensing*, 80, 733-743.

2) **Zhang, C**., and Z. Xie, 2013a. Data Fusion and Classifier Ensemble Techniques for Vegetation Mapping in the Coastal Everglades. *Geocarto International*, doi:10.1080/10106049.2012.756940.

3) **Zhang, C**., and Z. Xie, 2013b. Object-based Vegetation Mapping in the Kissimmee River Watershed Using HyMap Data and Machine Learning Techniques. *Wetlands*, 33, 233-244.

4) **Zhang, C**., and Z. Xie, 2012. Combining Object-based Texture Measures with a Neural Network for Vegetation Mapping in the Everglades from Hyperspectral Imagery. *Remote Sensing of Environment*, 124, 310-320.

5) **Zhang, C**., and F. Qiu, 2012. Mapping Individual Tree Species in an Urban Forest Using Airborne LiDAR Data and Hyperspectral Imagery. *Photogrammetric Engineering & Remote Sensing*, 78, 1079-1087.

Selected Other Publications (Total peer-reviewed journal articles: 27)

6) **Zhang, C**., 2014. Applying Data Fusion Techniques for Benthic Habitat Mapping and Monitoring in a Coral Reef Ecosystem. *ISPRS Journal of Photogrammetry and Remote Sensing*, http://dx.doi.org/10.1016/j.isprsjprs.2014.06.005.

7) **Zhang, C**., H. Cooper, D. Selch, *et al*., 2014. Mapping Urban Land Cover Types Using Object-based Multiple Endmember Spectral Mixture Analysis. *Remote Sensing Letters*, 5, 521-529.

8) **Zhang, C**., Z. Xie, and D. Selch, 2013. Fusing LiDAR and Digital Aerial Photography for Object-based Forest Mapping in the Florida Everglades. *GIScience & Remote Sensing*, 50, 562-573.

9) **Zhang, C**., D. Selch, Z. Xie, C. Roberts, H. Cooper, and G. Chen, 2013. Object-based Benthic Habitat Mapping in the Florida Keys from Hyperspectral Imagery. *Estuarine, Coastal and Shelf Science*, 134, 88-97.

10) **Zhang, C**., and F. Qiu, 2012. Unsupervised Hyperspectral Image Classification with a Neuro-fuzzy System. *Journal of Applied Remote Sensing*, 6, 063515.

Synergistic Activities

 I have been involved in the research and education of remote sensing since 2003. Over the last 10 years, I have been actively developing expertise in remote sensing of vegetation and ocean climate, as well as spatial modeling and analysis. I have developed new algorithms and innovative frameworks to combine multiple remote sensing data sources for vegetation mapping in urban areas and the Florida Everglades. I also developed a new algorithm to solve difficult areal interpolation problems.

 Since joining FAU, I have published 16 peer-reviewed journal articles (2 single authored, 10 first authored, and 4 co-authored). I have been awarded the First Place of 2013 ERDAS Award for Best Scientific Paper in Remote Sensing from the American Society for Photogrammetry and Remote Sensing (ASPRS), 2012 Early Career Paper Award by the Remote Sensing Specialty Group (RSSG) of Association of American Geographers (AAG), and the First Place of 2010 Student Honors Paper Competition by the RSSG of AAG.

 I finished my first Ph.D. in ocean remote sensing at the Ocean University of China (OUC). My dissertation research identified and simulated low-frequency variations and interactions in the air-sea system using remote sensing data. My dissertation won the Best Doctoral Dissertation Award in 2008. Serving as the principle investigator, my research was funded by the Natural Science Foundation of China (NSFC) during 2008-2010. In 2009, I won the National Natural Science Award (First Prize) honored by the Ministry of Education in China to recognize my significant contributions in another NSFC sponsored project entitled "Multi-sensors remote sensing the boundary of the ocean and atmosphere: theories and methods". I have published 11 peer-reviewed papers in ocean remote sensing, many of which are in internationally prestigious journals, such as *Journal of Geophysical Research*, and *Geophysical Research Letters*.

 Currently I serve as the PI for a FAU internally funding projects to investigate remote sensing of water quality in the Florida Everglades, and the Co-PI for a project funded by the U.S. Geological Survey to model water salinity in the Everglades using remote sensing.

 I am the Member of AAG and ASPRS. I have served as the reviewer for NSF and many international journals, the judge for the Student Honors Paper Competition of RSSG at AAG, and a session organizer for the 2013 AAG annual conference. I have also participated in various services at FAU. I also serve as the committee member of 6 Ph.D. students at FAU. I have been acting as the Assistant Director of the Center for Geo-Information Science at FAU since August 2013.

Collaborators & Other Affiliations

Collaborators and Co-Editors: Dr. Fang Qiu (University of Texas at Dallas); Dr. Ge Chen (Ocean University of China); Dr. Leonard Berry (CES of FAU); Dr. Marguerite Koch (Biology, FAU); Dr. Zhixiao Xie (FAU).

Graduate Advisor: Prof. Fang Qiu (University of Texas at Dallas); Prof. Ge Chen (Ocean University of China); Prof. Zuosheng Yang (Ocean University of China, retired).

Thesis Advisor and Postgraduate-Scholar Sponsor: Aaron Evens (co-advisor, Ph.D., graduated Summer 2014); Donna Selch (Ph. D., ongoing); Hannah Cooper (Ph. D., ongoing); Nicole Gamboa (M. A., ongoing); and Dr. Dezhi Huang (Visiting scholar from Central South University of China).

Courses Taught

Hyperspectral Remote Sensing
LiDAR Remote Sensing
Digital Image Analysis
Photogrammetry and Aerial Photography Interpretation
Marine Geology